

Kesmas

Jurnal Kesehatan Masyarakat Nasional
(National Public Health Journal)

Quarterly Journal

Invited Article:

Accelerating the Provision of Safe Water Supply in Urban and Rural Areas of Indonesia (pp. 137-144)

Research Articles:

Association between Self-Reported Fatigue and Sarcopenia Measures among Elderly in Selangor, Malaysia (pp. 145-150)

Strategy for Diagnosing Breast Cancer in Indonesia During the COVID-19 Pandemic: Switching to Ultrasound-Guided Percutaneous Core Needle Biopsy (pp. 151-157)

Correlation between Care Burden and Mental Health with the Perceived Social Support of Patients Relatives in Turkey (pp. 158-164)

King Bhumibol Adulyadej's Sufficiency Economy Philosophy and Post-Traumatic Stress Disorder among Higher-Education Students from the Armed Conflict Region of Thailand (pp. 206-212)

COVID-19 Preparedness and the Anxiety of Thai Citizens (pp. 213-220)

TABLE OF CONTENT

Invited Article:

- Accelerating the Provision of Safe Water Supply in Urban and Rural Areas of Indonesia** 137-144
Sumengen Sutomo, Salord Sagala, Bebi Sutomo, Sri Wrinarti, Gelant Sanjaya

Research Articles:

- Association between Self-Reported Fatigue and Sarcopenia Measures among Elderly in Selangor, Malaysia** 145-150
Maria Justine, Aliff Latir, Nadhirah Noor, Angelbeth Joanny, Izzaty Iskandar, Maisarah S A Faizi, Dzulhelmi Edinan

- Strategy for Diagnosing Breast Cancer in Indonesia during the COVID-19 Pandemic: Switching to Ultrasound-Guided Percutaneous Core Needle Biopsy** 151-157
Farida Briani Sobri, Adang Bachtiar, Sonar Soni Panigoro, Juwita Cresti Rahmaania, Patria Wardana Yuswar, Ening Krisnuhoni, Nelly Tandiar

- Correlation between Care Burden and Mental Health with the Perceived Social Support of Patients Relatives in Turkey** 158-164
Mehtap ŞAHİNGÖZ TAHTA, Elçin BALCI

- Correlation between Dental Environment and Perceived Stress Scale among Dental Students during the COVID-19 Pandemic in Indonesia** 165-170
Tri Erri Astoeti, Howis Josephine, Armelia Sari Widyanman, Widijanto Sudhana

- Characteristics of Cognitive Status in Sub-Population of Sub-Acute Stage of Ischemic Stroke Patients in West Nusa Tenggara, Indonesia** 171-177
Herpan Syafii Harahap, Muhammad Akbar, Jumraini Tammasse, Andi Kurnia Bintang, Andi Alfian Zainuddin

- Reasons for Unwanted Pregnancy among Women of Childbearing Age (15-19 Years) in Jambi Province** 178-188
Ummi Kalsum, Renny Listiawaty, Dato Noor A M Awal

TABLE OF CONTENT

Research Articles:

Factors Shaping Uptake of Antenatal Care in Surabaya Municipality, Indonesia: A Qualitative Study	189-198
<i>Lisa Jones, Nyoman Anita Damayanti, Nicola Wiseman, Neil Harris</i>	
Geographic Accessibility towards Primary Health Care in Karawang District	199-205
<i>Nabila Ramadina, Mulya Nurmansyah Ardisasmita, Budi Sujatmiko</i>	
King Bhumibol Adulyadej's Sufficiency Economy Philosophy and Post-Traumatic Stress Disorder among Higher-Education Students from the Armed Conflict Region of Thailand	206-212
<i>Chonnakarn Jatchavala, Arnont Vittayanont</i>	
COVID-19 Preparedness and the Anxiety of Thai Citizens	213-220
<i>Afifi Lateh, Prasopchai Pasunon, Kiflan Dolah, Panida Kongjam, Saminee Chemaee, Phanupong Panomwan, Alawee Lateh</i>	

Kesmas

Jurnal Kesehatan Masyarakat Nasional (National Public Health Journal)

Volume 16, Issue 3, August 2021

p-ISSN 1907-7505

e-ISSN 2460-0601

Kesmas: Jurnal Kesehatan Masyarakat Nasional (National Public Health Journal) is a journal that contains both research articles and invited review articles in the field of public health and published quarterly

Editor in Chief

Dewi Susanna

International Editorial Board

Dumilah Ayuningtyas (Faculty of Public Health Universitas Indonesia, Indonesia)
Ahmad Syafiq (Faculty of Public Health Universitas Indonesia, Indonesia)
Zarfiel Tafal (Faculty of Public Health Universitas Indonesia, Indonesia)
Doni Hikmat Ramdhan (Faculty of Public Health Universitas Indonesia, Indonesia)
Ahmad Sulaeman (Faculty of Human Ecology Bogor Agricultural University, Indonesia)
Tris Eryando (Faculty of Public Health Universitas Indonesia, Indonesia)
Tri Yunis Miko Wahyono (Faculty of Public Health Universitas Indonesia, Indonesia)
Upik Kusumawati Hadi (Faculty of Veterinary Medicine Bogor Agricultural University, Indonesia)
Yodi Mahendradhata (Faculty of Medicine Gadjah Mada University, Indonesia)
Rajendra Prasad (Merit India Consultant Pvt Ltd, India)
Peter D Sly (Faculty of Medicine and Biomedical Science, University of Queensland, Australia)
Budi Haryanto (Faculty of Public Health, Universitas Indonesia, Indonesia)
Prathurng Hongsrangon (University of Chulalongkorn, Thailand)
Hidayatulfathi Othman (Faculty of Health Sciences, National University of Malaysia, Malaysia)
Don Eliseo Lucero-Prisno III (London School of Hygiene and Tropical Medicine, England)
Orawan Kaewboonchoo (Mahidol University, Thailand)
Dian Kusuma (Imperial College London, the United Kingdom)
Mellissa Withers (University of Southern California, the United State of America)
Jalaludin Bin Badrudin (University of New South Wales, Australia)

Managing Editor

Ella Ayu Septia Mustika

Web Programmer

Eddy Afriansyah
Nico Kurnia Pratama

Language Editor

Anandani Difratia Prihabida

Editorial Secretary

Ninez Dwiandra Sekarsari

Published by

Faculty of Public Health Universitas Indonesia
G301 Building G 3rd Floor
Kampus Baru UI, Depok 16424
Mobile Phone: +62815-1141-6600
E-mail: jurnalkm@ui.ac.id or jurnalkesmas.ui@gmail.com
Website: <http://journal.fkm.ui.ac.id/kesmas>

READER MAIL

Dear Editorial Team, Authors, Viewers, Subscribers, and Readers

Since the COVID-19 pandemic situation in Indonesia is still not going well, I saw the articles about it dominating this year's edition of **Kesmas: Jurnal Kesehatan Masyarakat Nasional** (National Public Health Journal). I think it has positive and negative effects; the positive would be there is a discovery about behavior, response, or way of thinking because people were adjusting to this new situation. However, the negative effect means we are still going to experience this COVID-19 pandemic long enough. I hope the articles dominating the following editions of **Kesmas: Jurnal Kesehatan Masyarakat Nasional** (National Public Health Journal) would be how people face "the after-pandemic era," which means the COVID-19 pandemic has ended. (Clara, Yogyakarta)

INFORMATION

Kesmas: Jurnal Kesehatan Masyarakat Nasional (National Public Health Journal) editorial team accepts any criticism, feedback, and recommendation related to published articles and the progress of journal which can be submitted through e-mail: jurnalkesmas.ui@gmail.com. Please kindly inform your name, institution name, and address. We will publish the criticism, feedback and recommendation received on Reader Mail section in the next edition. We will provide an interesting souvenir for the reader whose criticism/feedback/recommendation is published on the reader mail. Thank you. (Editorial Team)

Every article published is charged an Article Processing Charge (APC) since April 15, 2021 of **USD 450**.

Please make a payment to the following account:
UNIVERSITAS INDONESIA BHPP
Bank BNI UI Depok
Account Number: 1273000568
Swift Code: BNINIDJA

Please send the receipt to:
Secretariat of Kesmas: Jurnal Kesehatan Masyarakat (National Public Health Journal)
Faculty of Public Health Universitas Indonesia
G301 Building G 3rd Floor
Kampus Baru UI, Depok 16424
or e-mail: jurnalkm@ui.ac.id or jurnalkesmas.ui@gmail.com

AUTHOR GUIDELINES

- Kesmas:** Jurnal Kesehatan Masyarakat Nasional (National Public Health Journal) publishes articles in the field of public health that includes Biostatistics, Epidemiology, Health Policy and Administration, Occupational Health and Safety, Environmental Health, Health Education and Behavioral Science, Public Health Nutrition, and Sexual and Reproductive Health.
 - Submitted articles must be research articles and invited review articles that should not have been previously published or be currently under consideration for publication anywhere else and free of plagiarism. Each submitted article will be checked by an application for detecting plagiarism.
 - Components of Articles:
 - The title is written in English with a maximum of 20 words.
 - The author's identity is written under the title, which includes name, affiliation, and correspondence address, phone number and e-mail. All authors' names will be put on the first page of the article; however, when the space is not enough, the names will be written in the Additional Information.
 - Abstract is written in English with a maximum of 200 words. The abstract should be one paragraph covering introduction, aim, method, results, and conclusion with a maximum of 5 (five) keywords separated by comma.
 - Introduction contains background, brief and relevant literature review and the aim of study.
 - Method includes design, population, sample, data sources, techniques/instruments of data collection, data analysis procedure, and ethics.
 - Results are research findings and should be clear and concise.
 - Discussion should properly and argumentatively define results of study with any relevant theory and prior finding.
 - Tables should be single-spaced and numbered consecutively in accordance with presentation in the text. Figures, pictures, or formulas should be original. Ensure that each illustration has a caption. Supply captions separately, not attached to the figure. A caption should comprise a brief title (not on the figure itself) and a description of the illustration. Keep text in the illustrations themselves to a minimum but explain all symbols and abbreviations used. Then, for resolution, rasterized based files (e.g., with .tiff or .jpeg extension) require a resolution of at least 1,000 dpi (dots per inch). Line art should be supplied with a minimum resolution of 1,000 dpi. Tables and/or figures should be no more than 6 (six) as presented in Result.
 - Conclusion and Recommendation (if any), should answer problems of study not exceeding the capacity of finding. Recommendation should refer to the aims and conclusion in form of narration, be logical and effective.
 - Abbreviations consist of abbreviations mentioned in the article (from Abstract to Conclusion).
 - Ethics Approval and Consent to Participate inform license obtained from institution and research subject.
 - Competing Interest stated whether the author(s) have interest in research.
 - Availability of Data and Materials clarifies sources of data or information used as study materials.
 - Authors' Contribution explain about contribution done by each author to the study.
 - Acknowledgment mention thank-you note to all components supporting the study, including funding (grant).
 - Additional Information confirms the names of authors if there is not enough space on the first page of the article and/or other additional information if necessary.
 - References should be written with Vancouver style.
 - Please ensure that every reference cited in the text is also present in the reference list (and vice versa).
 - Reference number must be numbered consecutively in accordance with the whole text and recent journal references are preferred.
 - Please write author's name with the last name first and the first name as initials, with a maximum of 6 (six) names of authors. If more than 6 (six) authors, the following author should be written with "et al".
 - The first letter of reference title should be capitalized and the remaining should be written in lowercase letters, except name of person, place and time. Latin terms should be written in italics. Title should not be underlined and written in bold.
 - Please provide the URL of the referred article.
 - When referencing in the body of text use superscript after full stop (.), e.g.:¹⁰. If the sentence stating the other author's name as reference, use the reference number by the end of the author's name then continue the sentence till full stop (.), e.g.: Abood,²...; or Latief, *et al*,¹...
- Example of References :
- Journal Article :
Hoq MN. Effects of son preference on contraceptive use in Bangladesh. Kesmas: National Public Health Journal. 2019; 14 (1): 21-7. Available from : <http://dx.doi.org/10.21109/kesmas.v14i1.2848>
 - Book :
Grech ED. ABC of interventional cardiology. 2nd ed. Chichester: Wiley blackwell; 2011. Available from: <https://ebookcentral.proquest.com/lib/imperial/detail.action?docID=822522>
 - Online article :
Pullen LC. Antibiotic resistance continues to be a problem in children. Medscape; 2017. Available from: <https://www.medscape.com/viewarticle/860801>
 - Thesis and Dissertation :
Slawsky E. An evaluation of greenspace exposure as a protective factor in dementia risk among U.S adults 75 years or older [Thesis]. University of Washington; 2019.
- Manuscript should be typed using word processors (Microsoft Word or Open Office) software. The font type for the paper is Times New Roman with font size 12. The paper size is A4 (e.g., 210 x 297 mm). It should be one-column format with all margin 3 cm, double spaced and maximum at 5,000 words. Manuscript must be submitted via website <http://journal.fkm.ui.ac.id/kesmas>. Please include Covering Letter and Statements, Ethics Approval Form, and Proof of Language Editing of the Article in a separated document file containing the summary of scientific finding and uploaded on Supplementary Files in PDF format.

Accelerating the Provision of Safe Water Supply in Urban and Rural Areas of Indonesia

Sumengen Sutomo^{1*}, Salord Sagala², Bebi Sutomo³, Sri Wrinarti⁴, Gelant Sanjaya⁵

¹Department of Environmental Health, Faculty of Public Health, Universitas Indonesia, Depok, Indonesia, ²Data Management Unit, Bangun Indonesia Foundation, Jakarta, Indonesia, ³Research and Development Unit, Bangun Indonesia Foundation, Jakarta Indonesia, ⁴Monitoring and Evaluation Unit, Bangun Indonesia Foundation, Jakarta Indonesia, ⁵Field Coordinator Data Collection, Bangun Indonesia Foundation, Jakarta Indonesia

Abstract

Over the past 100 years, the provision of a safe water supply to drink in Indonesia has been slowly progressed with low coverage. The majority of the population does not have access to safe water. Morbidity and mortality of water-related diseases, including diarrhea, are very high. The provision of safe water is not a technological issue but good water management that comprises content, institutional, and communication layer. This paper provided information for strategic and operational decisions to accelerate the provision of safe water services in urban and rural areas. Benchmarking good water management with the characteristics of the water supply location is required to improve the health status of the population, mainly the poor urban and rural areas with limited resources, including time and cost.

Keywords: good water management, infant mortality, safe water

Introduction

Water is a basic human need and forms about 65-90% of the body. Inability to obtain safe water leads to dehydration, as well as susceptibility to various infections and diseases, which potentially culminates in death faster than lack of food. Safe drinking water is free from microorganisms, chemical substances, and radiological hazards which affect quality health. It is culturally appropriate, sensitive to gender, fulfills privacy requirements, and is affordable by all.^{1,2} The water rights entitles everyone to access sufficient, safe, acceptable, physically accessible, affordable, and continuous water supply for personal and domestic use. Every individual has the right to a water and sanitation service that is physically accessible within the household, workplace, as well as educational or health institution. The people are rights-holders, while the government are duty-bearers of water service and are expected to guarantee equal water rights without discrimination.³

Indonesia has a total population of approximately 276.4 million people, 56.6% in urban and 43.4% in rural areas. The government is responsible for developing policies and strategies to provide water supply services

through several ministries. The Ministry of Home Affairs and Public Works is responsible for the urban sector. The Ministry of Health is responsible for water quality monitoring and rural services to a certain extent. The National Development Planning Agency/*Badan Perencanaan Pembangunan Nasional* (Bappenas) is responsible for planning investments, while the Ministry of Industry and Trade is responsible for the regulation of bottled water. The National Water Supply and Environmental Sanitation Working Group/*Kelompok Kerja Air Minum dan Penyehatan Lingkungan Berbasis Masyarakat* (POKJA AMPL) coordinates between departments donors, and other stakeholders. However, it has no legal basis nor secure funding.⁴

The Regional Water Utility Company/*Perusahaan Daerah Air Minum* (PDAM) is owned and controlled by the Regional Authorities (City, District, Province).⁵ Among the total 514 cities and districts, 350 have individual PDAMs which primarily supply drinking water with adequate quality and inadequate quantity for the survival and health of the communities. However, the coverage of current PDAM services is very low.⁶ The Ministry of Health reported a total of 55,546 water sup-

Correspondence*: Sumengen Sutomo, Department of Environmental Health, Faculty of Public Health, University of Indonesia. Kampus Depok Universitas Indonesia, Depok, Jawa Barat 16424, Indonesia, E-mail: sumengensutomo@yahoo.com; Phone: +62 21 786 3479 / +62 21 830 7603

Received : July 7, 2021
Accepted : July 25, 2021
Published : August 24, 2021

ply facilities, and the majority are at medium or low risk of contamination. Among the total sample of 6,221 facilities, 3.97% were contaminated by fecal bacteria in 2019.⁷ In 2020, only 18.1% of the population had access to safe drinking water, including 21.3% in urban and 14.4% in rural areas.⁸

The problems considered in this study include “why is the provision of water supply slow and low?” and “how can the current water supply services for both populations in urban and rural areas be accelerated?” This study provided evidence-based information to accelerate the provision of drinking water services in Indonesia.

Issue of Water Supply

In 1900, the Dutch government initiated a drinking water company and developed a water supply system in 1903, which served a total of 1,588 individuals in Surabaya. In 1905, Batavia was selected as the central government and transferred the company to the local government in 1906. The central government initiated a drinking water system that obtains water from Ciomas River without treatment in 1918. After several decades, the Dutch government eventually transferred the drinking water system to the Government of Indonesia (GoI). Since Indonesian independence (1945), the GoI has continued to develop drinking water services for several cities in Java, Sumatra, Sulawesi, and Kalimantan under the funding of the France government. The GoI issued Law No. 5 of 1962 concerning the establishment of Regional Water Utility Company (PDAM).⁹ Since the first International drinking water tragedy of 1997 and the United Nations International Drinking Water Decade 1980-1990, Indonesia ensured that 75% of urban and 40% of the rural population had access to safe water with 60 and 40 Litres/person/day respectively in 1990.¹⁰ However, after the decade ended in 1990. At the beginning of the Target 7C of the Millennium Development

Goal (MDG 7C), only 9% of the total population had access to safe water (piped on premises), including 25% and 2% of the urban and rural population, respectively. In 2010, the total population increased to 20%, with 36% urban and 8% rural.¹¹

In line with the National Mid-Term Development Plan 2015-2019 and the Sustainable Development Goal 6.1 (SDG 6.1), the GoI implemented a program for 100-0-100, with a target of 100% access to potable water, 0 slums, and 100% access to sanitation in 2019.¹² At the beginning of the SDG 6.1 in 2016, water coverage increased to 22%, and 29% in 2019. The coverage of the rural population that had access to safe water is low at 2% in 1990 but increased to 5% in 2000, 12.2% in 2015, and 14.4% in 2020.^{13,14}

The majority of the population, both in urban and rural areas, are at risk of water-related diseases, including diarrhea, typhoid, dysentery, cholera, dengue hemorrhagic fever, malaria, helminths, and skin infections. In 2016, it was reported that the total diarrhea case was 2,222,109 in 34 provinces, with an average of 80,658. The lowest was 6,337 cases in North Kalimantan, while the highest was 553,063 in West Java.¹⁵ Every year, 4,276 under five years old children die due to diarrhea, contributing to 32% of global deaths. Diarrhea is the leading cause of death among infants from 0-1 year and the second cause among children.¹⁶⁻¹⁸ National data on infant mortality rate and proportion of the population that has access to safe water in both urban and rural areas for 120 years (1900-2020) indicated that the reduction of infant mortality rate is significantly related to the increase in access to safe water (Figure 1).^{19,21}

The provision of safe water services is not a technological issue. It is a good water management issue related to government and non-governmental organizations (NGOs), processes, structures, instruments, and levels of commitment. Good water management comprises three

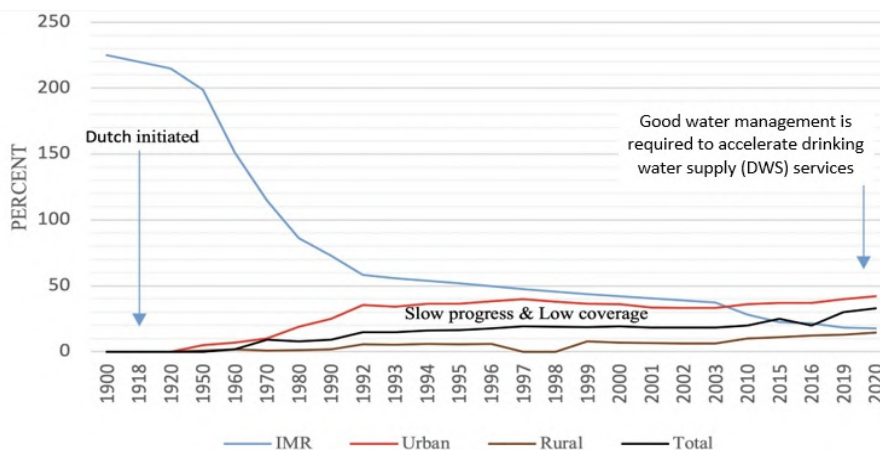


Figure 1. The Population with Access to Safe Water and the Reduction of Infant Mortality Rate 1900-2020,^{19,21}

layers; content, institutional, and communication. The content layer refers to knowledge of water systems, experience, and skills to solve the problem. Distinctive knowledge about safe and health effects is considered the main priority of providing water services by all decision makers at the policy, strategy, and operational levels. The institutional layer includes the organization's framework, legal instrument, and financial support. Organization framework, logistics, and management instruments in bureaucratic red tape are very expensive. Financial support from the government is limited and not considered necessary for water supply programs through PDAM compared to the educational and health programs. The communication and cooperation layer involves the public, related stakeholders, transparency, and trust. The communication issue is often due to lack of coordination and partnership with stakeholders, limited integration into the other relevant programs, lack of social-cultural participation, and good governance practice.²²

The PDAM is the government-subsidized institution responsible for direct the provision of safe water to the urban population. In recent years, the performance has been limited due to inadequate infrastructure and financial support and lack of managerial capacity, and expensive technology, which altogether lead to ineffective services. The Ministry of Public Works and Housing reported that between 2011-2020, the average performance of PDAM was 53.6% and considered healthy, while the others were not fit due to limited safe water services. In 2016, among the healthy PDAMs, 15 served over 100,000 of the population, while others served an average of 10,000 (Figure 2).²³⁻²⁵

The GoI has authorized DKI Jakarta Province for 25 years, from 1997 to the PT. PAM Lyonnaise Jaya (Palyja) France and PT. Thames PAM Jaya (TPJ), but have not been able to provide safe water for the urban population.^{26,27} The Dutch government has successfully bench-

marked from the United Kingdom to provide good quality, low cost, safe, and affordable water for its population. Since 1990, the entire population has had access to low-cost, safe, and quality water supply services. Several donor agencies partnered with government and NGOs in Indonesia and successfully developed appropriate low-cost technology to provide safe water for the rural population. The Cooperation Agency of the Association of Netherlands Municipalities/*Vereniging van Nederlandse Gemeenten* (VNG) International, through Logo South Indonesia, Indonesian Water Utility Company Association/*Persatuan Perusahaan Air Minum Indonesia* (PERPAMSI), local government, and several PDAMs, provided good practices of a dual program for capacity building towards improving drinking water services in Banten, Bogor, and North Sumatra provinces (2005-2008).²⁷ The government partnered with the World Bank (WB) and Australian Aid to implement Water Supply and Sanitation for Low Income Communities Program/*Program Air Minum dan Sanitasi Berbasis Masyarakat* (PAMSIMAS). The program covered 23,000 villages with an improved water supply to 17.2 million people and access to adequate sanitation facilities for 15.4 million people.²⁹ Moreover, Bangun Indonesia Foundation, an NGO, partnered with the Simpenan Health Center and local community resources to improve sustainable and adequate water services using low-cost technology of slow sand filter in Kertajaya village funded by the US Agency for International Development (USAID) and VNG International.³⁰

During the Coronavirus Disease 2019 (COVID-19) pandemic, the government and mass media encouraged people to frequently wash their hands with soap in running water to prevent coronavirus transmission by direct contact. This is a primary community hygiene practice for preventing and controlling various diseases, including coronavirus.³¹ However, low-income people in rural and

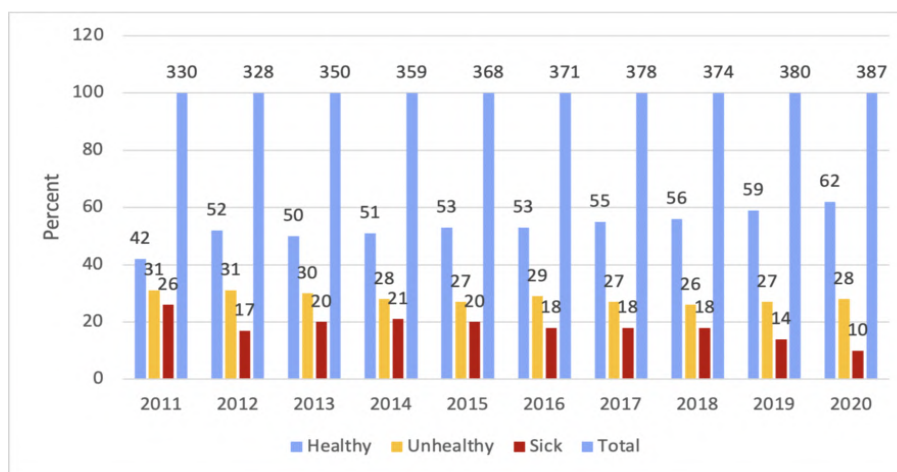


Figure 2. Regional Water Utility Company/*Perusahaan Daerah Air Minum* (PDAM) Status 2011-2020,²³⁻²⁵

poor urban areas do not have access to safe running water. The provision of safe water for these individuals is required. Even in urban areas, some public places provide refill running water which might not be safe. Several people prefer the use of hand sanitizer as a disinfectant but not the poor. Given that the coronavirus is not a water-related disease, frequent washing of hands provides benefits for personal hygiene. Several studies reported that 2–10% of COVID-19 cases present diarrhea. Two studies detected viral ribonucleic acid (RNA) fragments in the feces of COVID-19 patients, while one study cultured the COVID-19 virus from a single stool specimen. The COVID-19 virus tends to be persistent in drinking water, feces, and sewage. However, there is no evidence showing that human coronaviruses are present on surface or groundwater sources and transmitted through contaminated drinking water. The government is expected to provide continuous access to sufficient water for the populations living in the most vulnerable conditions, including poor urban and rural areas. The prevention of COVID-19 transmission is not possible without the provision of safe water services for personal hygiene.³² It is recommended that PDAM be limited to individuals capable of paying water bills and the poor masses affected by the economic crisis. The government is expected to enforce and comply with these essential services. There is a need to accelerate the provision of safe water for urban and rural populations. Good water management is affected by political, social, economic, technological, environmental, and legal factors.

Discussion

The goal of water supply services is to increase the population's health status by reducing water-related diseases. The objective is to provide access and use of safe water for domestic purposes, including drinking, cooking, washing utensils, and other needs. Safe water is not only meant to meet the physical, chemical, and bacteriological criteria but also easily accessible, affordable, and fulfills SDG 6.1.³³

Alternative Water Supply

Urban Areas

The Dutch government developed a drinking water supply system for several years through benchmarking from the United Kingdom. Between 1850 and 1990, people used water from vendors and had access to safe water. Recently, the government policy has changed due to the development in the knowledge of water quantity and quality, humidity, culture, and technological changes integrated into the supply system. In early 1850, a private water supply system was developed without environmental pollution and was expanded. in 1880 to serve more populations and increase the public health status of

the people. In 1910, the water supply system was considered to be critical and needed more funding. It became a business commodity in 1950. The key success factors of the public water supply system include public policy, private sector participation, understanding the importance of water and health, willingness to pay, as well as the technology integrated into the framework of adequate good water management.³⁴

This also applies to Indonesia, where each individual, household, profit, and non-profit organization need safe water for different purposes. Water is a basic human need and is essential for life, health, and the environment. The basic human value determines people's attitude and behavior, needs, and willingness to buy water.³⁵ The PDAM and several private sectors have taken water supply as a business commodity, but the services are still limited. Also, the government budget is limited, but benchmarking lessons from the Dutch government are suitable for accelerating the development of innovative good management for water supply, achieving the target of the SDG 6.1 and the general health of the population.

Technology Choice

Various countries, including the Netherlands, such as Duin & Water, and World Waternet. Surface water from the river passes through softening process by adding Na(OH), reduction of chemical pollution with activated carbon; open oxidation, pass through the rapid sand filter (RSF) and slow sand filter (SSF), produce safe water collected in the water collection tank, aerated with free oxygen, then pumped to the water reservoir through the piping system. Finally, safe water is then distributed to the population in the targeted areas. The Dutch government replaced 200 with 10 water companies using bio-sand filtering technology water treatment plants to serve all the population in the country. The application of this system is described in the Dunea Duin & Water company (Figure 3).³⁶

Rural Areas

Various models of water supply systems have been developed through local government and NGOs funded by donor agencies, including USAID, German Agency for Technical Cooperation/*Deutsche Gesellschaft für Technische Zusammenarbeit* (GTZ), the United Nation International Children's Emergency Fund (UNICEF), WB, Asian Development Bank (ADB), Canadian International Development Agency (CIDA), and Japan International Cooperation Agency (JICA). Different sources were used for water intake, including stream, river, spring water, dam, and rainwater, using simple and low-cost technology to provide safe and sustainable water for domestic purposes. The selected water supply system technology was integrated into strategic and program

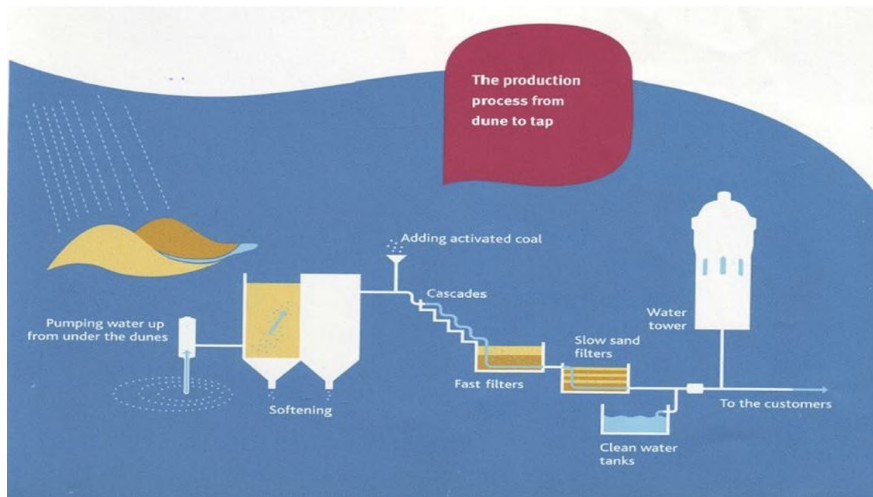


Figure 3. Water Treatment Plant of Dunea Duin & Water,³⁶

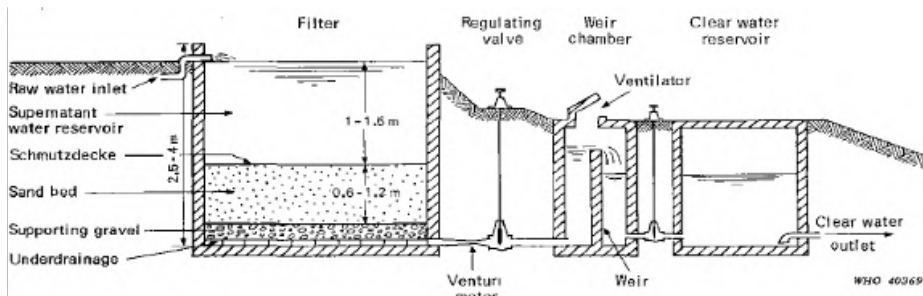


Figure 4. Diagram of Slow Sand Filter in WHO (1974),³⁹

management. The strategic level includes analysis, direction, and formulation, which altogether provide a strategic plan as the guideline for program management. The program level includes analysis of the problem, objective, alternative, and stakeholder to plan for project development and implementation. Management development strategy and program require accurate and complete data through research to integrate the selected technology into the management before a wide-scale implementation.

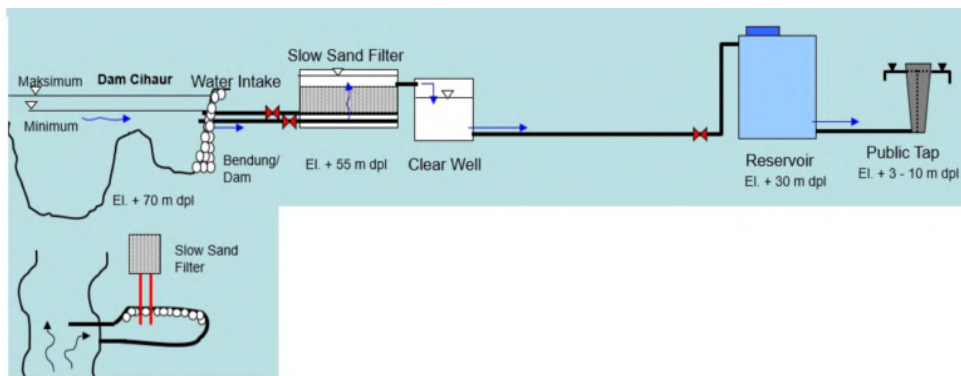
Simple Technology: Slow Sand Filter (SSF)

This water biological filtering system consists of a cemented tank, gravel, and sand of suitable sizes. The system filters surface water through a simple biological process technology that is cheap and effective in producing safe water that meets the physical, chemical, and biological parameters of the WHO Drinking Water Quality Standard and the Ministry of Health.³⁷ During the SSF filtering process, microorganism in the water reservoir develops a thin layer “*Schmutzdecke*” made of complex protein cells, carbohydrates, diatoms, algae, bacteria, and zooplankton. This layer kills pathogens through “biologi-

cal flocculation” and develops toxins that kill or remove viruses and bacteria in raw water. The physical SSF uses local components, including raw water intake, reservoir, sand bed, supporting gravel, and drainage with the right size of measurement depending on the need of water services.

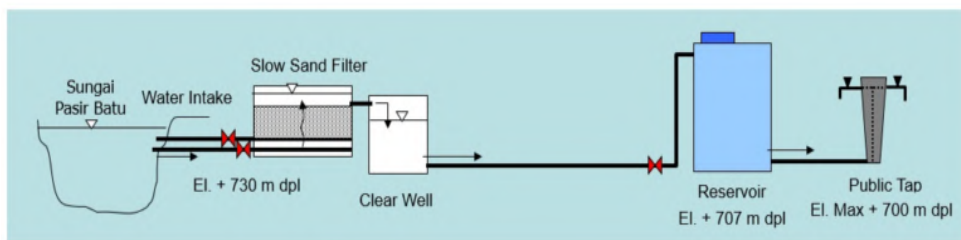
Basically, the filtered water passes through an aeration tank, and then a clean reservoir for distribution as described in Figure 4.^{38,39} In practice, the development of the SSF system involves local men, women, children, human resources, uses gravity without fossil energy or chemical disinfectants, and is not expensive. Although several people consider it as an old method, this is not true as various developed countries such as the Netherlands have continued to successfully use this technology.

Bangun Indonesia Foundation partnered with the Simpanan Health Center, PDAM Sukabumi, Environmental Service Program, and Logo South Indonesia to develop a low-cost water supply system using SSF technology in Cisantri Sub-village coastal, Cijangkar Mountain, and Citemen inland area. The project was



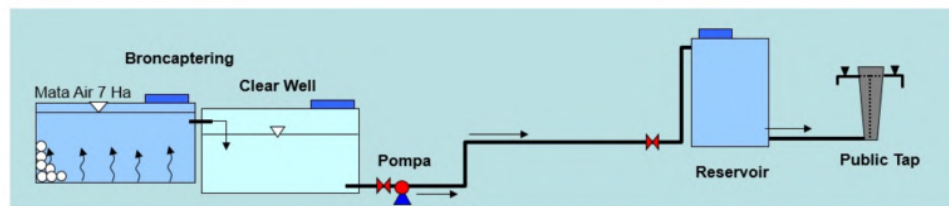
Notes: *Maksimum:* Maximum, *Bendungan:* Dam
Intake water from stream passes through slow sand filter (SSF) tank, stores in clear well, distributes through high-density polyethylene piping (HDPE) piping system to a reservoir, public tap, and house connections.

Figure 5a. Sub-village Cisantri in a Coastal Area,⁵⁰



Notes: *Sungai Pasir Batu:* Pasir Batu River
Intake water from stream passes through slow sand filter (SSF) tank, stores in clear well, distributes through high-density polyethylene piping (HDPE) piping system to a reservoir, public tap, and house connections.

Figure 5b. Sub-village Citemen in the Mainland Area,⁵⁰



Notes: *Mata Air:* Spring Water, *Pompa:* Pump
Intake water from water spring is collected via broncaptering, pumps, and distributes through high-density polyethylene piping (HDPE) system piping system to a reservoir, public tap, and house connections.

Figure 5c. Sub-village Cijangkar in a Mountain Area,⁵⁰

funded by the VNG International and USAID (2008-2009), while the water sources include stream, dam, and spring water which are passed through the SSF tank, producing safe water collected in a clean tank. The water flows through a high-density polyethylene piping system (HDPE) using gravity energy to reach the public hydrant and house connection. Due to the spring water location in the lowland of the tea plantation under the sea level, a diesel pumping machine is used to lift the water to the reservoir and finally to the public hydrant and house connection. Populations in the three sub-villages had access to and utilized safe water from the low-cost sustainable

supply for domestic purposes.

This water supply system shows coordination among government institutions, private sectors, and civil society organizations (CSOs), including NGOs and community organizations which scales up to other areas. Figure 5 describes the water supply system using low-cost technology of slow sand filter for the population in three sub-villages; Cisantri (5a), Citemen (5b), Cijangkar (5c), of Kertajaya Village, Sukabumi.⁵⁰ Since 2010, most people in the sub-villages have had access to adequate and sustainable water services. Water is obtained and treated from the dam in Cisantri, stream in Citemen, and spring water in

Cijangkar. Water services monitoring in 2015 and 2018 indicated that the population of three sub-villages in Kertajaya Village, Sukabumi had access to adequate water services.

Conclusion

The majority of the Indonesian population has no access to safe water due to slow and low coverage of supply services over the past 100 years. Morbidity and mortality of water-related diseases such as diarrhea are very high. The acceleration of safe water services is required to improve the population's health status, especially in poor urban and rural areas. The usual method of water management requires a long period and is expensive. A good water management approach is needed at the policy and strategic levels, while benchmarking strategy is recommended at the operational level.

Good management benchmarking for water supply from the Netherlands's water company to the urban areas is appropriate. The application of a combined rapid and slow sand filter water treatment plant technology and the Dunea Duin & Water, Water-Net, is inexpensive. Also, the low-cost technology of slow sand filters utilized in Cisantri, Citemen, and Cijangkar Sub-villages of Kertajaya Village, Sukabumi is appropriate, cheap, and acceptable. In addition, water governance is recommended to be integrated into the related sector in the rural areas.

Abbreviations

Bappenas: *Badan Perencanaan Pembangunan Nasional* (National Development Planning Agency); POKJA AMPL: *Kelompok Kerja Air Minum dan Kesehatan Lingkungan Berbasis Masyarakat* (Working Group on Water Supply and Sanitation); PDAM: *Perusahaan Daerah Air Minum* (Regional Water Utility Company); GoI: Government of Indonesia; MDGs: Millennium Development Goal; SDG: Sustainable Development Goal; NGOs: Non-Governmental Organizations; Palyja: PT. PAM Lyonnaise Jaya; TPJ: PT. Thames PAM Jaya; VNG International: *Vereniging van Nederlandse Gemeenten*; PERPAMSI: *Persatuan Perusahaan Air Minum Indonesia* (Indonesian Water Utility Company Association); PAMSIMAS: *Program Air Minum dan Sanitasi Berbasis Masyarakat* (Water Supply and Sanitation for Low Income Communities Program); WB: World Bank; USAID: United States Agency for International Development; COVID-19: Coronavirus Disease 2019; RNA: Ribonucleic Acids; RSF: Rapid Sand Filter; SSF: Slow Sand Filter; GTZ: *Deutsche Gesellschaft für Technische Zusammenarbeit*; UNICEF: United Nations Children's Emergency Fund; ADB: Asian Development Bank; BCIDA: Canadian International Development Agency; JICA: Japan International Cooperation Agency; HDPE: High-Density Polyethylene; CSOs: Civil Society Organizations.

Ethics Approval and Consent to Participate

Not Applicable

Competing Interest

The authors have no conflict of interest.

Availability of Data and Materials

The datasets used and analyzed during the current study are available in the official government document and the internet.

Authors' Contribution

SS contributed to the overall review, analysis, and writing of the article, while SSG contributed to data collection, review, and plot data. Furthermore, BS contributed to the selection of strategic changes, benchmarking, and scaling up the lessons while SW provided operational best practices in rural areas. GS contributed to the review of the statistical data and plot data testing.

Acknowledgment

The authors are grateful to Iman Surachman, who communicated with Simpanan Health Center for implementing a water supply project in rural areas, Ms. Made documented the project activities in Sukabumi, and Ms. H.Ade Head of the Health Center, the implementing partners of the water supply project in Kertajaya, Simpanan, Sukabumi.

References

1. Children's Prize. Why water is a basic human need. Children' Prize Foundation; Built using WordPress and the Mesmerize Theme 2021; 2021.
2. Menteri Kesehatan Kesehatan Republik Indonesia. Keputusan Menteri Kesehatan Republik Indonesia nomor 907/Menkes/SK/VII/2002 tentang syarat-syarat dan pengawasan kualitas air minum. Jakarta: Departemen Kesehatan Republik Indonesia; 2012.
3. United Nations. A/RES/64/292. General assembly. Sixty-fourth session. Agenda item 48. The human right to water and sanitation. Resolution adopted by the General Assembly on 28 July 2010; 2010.
4. Badan Perencanaan Pembangunan Nasional. Kebijakan nasional pembangunan air minum dan kesehatan lingkungan berbasis masyarakat. Jakarta: Bappenas; 2003.
5. Presiden Republik Indonesia. Undang-Undang Republik Indonesia nomor 5 tahun 1962 tentang perusahaan daerah; 1962.
6. Kusmayadi, R. Chair Indonesia water supply association. Water supply in Indonesia towards SDGs. Presented in International Forum at JWJA. Saitama, Japan: General Assembly and Conference: 2015.
7. Kementerian Kesehatan Republik Indonesia. Profil kesehatan Indonesia tahun 2019. Jakarta: Kementerian Kesehatan RI; 2020.
8. National Water & Sanitation Information Services. Kualitas air minum rumah tangga di Indonesia dinilai dari kontaminasi bakteri E Coli. Nawasis; 2021.
9. Irman J. Kebijakan dan strategi pengembangan air minum; 2011.
10. O'Rourke, E. The international drinking water supply and sanitation decade: dogmatic means to a debatable end. *Water Science and Technology*. 1992; 26 (7-8): 1929-39.
11. Patunru AA. Access to safe drinking water and sanitation in Indonesia. Special Research Article on Health Policy. *Asia & the Pacific Policy Studies*. 2015; 2 (2): 234-244.
12. Kementerian Pekerjaan Umum dan Perumahan Rakyat. Tentang pro-

- gram kota tanpa kumuh (Kotaku); 2017.
13. World Bank. Water supply and sanitation in Indonesia turning finance into service for the future. Water and Sanitation Program; 2015.
 14. United Nations Children's Fund. Progress on drinking water, sanitation and hygiene; 2019.
 15. Kadim M. Cholera updates in Indonesia; 2017.
 16. United Nations Children's Fund. Water, sanitation and hygiene; 2016.
 17. United Nations Children's Fund Data. Monitoring the situation of children and women. Indicator profiles. Infant mortality rate. UNICEF; 2021.
 18. World Health Organization. Preventing diarrhea through better water, sanitation and hygiene. Exposures and impacts in low and middle-income countries. WHO Library Cataloguing-in-Publication Data; 2014.
 19. United Nations Children's Fund. The state of children in Indonesia; 2020.
 20. United Nations-World Population Prospects. Indonesia infant mortality rate 1950-2019. World Population Prospects; 2019.
 21. World Bank. Indonesia: expanding access to clean water for the rural poor; 2019.
 22. Hoogsteen KJ, van der Kolff G, Ruijter JA. Public private partnership for efficient and sustainable water supply development in Indonesia. *Water Practice & Technology*. 2008; 3 (1).
 23. Kementerian Pekerjaan Umum dan Perumahan Rakyat. Buku kinerja PDAM. Laporan Hasil penilaian kinerja PDAM 2017; 2017.
 24. Limbong HM. Indonesia PPP projects in water supply sector; 2019.
 25. Kementerian Pekerjaan Umum dan Perumahan Rakyat (PUPR). Direktur Air Minum: 148 PDAM di Indonesia Berkinerja Kurang Sehat. *PU-net*. February 19, 2021; 2021.
 26. Lanti A, Varis O, Tortajada C, Altinbilek D. Regulatory approach to the Jakarta water supply concession contracts. *International Journal of Water Resources Development*. 2006; 22 (2).
 27. Ismowati M. Profile of Pam Jaya and private partners in clean water supply Jakartan (case study year 1998-2012). *KnE Social Sciences*; 2018.
 28. VNG International. Cooperation program Netherlands and Indonesia. Logo South Country program Indonesia. Best practices in PDAMs through twinning 2005-2008. Capacity building towards improvement in drinking water services in Banten Province, Bogor and North Sumatra Provinces. The Hague Netherlands; 2008.
 29. World Bank. PAMSIMAS: responding to the water and sanitation challenges in rural Indonesia; 2014.
 30. Bangun Indonesia Foundation, Partnership BIF, ESP, VNG, HC, local community Kertajaya Village, Sukabumi Project for improving water supply services in Kertajaya Village, Sukabumi West Java Province Funded by: VNG International and USAID; 2018.
 31. World Bank. The impact of COVID-19 on the water and sanitation sector; 2020.
 32. World Health Organization. Water, sanitation, hygiene, and waste management for the COVID-19 virus: interim guidance. March 19, 2020; 2020.
 33. United Nation. Goal 6: ensure access to water and sanitation for all; 2021.
 34. Zetland D, Colenbrander B. Water civilization: the evolution of the dutch drinking water sector. Leiden University: Scholarly Publications; 2018.
 35. Van der Kerk A, Wwterweel JW, Havekes H, Teeuwen B. Opportunities for water governance in Indonesia. A government quick scan under the Indonesian-Dutch water management cooperation; 2013.
 36. Dunea Duin & Water. Betrouwbaar en lekker drinkwater. Hoe wordt uw drinkwater gemaakt? Duinwaterbedrijf Zuid-Holand; 2020.
 37. World Health Organization. Guidelines for drinking-water quality. WHO Geneva; 2008.
 38. Slow Sand Filter. Frequently asked questions regarding slow sand filters; 2016.
 39. Huisman L, Wood WE. Slow sand filtration. Geneva: World Health Organization; 2012.

Association between Self-Reported Fatigue and Sarcopenia Measures among Elderly in Selangor, Malaysia

Maria Justine^{1*}, Aliff Latir¹, Nadhirah Noor¹, Angelbeth Joanny¹, Izzaty Iskandar¹, Maisarah S A Faizi¹, Dzulhelmi Edinan²

¹Centre for Physiotherapy Studies, Faculty of Health Sciences, Universiti Teknologi MARA, Selangor, Malaysia, ²Physiotherapy Unit, Cheras Rehabilitation Hospital, Ministry of Health Malaysia

Abstract

The association between fatigue and sarcopenia is not well understood, therefore, this study aimed to compare the sarcopenia measures among elderly with mild and severe fatigue and to determine whether fatigue severity is associated with sarcopenia measures. This was a cross-sectional study conducted on 201 elderly (age = 68.45±6.30 years). The elderly was classified into either mild or severe fatigue based on the Fatigue Severity Scale (FSS), meanwhile, sarcopenia measures include SARC-F score, muscle mass (ASM/height²), calf circumference (CC), upper (handgrip) and lower limb muscle strength, as well as physical performance (gait speed). Data were analyzed using independent t-tests and logistic regression. The results showed that elderly with severe fatigue were significantly older, with lower muscle strength, and slower gait speed (all p-value <0.05). After adjusting for age, fatigue severity remained significantly associated with SARC-F score (OR = 1.583, 95% CI = 1.262-1.986, p-value = 0.001) and CC (OR = 1.103, 95% CI = 1.014-1.200, p-value = 0.022). Moreover, when the SARC-F score was removed from the regression model, fatigue severity was significantly associated with CC (OR = 1.088, 95% CI = 1.006-1.178, p-value = 0.036) and gait speed (OR = 0.011, 95% CI = 0.001-0.168, p-value = 0.001). Based on the results, fatigue severity is associated with SARC-F score, CC, and gait speed, therefore, interventions targeted at sarcopenia measures is recommended to optimize physical endurance in the elderly.

Keywords: elderly, fatigue, Malaysia, muscle strength, sarcopenia

Introduction

Fatigue is a common self-reported distressing symptom, perceived as a lack of energy or a feeling of exhaustion accompanying the aging process,¹ it affects more than 20% of the community-dwelling elderly.^{2,3} Meanwhile, sarcopenia is defined as a generalized muscle weakness which may have a role in the development of fatigue in the elderly. Globally, sarcopenia shows some tendencies toward a greater use or burden on healthcare resources in the population,⁴ due to its potential association with fatigue and malnutrition,^{5,6} which results in poor life quality and frailty syndrome in the long run.⁷

Previous findings on the association between fatigue and sarcopenia were inconsistent as different assessment tools have been used. For instance, a population-based study in Brazil found that self-reported fatigue using the Centre for Epidemiologic Studies-Depression (CES-D) Scale was associated with physical performances as indicated by the Short Physical Performance Battery (SPPB) and normal gait speed after adjusting covariates.³ In contrast, another study reported no association between fa-

tigue and any criteria used to define sarcopenia.⁸ In the latter study, fatigue symptom was assessed by inquiring “In the last week, how many times have you felt that everything you do is an effort?” with four possible answers: (a) rarely, (b) few times, (c) occasionally, and (d) most of the time. The lack of association is probably due to the use of inadequate assessment, sufficient to operationalize the perception of fatigue in the elderly.

Furthermore, a study found no significant differences in self-reported fatigue among non-sarcopenic and sarcopenic patients with osteoarthritis and rheumatoid arthritis. In the study, fatigue was measured using the Multidimensional Assessment of Fatigue and Visual Analog Scale.⁹ Besides, the sarcopenia status of the participants was diagnosed based on the appendicular skeletal muscle mass (AMI), meanwhile, based on the results, there was no significant association with self-reported fatigue or physical function.⁹ Self-reported fatigue assessment using Fatigue Severity Scale (FSS) might be a better option for the elderly as the scale measures the severity of fatigue and its effect on individual activities and

Correspondence*: Maria Justine, Centre for Physiotherapy Studies, Faculty of Health Sciences, Universiti Teknologi MARA, Selangor Branch, Puncak Alam Campus, 42500 Puncak Alam, Selangor, Malaysia, E-mail: maria205@uitm.edu.my, Phone: +60 176 573 248

Received : October 31, 2020
Accepted : February 10, 2021
Published : August 24, 2021

lifestyle with 9-items.¹⁰ Furthermore, the FSS has been reported to have low floor and moderate ceiling effects.¹¹ In comparison, the CES-D scale is related to symptoms associated with depression,¹² while the Multidimensional Assessment is a 16-item scale and might take a longer time to be completed.¹³

Recently, the European Working Group for Sarcopenia in Older People (EWGSOP),¹⁴ and the Asian Working Group for Sarcopenia (AWGS),¹⁵ suggested that measures of sarcopenia includes finding cases using the SARC-F questionnaire, muscle mass (MM), and strength, as well as physical performances. Also, AWGS suggested that sarcopenia is also determined by measuring the calf circumference (CC) as a proxy for MM in the absence of other tools.¹⁵ Identifying which measures influence the severity of fatigue using a more practical assessment scale is important as it promote rehabilitation for the elderly with physical intolerance especially when performing daily activities. This study aimed to compare the sarcopenia measures among elderly with mild and severe fatigue and to determine whether fatigue severity is associated with sarcopenia measures.

Method

This was a cross-sectional study conducted on 201 community-dwelling elderly aged 60 years and above from 10 selected villages in Selangor from November 2019 to January 2020. Meanwhile, Selangor was selected because it is one of the states with the highest elderly population in Malaysia.¹⁶ Participants were included depending on the ability to understand Malay or English as well as verbal instruction, and provided the Mini-cog score is above four.¹⁷ In addition, participants with severe hypertension (systolic blood pressure >180 during screening or recruitment), unable to understand the study procedure, with underlying medical problems, and undergone surgical procedure (less than six months before screening) were excluded. Eligible participants completed the questionnaires for biomedical examination and socio-demographic profile, meanwhile each participant was required to sign an informed consent before data collection while an ethics approval was obtained from the Research Ethics Committee of Universiti Teknologi MARA (Approval No. REC/493/19). Besides, data such as age, gender, and health history were gathered through self-reported or assisted questionnaires. Bodyweight was measured by a calibrated scale, and height was assessed with a measuring tape fixed on a wall.

The Fatigue Severity Scale (FSS) was used to assess the participants' level of self-reported fatigue consisting of 9-item in relation to how the level of fatigue causes disturbances in physical function, continuous physical, work, or social activities. The minimum possible score is 0, while the maximum possible score is 63. Moreover,

the participants were categorized into mild and severe fatigue based on the cut-off score >36, which indicates severe fatigue.¹⁸

Based on the AWGS algorithm recommendation,¹⁵ the following sarcopenia measures were included SARC-F questionnaire, muscle mass (MM), calf circumference (CC), upper (handgrip), and lower limb muscle strength, as well as physical performance (gait speed). The SARC-F questionnaire is a series of questions on capability, and difficulty in performing specific tasks such as lifting and carrying objects weighing 10 pounds, walking across a room, transferring from a chair to a bed or vice versa, climbing a flight of ten stairs, and the number of falls in the previous year. Furthermore, the scores is graded as 0 having no difficulty, 1 as having some difficulty, and 2 as a lot of difficulties to perform the task. A score of ≥ 4 indicates the possibilities of sarcopenia.¹⁹

The bioimpedance analysis was used to assess MM by measuring the appendicular skeletal muscle mass (ASM) and recorded in kg. Thereafter, the score was then converted to appendicular skeletal muscle index (ASMI) [ASM/height² (kg/m²)]. The cutoffs for low MM in sarcopenia diagnosis were as follows, <7.0 kg/m² in male, and <5.7 kg/m² in female.¹⁵ Besides, CC was measured using a non-elastic tape on both calves in a standing position. The score was recorded based on the highest value of either side of the calves. Meanwhile, cut-off values of <34 cm and <33 cm were used for male and female respectively, for possible sarcopenia.¹⁵

Handgrip strength was assessed to determine the upper limb (UL) muscle strength using a Jamar hand-held dynamometer. The participants were positioned in sitting position with the elbow in 90° flexion, while the wrist and forearm in a neutral angle. Participants were asked to grip (with the dominant side) the dynamometer as strong as possible for three trials with a 1-min rest interval.²⁰ The score was recorded based on the best performance among the trials. The cut-off points for grip strength were <28 kg and <18 kg for male and female respectively for possible sarcopenia.¹⁵ The lower limb (LL) strength was measured using the Five Times Sit-to-Stand Test (FSTS) while the time taken to complete the test was recorded. When participants takes more than 12 seconds to complete the task, this indicate possible sarcopenia.¹⁵

Physical performance was evaluated based on the normal gait speed (m/s) using the 4-meter walk test (4MWT). The participants performed 8-meter walk with 2-meter for the acceleration phase and another 2-meter for the deceleration phase. Moreover, the time taken was noted when participants have passed through the first 2-meter and stop before the last 2-meter, hence, measuring only 4-meter.²¹ The cut-off for gait speed was <1.0 m/s, indicating possible sarcopenia.¹⁵

Statistical analysis was carried out using SPSS

Version 25 (IBM Corp., New York, USA). Meanwhile, the independent t-test was used to compare the characteristics and sarcopenia measures between participants with mild and severe fatigue. The multivariate logistic regression was performed to test the association between self-reported fatigue and sarcopenia measures based on three models. Model 1 was the unadjusted model, Model 2 was performed by adjusting age, while Model 3 was carried out by removing the SARC-F score from the model but with age-adjusted. All statistical significance was set at p-value <0.05.

Results

A total of 201 elderly were recruited for this study with a mean age of 68.45±6.30 years. Meanwhile, 57 (28.36%) elderly were found to report severe fatigue. Comparisons among elderly with mild and severe fatigue in terms of age, anthropometric data, and sarcopenia measures are shown in Table 1. Participants that reported severe fatigue were significantly older with heavier weight, higher body mass index (BMI) and SARC-F score, lower handgrip (upper limb) and lower limb

strength, as well as slower gait speed (all p-value <0.05).

The association between fatigue severity and sarcopenia measures is shown in Table 2. In Model 1 for unadjusted logistic regression analysis, fatigue severity was significantly associated with SARC-F score (OR = 1.584, 95% CI = 1.263-1.986, p-value = 0.001) and CC (OR = 1.101, 95% CI = 1.012-1.205, p-value = 0.025). Meanwhile, in Model 2 after adjusting for age, fatigue severity remained significantly associated with SARC-F score (OR = 1.583, 95% CI = 1.262-1.986, p-value = 0.001) and CC (OR = 1.103, 95% CI = 1.014-1.200, p-value = 0.022). Model 3 was performed by removing the SARC-F score, while analysis showed CC (OR = 1.088, 95% CI = 1.006-1.178, p-value = 0.036) and gait speed (OR = 0.011, 95% CI = 0.001-0.168, p-value = 0.001) were significantly associated with fatigue severity after adjusting for age.

Discussion

Based on the results, there was an association between self-reported fatigue and sarcopenia measures (SARC-F score, MM, CC, upper (handgrip), and lower

Table 1. Comparisons of Characteristics among Elderly with Mild and Severe Fatigue (n = 201)

Variable	(Mean ± SD)			p-value
	Total (n = 201)	Mild Fatigue (n = 144)	Severe Fatigue (n = 57)	
Age	68.45±6.30	67.65±5.89	70.46±6.87	0.004**
Gender				0.499
Male	97	70	27	
Female	104	74	30	
Height (cm)	160.22±9.26	159.91±9.23	161.00±9.38	0.456
Weight (kg)	69.08±13.21	67.05±12.45	74.23±13.95	0.001**
Body mass index (kg/m ²)	26.91±4.67	26.15 ± 4.10	28.82±5.45	0.001**
SARC-F score	1.77±2.04	1.19±1.61	3.21±2.28	0.001**
MM (ASM/height ²)	6.44±1.31	6.46±1.31	6.38±1.32	0.709
CC (cm)	35.99±5.33	34.02±4.95	35.60 ± 6.19	0.060
UL strength (kg)	25.34±11.028	26.35±11.32	22.77±9.86	0.038*
LL strength (s)	14.59±6.94	13.68±6.95	16.87±6.43	0.038*
Gait speed (m/s)	0.54±0.18	0.57±0.16	0.44±0.17	0.001**

Notes: CC: Calf Circumference; UL: Upper Limb; LL: Lower Limb; ASM: Appendicular Skeletal Muscle Mass, SD: Standard Deviation. Independent t-test; *significant at p-value < 0.05; **significant at p-value < 0.01. The gender difference was compared using a χ² test.

Table 2. Multivariate Models for the Association of Sarcopenia Measures and Self-Reported Fatigue Severity among Elderly (n = 201)

Variable	Model 1			Model 2			Model 3		
	OR	95% CI	p-value	OR	95% CI	p-value	OR	95% CI	p-value
SARC-F score	1.584	1.263-1.986	0.001**	1.583	1.262-1.986	0.001**	-	-	-
MM	0.842	0.588-1.205	0.346	0.861	0.589-1.241	0.422	0.898	0.635-1.271	0.545
CC	1.101	1.012-1.197	0.025*	1.103	1.014-1.200	0.022*	1.088	1.006-1.178	0.036*
UL strength	1.017	0.978-1.058	0.397	1.016	0.976-1.057	0.164	0.995	0.959-1.032	0.777
LL strength	0.994	0.938-1.054	0.831	0.993	0.937-1.052	0.801	0.999	0.948-1.052	0.966
Gait speed	0.119	0.007-2.068	0.226	0.170	0.008-3.419	0.358	0.011	0.001-0.168	0.001**

Notes: Model 1: Univariate analysis; Model 2: adjusted for age; Model 3: adjusted for age with SARC-F score removed. CC: Calf Circumference; UL: Upper Limb; LL: Lower Limb; OR: Odds Ratio; CI: Confidence Interval. *significant at p-value <0.05; **significant at p-value <0.01

limb strength, as well as gait speed). The prevalence of fatigue was 28.36%, which was higher compared to previous report measured using the CES-D scale in the community,³ but lower compared to a report in the institution measured using FSS.²² For the unadjusted model, only SARC-F score and CC were associated with self-reported fatigue. Meanwhile, after adjusting for age, the SARC-F score and CC remained significantly associated with fatigue severity. Model 3, which excluded the SARC-F score, but age-adjusted, showed that CC and gait speed were significantly associated with fatigue severity.

Furthermore, the results showed that elderly with severe fatigue have significantly higher SARC-F scores, weaker muscle strength (UL and LL), and slower gait speed. SARC-F was found to be consistently associated with fatigue even after adjustment for age. A previous study on cancer patients also found that fatigue, known to be related to cancer diagnosis and treatment, was significantly associated with the SARC-F score.²³ This was expected as the SARC-F questionnaire asked for the participants' performance on specific physical activities similar to the FSS which made both methods to be associated.

Regarding MM, measured using the bioelectrical impedance analysis (BIA), together with CC as a proxy for MM, there was no significant differences between elderly with mild and fatigue severity. This is probably due to the physiological decline resulting from aging process in the elderly. However, CC was consistently associated with fatigue severity in all the regression models. In contrast to a previous study, MM based on the skeletal muscle index was found to predict the level of fatigue.²⁴ This inconsistent result is probably because the participants in the previous study had cancer-related fatigue which might have a different mechanism of fatigue and sarcopenia, or in other words, the sarcopenia is due to secondary causes.²⁴ Secondary sarcopenia occurs as a result of both depletion of fat and muscular tissue either due to lack of vitamin D, insufficient food intake, decrease physical activity secondary to fatigue, as well as outcome of a direct effect of chemotherapy on muscular tissue.²⁵ Meanwhile, sarcopenia in the elderly primarily occurs due to changes in aging throughout life where there is a progressive decline in skeletal muscle strength and MM.²⁶ Neefjes, *et al.*,²⁴ found no significant differences in the level of fatigue with increased MM in women with advanced cancer signifying the probability of other factors that contribute to fatigue. It has been argued that exercise induces angiogenesis, thereby improving blood supply to the muscles,²⁷ hence, promote recovery of muscle fatigue.²⁸ The result was not in line with a previous study that found no significant relationship between muscle strength and fatigue level.²⁹ Meanwhile, this was expected as this study recruited individuals with Parkinson's disease which

have a different underlying mechanism.²⁹

This study also showed that the muscle strength of the UL and LL in the elderly with severe fatigue was significantly lower. The results were consistent with a previous study which reported a significant decline in grip strength (p-value <0.01) in the elderly that complained of fatigue resulting in reduced physical performance.³⁰ Besides, LL strength was also found to be lower in a previous study that used the 5-Step Test to measure the time (in second). It took five times, for the participants to go up and down a 10.1 cm wooden platform. Similarly, Gacesa, *et al.*,³¹ observed a decremental pattern in the level of muscle fatigue as opposed to an incremental pattern in muscle strength following four weeks of strength training (fatigue decreased from 38.9+8.6% to 12.4+0.7%; muscle strength increased from 660.0+112.3% to 839.5+125.5%, respectively). The results showed a significant association between fatigue level and muscle strength indicating that a higher level of muscle strength results in a lower level of fatigue. This is in line with the current study which found a lower level of fatigue in the elderly with a higher LL strength. Strength training causes an increase in skeletal muscle adaptations, which resultantly increase muscle ability to generate power and force to execute functional tasks thereby decreasing fatigue.³¹

Furthermore, increased recruitment of new motor units along with an increase in cellular metabolic control improves the energy level and efficiency of energy consumption necessary for muscle contractions.³¹ In contrast, this study found that none of these muscle strength measures were significantly associated with fatigue severity. Measuring LL strength using the FSTS was not recommended by the AWGS as it tends to reflect multicomplicated pathologies.¹⁵ Therefore, it is suggested that measures of strength must not directly influence fatigue severity as the item asked in FSS including physical function as well as physical, work, and social activities are more geared towards physical performance. This also explains why the SARC-F score and gait speed were more likely to be associated with fatigue severity as the measures indicate activities related to physical performances.²³

Concerning gait speed, the elderly that reported fatigue took a longer time to complete the test indicating lower physical performance. This was supported by a previous study which found that gait speed as one of the components in the SPPB scale was associated with self-reported fatigue, however, in this study, fatigue was measured based on the CES-D scale.³ These findings occurred because the elderly that reported fatigue tend to have reduced walking speed, which might also be due to weakness of the lower limb as shown by a longer time complete the test which resultantly led to a reduced muscle force production needed to initiate walking move-

ment. Hence, fatigue is an essential factor which directly or indirectly affect the elderly's physical performances. Based on the results, there was a difference in the level of fatigue and physical performance (gait speed) in line with a previous study reported that elderly who complained of fatigue display poorer health and lower physical performance compared to non-fatigued.³²

There are a few limitations that need to be addressed in this study. The small sample size makes it difficult to find significant differences between fatigue and sarcopenia among the elderly. In addition, the participants consisted of only 201 elderly from a few selected locations in Selangor, Malaysia, hence, the findings from this study is not generalizable to all entire elderly population in Malaysia as the level of fatigue might be affected by secondary factors such as pain, long-term medical illnesses, emotional distress or personal lifestyles.³³ Also, causalities are not assumable as this is a cross-sectional study. The purposeful sampling method was used to collect data hence, the results might not be the actual representation of the populations. In future studies, fatigue is expected to be conceptualized through two different definitions, namely perception of fatigue and as well as, fatigability and objective changes that occur in response to neuromuscular system activation.³⁴

Conclusion

In conclusion, fatigue severity is associated with perceived sarcopenia as measured by the SARC-F questionnaire, CC and gait speed. The severely fatigued elderly demonstrate lower muscle mass, higher SARC-F score, lower muscle strength, and slower gait speed. In addition, muscle mass and gait speed are associated with fatigue. The findings of this study have implication on the practice of physiotherapists to include sarcopenia and fatigue measures when dealing with elderly. Intervention for elderly should also target the sarcopenia indicators to improve the physical tolerance or to reduce the perception of fatigue.

Abbreviations

FSS: Fatigue Severity Scale; CC: Calf Circumference; CES-D: Centre for Epidemiologic Studies-Depression; SPPB: Short Physical Performance Battery; EWGSOP: European Working Group for Sarcopenia in Older People; MM: Muscle Mass; AWGS: Asian Working Group for Sarcopenia; ASM: Appendicular Skeletal Muscle Mass; ASMI: Appendicular Skeletal Mass Index; LL: Lower Limb; UL: Upper limb; FSTS: Five Times Sit-to-Stand test; MWT: Meter Walk Test; BMI: Body Mass Index.

Ethics Approval and Consent to Participate

Written informed consent was obtained from all participants, meanwhile an ethical approval was obtained from the Research Ethics Committee, Universiti Teknologi MARA Malaysia.

Competing Interest

The author declares that there are no significant competing financial, professional, or personal interests that might have affected the performance or presentation of the work described in this manuscript.

Availability of Data and Materials

Not Applicable

Authors' Contribution

MJ and AL conceptualized the study design, contributed to data analysis, interpreted the results, drafted the manuscript, and approved the final copy of the manuscript. Meanwhile, NN, AJ, II, MSAF, and DE conducted data collection and management and helped prepare the manuscript. All authors read and approved the final version of the manuscript.

Acknowledgment

This work was supported by a research grant "GERAN DANA UiTM SELANGOR (DUCS 2.0) [Project Code: 600-UiTMSEL (PI. 5/4) (025/2020)]. The authors are grateful to the Faculty of Health Sciences, Universiti Teknologi MARA Selangor for the administrative support.

References

1. Zengarini E, Ruggiero C, Pérez-Zepeda MU, Hoogendijk EO, Vellas B, Mecocci P, Cesari M. Fatigue: relevance and implications in the aging population. *Experimental Gerontology*. 2015; 70: 78-85.
2. Galland-Decker C, Marques-Vidal P, Vollenweider P. Prevalence and factors associated with fatigue in the Lausanne middle-aged population: a population-based, cross-sectional survey. *BMJ Open*. 2019; 9 (8): e027070.
3. Soares WJ, Lima CA, Bilton TL, Ferrioli E, Dias RC, Perracini MR. Association among measures of mobility-related disability and self-perceived fatigue among older people: a population-based study. *Brazilian Journal of Physical Therapy*. 2015; 19 (3): 194-200.
4. Bruyère O, Beaudart C, Ethgen O, Reginster JY, Locquet M. The health economics burden of sarcopenia: a systematic review. *Maturitas*. 2019; 119: 61-9.
5. Ying-Hsin H, Chih-Kuang L, Ming-Yueh C, Mei-Chen L, Yu-Teh L, Liang-Kung C, et al. Association of cognitive impairment, depressive symptoms and sarcopenia among healthy older men in the veterans retirement community in southern Taiwan: a cross-sectional study. *Geriatric and Gerontology International*. 2014; 14 Suppl 1: 102-8.
6. Visser M, Schaap LA. Consequences of sarcopenia. *Clinics in Geriatric Medicine*. 2011; 27 (5): 387-99.
7. Limpawattana P, Kotruchin P, Pongchaiyakul C. Sarcopenia in Asia. *Osteoporosis and Sarcopenia*. 2015; 1 (2): 92-7.
8. Patino-Hernandez D, David-Pardo DG, Borda MG, Pérez-Zepeda MU, Cano-Gutiérrez C. Association of fatigue with sarcopenia and its elements: a secondary analysis of SABE-Bogotá. *Gerontology and Geriatric Medicine*. 2017; 3: 1-7.
9. Vlietstra L, Stebbings S, Meredith-Jones K, Abbott JH, Treharne GJ, Waters DL. Sarcopenia in osteoarthritis and rheumatoid arthritis: The association with self-reported fatigue, physical function and obesity. *PloS one*. 2019; 14 (6): e0217462.

10. Goodwin E, Hawton A, Green C. Using the Fatigue Severity Scale to inform healthcare decision-making in multiple sclerosis: mapping to three quality-adjusted life-year measures (EQ-5D-3L, SF-6D, MSIS-8D). *Health and Quality of Life Outcomes*. 2019; 17 (1): 136.
11. Amtmann D, Bamer AM, Noonan V, Lang N, Kim J, Cook KF. Comparison of the psychometric properties of two fatigue scales in multiple sclerosis. *Rehabilitation Psychology*. 2012; 57 (2): 159-66.
12. Demirchyan A, Petrosyan V, Thompson ME. Psychometric value of the center for epidemiologic studies depression (CES-D) scale for screening of depressive symptoms in Armenian population. *Journal of Affective Disorders*. 2011; 133 (3): 489-98.
13. Belza B, Miyawaki CE, Liu M, Aree-Ue S, Fessel M, Minott KR, et al. A systematic review of studies using the multidimensional assessment of fatigue scale. *Journal of Nursing Measurement*. 2018; 26 (1): 36-74.
14. Cruz-Jentoft AJ, Bahat G, Bauer J, Boirie Y, Bruyère O, Cederholm T, et al. Sarcopenia: revised European consensus on definition and diagnosis. *Age and Ageing*. 2019; 48 (1): 16-31.
15. Chen LK, Woo J, Assantachai P, Auyeung TW, Chou MY, Iijima K, Jang HC, Kang L, Kim M, Kim S, Kojima T. Asian working group for sarcopenia: 2019 consensus update on sarcopenia diagnosis and treatment. *Journal of the American Medical Directors Association*. 2020; 21 (3): 300-7.
16. Department of Statistics Malaysia. *Pocket stats quarter*; 2020.
17. McCarten JR, Anderson P, Kuskowski MA, McPherson SE, Borson S. Screening for cognitive impairment in an elderly veteran population: acceptability and results using different versions of the Mini-Cog. *Journal of American Geriatric Society*. 2011; 59 (2): 309-15.
18. Bubel K, Jarek E, Singleton C. *Fatigue severity scale*. Rehab Measures; 2016.
19. Malmstrom TK, Morley JE. SARC-F: a simple questionnaire to rapidly diagnose sarcopenia. *Journal of the American Medical Directors Association*. 2013; 14 (8): 531-2.
20. Sousa-Santos AR, Amaral TF. Differences in handgrip strength protocols to identify sarcopenia and frailty - a systematic review. *BMC Geriatric*. 2017; 17 (1): 238.
21. Braden J, Hilgenberg S, Bohannon RW, Ko MS, Hasson S. Gait speed is limited but improves over the course of acute care physical therapy. *Journal of Geriatric Physical Therapy*. 2012; 35 (3): 140-4.
22. Soyuer T. Fatigue and physical performance in the elderly aged 65 and over living in a nursing home. *International Journal of Family & Community Medicine*. 2018; 2: 371-3.
23. Wang B, Thapa S, Zhou T, Liu H, Li L, Peng G, Yu S. Cancer-related fatigue and biochemical parameters among cancer patients with different stages of sarcopenia. *Supportive Care in Cancer*. 2020; 28 (2): 581-8.
24. Neeffjes ECW, van den Hurk RM, Blauwhoff-Busker molen S, van der Vorst MJDL, Becker-Commissaris A, de van der Schueren MAE, et al. Muscle mass as a target to reduce fatigue in patients with advanced cancer. *Journal of Cachexia, Sarcopenia and Muscle*. 2017; 8 (4): 623-9.
25. Davis MP, Panikkar R. Sarcopenia associated with chemotherapy and targeted agents for cancer therapy. *Annals of Palliative Medicine*. 2019; 8 (1): 86-101.
26. Walston JD. Sarcopenia in older adults. *Current Opinion in Rheumatology*. 2012; 24 (6): 623-7.
27. Kwak SE, Lee JH, Zhang D, Song W. Angiogenesis: focusing on the effects of exercise in aging and cancer. *Journal of Exercise Nutrition and Biochemistry*. 2018; 22 (3): 21-26.
28. Carroll TJ, Taylor JL, Gandevia SC. Recovery of central and peripheral neuromuscular fatigue after exercise. *Journal of Applied Physiology*. 2017; 122 (5): 1068-76.
29. Huang YZ, Chang FY, Liu WC, Chuang YF, Chuang LL, Chang YJ. Fatigue and muscle strength involving walking speed in Parkinson's disease: insights for developing rehabilitation strategy for PD. *Neural Plasticity*. 2017; 1941980.
30. Mänty M, Ekman A, Thinggaard M, Christensen K, Avlund K. Indoor mobility-related fatigue and muscle strength in nonagenarians: a prospective longitudinal study. *Aging Clinical and Experimental Research*. 2014; 26 (1): 39-46.
31. Gacesa JZ, Klasnja AV, Grujic NG. Changes in strength, endurance, and fatigue during a resistance-training program for the triceps brachii muscle. *Journal of Athletic Training*. 2013; 48 (6): 804-9.
32. Vestergaard S, Nayfield SG, Patel KV, Eldadah B, Cesari M, Ferrucci L, et al. Fatigue in a representative population of older persons and its association with functional impairment, functional limitation, and disability. *The Journal of Gerontology, Series A: Biological Sciences and Medical Sciences*. 2009; 64 (1): 76-82.
33. Wei-Quan L, Meng-Juan J, Jie T, Jia-Ji W, Hui-Shan Z, Le-Xin Y, et al. Factors associated with fatigue among men aged 45 and older: a cross-sectional study. *International Journal of Environmental Research and Public Health*. 2015; 12 (9): 10897-909.
34. Kluger BM, Krupp LB, Enoka RM. Fatigue and fatigability in neurologic illnesses: proposal for a unified taxonomy. *Neurology*. 2013; 80 (4): 409-16.

Strategy for Diagnosing Breast Cancer in Indonesia during the COVID-19 Pandemic: Switching to Ultrasound-Guided Percutaneous Core Needle Biopsy

Farida Briani Sobri^{1,2*}, Adang Bachtiar³, Sonar Soni Panigoro⁴, Juwita Cresti Rahmaania⁵, Patria Wardana Yuswar⁶, Ening Krisnuhoni⁷, Nelly Tandiari⁸

¹Doctorate Student of Faculty of Public Health, Universitas Indonesia, Depok, Indonesia, ²Department of Surgical Oncology, Metropolitan Medical Centre Hospital, Jakarta, Indonesia, ³Department of Health Policy and Administration, Faculty of Public Health, Universitas Indonesia, Depok, Indonesia, ⁴Department of Surgery, Faculty of Medicine, Universitas Indonesia, Jakarta, Indonesia, ⁵Department of Surgery, Metropolitan Medical Centre Hospital, Jakarta, Indonesia, ⁶Faculty of Medicine Universitas Indonesia, Jakarta, Indonesia, ⁷Department of Pathology, Metropolitan Medical Centre Hospital, Jakarta, Indonesia, ⁸Department of Radiology, Metropolitan Medical Centre Hospital, Jakarta, Indonesia

Abstract

In this era of COVID-19, suspected breast cancer patients experience delay in diagnosis due to the fear of contracting the virus and reduction of non-COVID-19 health services. Furthermore, it may lead to potential increase in the incidence of advanced cancers in the future. Ultrasound-guided (US-guided) percutaneous core needle biopsy (CNB) is a great option for the diagnosis of cancer but it is poorly utilized. This study aimed to prove that the US-guided CNB is accurate when performed in a local setting and a potential solution for diagnosing breast cancer patients in this pandemic. In addition, it was a single health center cross-sectional study, and the participants were all breast cancer patients that had US-guided CNB from 2013-2019. The pathology results from US-guided CNB were compared to specimens from post-CNB surgeries. The data were collected from medical records and the immunohistochemistry (IHC) examinations were carried out for malignancy. There were 163 patients who were included in this study, 86 had malignancies and 77 had benign tumor reported in their CNB results. The US-guided CNB had 100% sensitivity and specificity compared to surgery. With its lower cost, time usage, and patient exposure to the hospital environment, US-guided CNB should replace open surgery biopsy for diagnosing suspicious breast cancers during the pandemic in Indonesia.

Keywords: breast cancer, core needle biopsy, COVID-19, health cost, resources

Introduction

According to the data from the Global Burden of Cancer Study (GLOBOCAN) 2018, breast cancer has the second-highest incidence after lung cancer.¹ Meanwhile, its mortality rate is among the top five, 6.6% from all mortality caused by cancer. Furthermore, being known as one of the most common cancer in Indonesia, its incidence is estimated to about 40.3 per 100,000 women or 48,998 new cases every year. This number is 30.5% from all types of cancer in females or 16.4% from all types of cancer in the general population, which means there are six new cases of breast cancer every hour in the country.²

The current coronavirus disease 2019 outbreak (COVID-19) is affecting the management of cancer patients, including breast cancer. The disease has claimed more than one million life losses worldwide since its outbreak in early 2020. Studies have shown that patients

with cancer were at higher risk of the need for intensive care unit admission and mortality, approximately 1.5–2 times the risk compared to those without cancer.³

A report based on an international survey shows that breast cancer management has changed dramatically.⁴ Most long-term follow-up care of breast cancers was temporarily held and most doctors can only focus on emergencies. In this pandemic situation, international organizations and societies for oncology have published recommendations for the management of breast cancer patients previously diagnosed.⁵ However, in Indonesia, the challenge remains for patients with suspected breast cancer, such as breast lump, but unable to be properly diagnosed due to limitation of hospital services and patients are reluctant to go to a health center for fear of getting infected. With excision biopsy as the main histopathologic diagnostic procedures, breast cancer patients typically must visit the hospital several times,

Correspondence*: Farida Briani Sobri, Department of Surgical Oncology, Metropolitan Medical Centre Hospital, H. R. Rasuna Said, Karet Kuningan, Setiabudi, South Jakarta, Jakarta Province, 12940, Indonesia, E-mail: didabriani@gmail.com, Phone: +62 21 520 3435

Received : October 21, 2020
Accepted : February 15, 2021
Published : August 24, 2021

which requires lengthy period, exposing them the risk of being prone to COVID-19 infection.

Delaying diagnosis can harm breast cancer patients, which may lead to advanced breast cancer, limiting treatment options and reducing survival rate.⁶ Therefore, it is important to have a quick and accurate procedure for breast cancer diagnosis in this pandemic. An alternative to excision biopsy is ultrasound-guided percutaneous core needle biopsy (US-guided CNB). The CNB, especially US-guided, is recommended for the initial diagnosis and management plan of breast cancer.⁷ Compared to open surgical biopsy, it has similar high accuracy (98–100%), cost-effective (<1 million Indonesian rupiah [IDR] vs. 4–5 million IDR for surgical biopsy), less invasive, minimum side effects (bruising, bleeding or infection <1%), time-saving (only 5–15 minutes), does not need preoperative evaluation and general anesthesia, and can be performed at the outpatient unit.⁸ A panel of experts from the Breast Health Global Initiative (BHGI) also stated that CNB is one of the diagnostic procedures of choice in a limited-resource setting.⁹

Despite these advantages, the US-guided CNB is an uncommon procedure in Indonesia compared to surgical biopsy. Moreover, the National Health Insurance/*Jaminan Kesehatan Nasional* (JKN) only covers this procedure in type A hospitals, which may aggravate the rarity of CNB further. Furthermore, while its use and capability have been established in the international community, there was no previous report on its performance in local settings. Therefore, this study aims to determine the accuracy of the US-guided CNB to differentiate between malignant and benign breast tumors in Indonesia. If the US-guided CNB is proven to be accurate when performed in local settings, perhaps it is time for surgeons in Indonesia to prioritize the US-guided CNB rather than surgical biopsy, especially due to its cost-effectiveness and time-saving characteristics, which may reduce the time that patients spend in hospital, leading to lower risk of infection in this pandemic.

Method

This study was using a single-center cross-sectional design that aims to find out the advantage and accuracy of US-guided CNB. The study was conducted at Metropolitan Medical Centre, Jakarta, Indonesia. The participants were all female breast tumor patients of any age that received US-guided CNB as an initial biopsy method within the period of 2013 to the middle of 2019. The patients that received other initial biopsy methods, such as open biopsy or fine-needle aspiration biopsy, and with incomplete medical records data were excluded. A total sampling method was carried out.

Data were collected from medical records, and the

data were the age of participants, category of tumors based on ultrasound examination, number of specimens obtained, and size of tumors. For patients that received surgery as a treatment, pathology results from surgery were obtained for diagnostic analysis. The discrepancy between the US-guided CNB pathology results and surgical pathology results was noted. For patients with malignant pathology results, data of breast cancer subtypes based on immunohistochemistry (IHC) examination and stage of cancers as described by the American Joint Committee on Cancer (AJCC) were also collected.¹⁰

All cases were biopsied by one operator, a surgical oncologist who has been doing US-guided CNB since 2012, using 14-G automatic spring-loaded core biopsy needle (ACECUT®, ACE-141502 14G x 150 mm, 15 mm-throw, by TSK Laboratory, Japan) with semi-automatic (double) firing. The operator handled the US probe and CNB device by herself, the preferred biopsy technique according to Parker, *et al.*¹¹ A US device with an 11 MHz linear transducer was used.

Based on the ultrasound findings, participants were grouped into the following categories, suspicious benign (absent malignant findings, intense hyperechogenicity, an ellipsoid shape, gentle bi- or trilobulations, and thin and echogenic pseudocapsule), indeterminate (maximum diameter, isoechogenicity or mild hypoechogenicity, enhanced or normal sound transmission, and heterogeneous or homogeneous texture), or suspicious malignant lump (spiculation, angular margins, marked hypoechogenicity, shadowing, calcification, duct extension, branch pattern, and microlobulation). For suspicious benign category, all criteria should be presented.¹²

The sizes of the tumors were grouped into unpalpable (≤ 1.3 cm), palpable small (1.4–2.9 cm), and generally very palpable (≥ 3 cm).¹³ Breast cancer subtype was luminal when the hormone receptor (HR) was positive and human epidermal growth factor receptor 2 (HER2) was negative. The HER2 subtype means HER2 was positive, indifferent to the status of HR. When both HR and HER2 were negative, the subtype was triple-negative breast cancer (TNBC).

IBM SPSS Statistic Version 25 (IBM Corp., New York, USA) was used for statistical analysis. Descriptive data were reported, including mean (for data with normal distribution), median (for data without normal distribution), minimum, and maximum. The data distribution was determined from Shapiro-Wilk analysis, with p-value > 0.05 was categorized as a normal distribution.

A diagnostic analysis was performed to determine the ability of US-guided CNB to identify malignant from benign specimens compared to the subsequent treatment surgery as a gold standard. Sensitivity, specificity, positive predictive value (PPV), and negative predictive

value (NPV) were manually calculated based on a 2x2 table. The ethical approval was obtained from the hospital's ethics committee (No. 239/Kom-Etik/Int/VI/2019).

Results

The data collected showed the number and age distribution of patients, pathology results of the US-guided CNB and their corresponding size. The comparison of pre-biopsy US category and post-biopsy pathology result, number of samples that were obtained when performing US-guided CNB, the accuracy of US-guided CNB compared to surgery, and some discrepancies in cancer grade. Moreover, the stage and subtype of breast cancers in correlation to the size categories of the tumors were also described.

A total of 163 patients were included and all were women. The age of patients was not normally distributed, with a median of 42 (minimum 20 and maximum 83) years old. Out of all, 86 patients had malignancies and 77 patients had benign tumors for their CNB pathology results. The number of patients with unpalpable, palpable small, and generally very palpable size was 39, 86, and 38, respectively (Table 1). In addition, one patient in the small palpable mass group and two in the generally palpable mass group were pregnant. Typically, pregnancy raises awareness to perform surgery under general anesthesia, but for CNB, there was no need for special preparation.

Among 16 patients with malignant unpalpable breast lesions (as shown in Table 1), 13 (81.25%) initially had suspicious malignant pre-biopsy characteristics, while the

rest (18.75%) had indeterminate pre-biopsy characteristics. From 23 patients with benign unpalpable breast lesions, initial pre-biopsy characteristics of malignant, indeterminate, and benign were detected in 2 (8.7%), 20 (87%), and 1 (4.3%) patients, respectively. The largest dimension of all unpalpable tumors was 1.37 cm while the smallest was 0.56 cm. In this group, 2 (8.7%) patients with benign pathology results and 6 (37.5%) patients with malignant pathology results showed no visible mass but architectural distortion lesions on US examination.

The number of samples obtained from biopsies played an important role in obtaining accurate pathology results. Furthermore, the minimum number of samples obtained was three, while seven was recorded as the highest number of samples. The mean number of samples was four (Table 2).

Out of 163 patients that received US-guided CNB, 75 patients also underwent surgeries in our institution, 53 patients and 22 patients had congruent US-guided CNB and surgeries pathology results for malignant and benign tumors, respectively. Based on these results, in the terms of determining if the tumor was benign or malignant, the

Table 1. Size of Tumors with Their Pathology Results after Ultrasound-guided Core Needle Biopsy

Category	Pathology Result	
	Benign	Malignant
Unpalpable (n = 39)	23	16
Palpable small (n = 86)	45	41
Generally very palpable (n = 38)	9	29

Table 2. Pre-Biopsy Radiological Diagnosis and Post-Biopsy Pathology Results

Pre-Biopsy	Post-Biopsy	Number of Patient	Number of CNB Sample Taken		Mean Number of Sample
			Minimum	Maximum	
Benign	Benign	5	4	5	4.2
Indeterminate	Benign	63	3	7	4.2
Indeterminate	Malignant	16	4	7	4.4
Malignant	Malignant	70	3	6	4.28
Malignant	Benign	9	3	5	3.5
Mean number of samples in average					4.116

Note: CNB: Core Needle Biopsy

Table 3. Core Needle Biopsy and Surgery Pathology Discrepancy Comparison in Three Patients

Core Biopsy Specimen Pathology Result	Surgery Specimens Pathology Result
Invasive Ca* NST† grade 1	Invasive Ca* NST† grade 2
Invasive Ca* NST† grade 2	Invasive Ca* NST† grade 3
Invasive Ca* metaplastic grade 3	Invasive Ca* metaplastic grade 2

Notes: *Ca: Cancer; †NST: No Special Type

Table 4. Breast Cancer Subtypes and Stages Grouped by Pre-Biopsy Size

Subtype	Stage ^a	Size		
		Unpalpable	Palpable Small	Generally Very Palpable
Luminal	0	1	0	0
	I	4	5	0
	II	3	10	4
	III	1	3	6
HER2 [†]	IV	0	3	4
	0	1	0	0
	I	2	3	0
	II	1	11	6
TNBC [‡]	III	1	0	2
	IV	0	2	1
	0	0	0	0
	I	0	0	0
DCIS [*]	II	0	2	1
	III	0	0	4
	IV	0	2	0
	0	2	0	1

Notes: *DCIS: Ductal Carcinoma In Situ, †HER2: Human Epidermal Growth Factor Receptor 2, ‡TNBC: Triple-Negative Breast Cancer
^aStage was categorized based on the Tumor (T), Node (N), and Metastasis (M) of tumors as described in the 8th cancer staging manual of the American Joint Committee on Cancer (AJCC).¹⁰

sensitivity, specificity, PPV, and NPV of US-guided CNB compared to surgeries were 100%. There were cancer grade differences between specimens obtained from US-guided CNB compared to surgeries in 3 out of 53 patients (Table 3). However, these differences did not affect treatment.

Because one of the important purposes of performing US-guided CNB is to treat breast cancer patients, based on recent studies, patients were classified based on tumor’s size, stage, and subtype as shown in Table 4. Patients with benign pathology results in whom the tumor had not been removed were followed up while they presented to the day clinic for a routine examination. None of the patients showed signs of malignancy for the lumps that had been biopsied. Furthermore, there was no adverse case of continuous bleeding, severe pain, infection, or pneumothorax.

Discussion

This study showed that the US-guided CNB was able to differentiate malignant from benign breast tumors compared to standard operations with perfect sensitivity and specificity (both 100%). The result of this study was similar to the previous studies of larger international studies.^{8,14–16} For example, a meta-analysis showed that US-guided CNB had a sensitivity of 87% (95% CI = 84–88%) and a specificity of 98% (95% CI = 96–99%).¹⁴ The reason for perfect sensitivity and specificity was perhaps due to a less varied setting (single-center study with all procedures performed by one surgical oncologist).

There were three patients with discrepancies in pathology grade of the cancers, but it did not have any implication on the management of the cancers.

As an additional note, the US-guided CNB of the breast did not need a long learning curve. The data also included patients that received US-guided CNB when the surgical oncologist only had one year of experience with the procedure (patients in 2013). While there was no previous study on the learning curve of US-guided CNB for breast tumors, a report showed that US-guided vacuum-assisted breast biopsy (VABB), an almost similar procedure to US-guided CNB, can give a clue about the learning curve of such procedure. In the study, operators tended to gradually get faster after the first procedure until optimal skill was achieved at the twentieth procedure.¹⁷ The mean number of specimens obtained with CNB from each lesion was 4 and a minimum of 3. There was no standard or consensus on the minimum number of specimens that were needed to obtain an accurate result, but the US-guided CNB with a 14G core needle may need at least two specimens from each lesion.¹⁸

In addition to the accuracy of US-guided CNB, this study also showed that there were 57 (45.6%) patients with breast tumor size <3 cm that had malignant results (Table 1). This was an important finding because of the current practice in Indonesia, most surgeons only perform CNB without US guidance for breast tumor with size ≥3 cm.¹³ For comparison, latest guidelines from the European Society for Medical Oncology (ESMO) and National Comprehensive Cancer Network (NCCN) did

not restrict CNB indication based on size.^{19,20} These guidelines recommended US-guided CNB as the procedure of choice for breast tumor biopsy. If this study had only performed CNB on patients with tumor size ≥ 3 cm, nearly half of the patients with small or unpalpable breast mass might have mis- or delayed diagnosis, resulting in decreased survival rate due to advancement of cancer stage.

The use of US guidance while performing CNB should be recommended for all tumor sizes. Non-image-guided CNB was no longer recommended in the international community due to the significantly lower sensitivity and specificity when compared to the US-guided or stereotactic-guided one.^{19,20} Recently, the latest guideline by the Indonesian Society of Surgical Oncology recommends the US-guided CNB as a standard biopsy method for all suspicious breast lesions that can be detected by the US. However, the guideline also includes a contradicting algorithm that suggests an incisional or excisional biopsy with a frozen section as the initial biopsy approach for a breast lesion without further explanation on when such a non-standard method may be used. This inconsistency can potentially cause confusion among surgeons.¹³

Among the patients with tumor size of <3 cm, there were 16 (41%) patients with unpalpable size tumor that showed post-biopsy malignant pathology results. Considering the tumor size of this group, without US-guided CNB, a definitive diagnosis could not be carried out. Therefore, those cases could eventuate as delayed diagnosis. Such circumstances were a prime example of US-guided CNB's importance. Furthermore, out of the 16 patients, six had architectural distortion, which is defined as a distortion of the normal architecture of the breast with no visible definite mass.²¹ Originally, architectural distortion cases should be biopsied with VABB.^{21,22} However, at the time of the study, VABB was not available in Indonesia, therefore the US-guided CNB was used as an alternative. In this study, six of eight patients that had architectural distortion breast lesions turned out to be having breast cancers. These cases showed another strong point of US-guided CNB.

In contrast, there were 68 (54.4%) patients experiencing benign unpalpable or small size tumors (Table 1). Based on the authors' experience (as there was no published data), Indonesian surgeons typically preferred open surgery biopsy intending to remove the tumor in "one swoop". If such practice had been applied, approximately half of the patients would have received unnecessary surgery along with all of its potential complications.

Every discrepancy between clinical, radiological, and pathology results was investigated carefully. There were two patients with clinically and radiologically suspicious malignant unpalpable tumors. Both had benign pathology results, mastitis with usual ductal hyperplasia (UDH)

from US-guided CNB. Due to the incongruity between clinical-radiological and pathology results, further excisions were offered to the patients. Eventually, the same benign pathology results were reported from excisions, corresponding to the results of the US-guided CNB.

In this study, other than indeterminate and suspicious malignant pre-biopsy characteristics, US-guided CNB was also performed for other indications. There were five patients with benign pre-biopsy characteristics (as shown in Table 2) but underwent US-guided CNB due to large tumor size, therefore necessitate reconstructive surgery. Since reconstructive surgery is a complex procedure, definitive diagnosis confirmation with US-guided CNB was deemed necessary to avoid inappropriate procedures.

In correlation to breast cancer treatment based on stage and subtype, there were 21 patients with HER2 subtype and 7 patients with TNBC subtype breast cancers that were in stage II and III (Table 4). Among these, there were 13 out of 21 HER2 patients and 2 out of 7 TNBC ones whose tumors were unpalpable or small. St. Gallen expert panel consensus in 2019 agreed that stage II and III HER2 and TNBC subtype breast cancer should be treated with neoadjuvant systemic therapy (NAT) to allow surgical de-escalation, prevent unneeded full axillary dissection in selected patients, learn in vivo response of systemic therapy to predict patients' survival, and recognize worse recurrence risk.²³ On the contrary, patients with such cases can receive direct excision as a form of prior therapy without NAT if doctors did not perform US-guided CNB.

Based on those results, there are two implications. First, a US-guided CNB performed at a local hospital by a local surgical oncologist is not inferior to a US-guided CNB that is performed in developed countries. Furthermore, the training for US-guided CNB is probably minimum because it does not need a long learning curve. Therefore, it is feasible to be performed in Indonesia.

The second implication is the possible benefit of the US-guided CNB in the COVID-19 pandemic era. Due to this, the incidence of advanced breast cancer may rise because patients become more reluctant to go to the hospitals, and with the limited capability of health providers to provide adequate services.²⁴ The US-guided CNB has the advantage as a time-saving and cost-effective procedure and is associated with fewer complications compared to surgical biopsy.^{25,26} The current data from JKN in 2015–2020 showed that the unit cost of breast biopsy was approximately four million IDR, while the US-guided CNB can be performed with cost only one-fourth to one-third of it.²⁷

Another major advantage of the US-guided CNB is that it can be performed at an outpatient unit.^{28,29} The patients may directly go home after the biopsy in such a way that the risk of exposure to COVID-19 can be low-

ered. This advantage is important because there were at least about 60,000–80,000 small breast procedures every year in Indonesia and almost all were performed in an inpatient unit. This means that for cases suitable for US-guided CNB instead of open surgery biopsy, there will be spared resources for more urgent cases.²⁷

Preoperative biopsy also offers a significant benefit as pathological findings can help surgeons classify urgent cases (e.g., malignant tumors, giant fibroadenomas, and phyllodes tumors) and non-urgent cases. Patients with non-urgent cases can delay their surgery until the national health system recovered after this pandemic, which will help to de-escalate hospital burdens during this period. There is also a future notable use of US-guided CNB with the global development of gene assay in the treatment of breast cancer. The biomolecular and genetic characteristics from samples taken by preoperative CNB have a role to direct more appropriate therapy for breast cancer patients and therefore can boost the survival of the patients.³⁰ Understanding this insight, clinicians in Indonesia should be familiar with the US-guided CNB.

The strength of this study was the total sampling of breast tumor patients over seven years with both benign and malignant results. Meanwhile, the limitation of this study was the involvement of only one surgical oncologist. Therefore, the sensitivity and specificity of US-guided may be slightly different from the studies with multiple operators because the accuracy of US-guided CNB is influenced by the learning curve of the operator.

Conclusion

This study showed that US-guided CNB is a reliable breast biopsy procedure that can potentially be performed in local hospitals by local clinicians in Indonesia. Instead of an open biopsy surgery, the US-guided CNB, which has the advantages as a time-saving method that does not require inpatient observation should be implemented as the procedure of choice for breast tumor biopsy, following the international guidelines. Further multicenter studies involving multiple clinicians may be needed to confirm the accuracy of the US-guided CNB in Indonesia.

Abbreviations

US: Ultrasound; CNB: Core Needle Biopsy; IHC: Immunohistochemistry; GLOBOCAN: Global Burden of Cancer Study; COVID-19: Coronavirus Disease 2019; IDR: Indonesian Rupiah; BHGI: Breast Health Global Initiative; JKN: *Jaminan Kesehatan Nasional* (National Health Insurance); AJCC: American Joint Committee on Cancer; HR: Hormone Receptor; HER2: Human Epidermal Growth Factor Receptor 2; TNBC: Triple-Negative Breast Cancer; PPV: Positive Predictive Value; NPV: Negative Predictive Value; VABB: Vacuum-Assisted Breast Biopsy; ESMO: European Society for Medical Oncology; NCCN: National Comprehensive Cancer Network; UDH: Usual Ductal

Hyperplasia; NAT: Neoadjuvant Systemic Therapy.

Ethics Approval and Consent to Participate

Ethical approval was obtained from the local hospital (No. 239/Kom-Etik/Int/VI/2019).

Competing Interest

The authors declare that there are no significant competing financial, professional, or personal interests that was likely to have affected the performance or presentation of the work described in this manuscript.

Availability of Data and Materials

Data was available from the corresponding author on request.

Authors' Contribution

FBS proposed, planned, carried out, and supervised the study and report, AB and SSP guided, supervised, and finalized the writing of the report, JCR carried out the research and collected medical record data, EK carried out pathologic examinations and provided pathologic data, NT carried out radiologic examinations and provided radiologic data, PWY wrote the report. All authors read and approved the final manuscript.

Acknowledgment

The authors express profound gratitude to patients that were willing to have core biopsy, a well-known procedure in the international community, despite it is less commonly practiced in Indonesia. The authors thank Metropolitan Medical Centre (MMC) Hospital that granted permission for the study.

References

1. Globocan Observatory W. Cancer today - world. International Agency for Research on Cancer. 2019; 876: 2018–9.
2. Youlden DR, Cramb SM, Yip CH, Baade PD. Incidence and mortality of female breast cancer in the Asia-Pacific region. *Cancer Biology & Medicine*. 2014;11 (2): 101–15.
3. Al-Shamsi HO, Alhazzani W, Alhurairi A, Coomes EA, Chemaly RF, Almuhan M, et al. A practical approach to the management of cancer patients during the novel coronavirus disease 2019 (COVID-19) pandemic: an international collaborative group. *The Oncologist*. 2020; 25 (6).
4. Rocco N, Montagna G, Micco R, Benson J, Criscitiello C, Chen L, et al. The impact of the COVID-19 pandemic on surgical management of breast cancer: global trends and future perspectives. *The Oncologist*. 2021; 26 (1).
5. Çitgez B. Management of breast cancer during the COVID-19 pandemic. *Medical Bulletin of Sisli Etfal Hospital*; 2020.
6. Amit M, Tam S, Bader T, Sorkin A, Benov A. Pausing cancer screening during the severe acute respiratory syndrome coronavirus 2 pandemic: Should we revisit the recommendations? *European Journal of Cancer*. 2020; 134: 86–9.
7. You K, Park S, Ryu JM, Kim I, Lee SK, Yu J, et al. Comparison of core needle biopsy and surgical specimens in determining intrinsic biologic-

- al subtypes of breast cancer with immunohistochemistry. *Journal of Breast Cancer*. 2017; 20 (5): 297.
8. Dahabreh IJ, Wieland LS Adam GP, Halladay C, Lau J, Trikalinos TA. Core needle and open surgical biopsy for diagnosis of breast lesions: an update to the 2009 report. Rockville (MD): Agency for Healthcare Research and Quality (US); 2014.
 9. Duggan C, Dvaladze A, Rositch AF, Ginsburg O, Yip C, Horton S, et al. The breast health global initiative 2018 global summit on improving breast healthcare through resource-stratified phased implementation: methods and overview. *Cancer*. 2020; 126 (S10): 2539–52.
 10. American Joint Committee on Cancer. AJCC cancer staging manual. 8th ed. Chicago: American Joint Committee on Cancer; 2016.
 11. Apesteguía L, Pina LJ. Ultrasound-guided core-needle biopsy of breast lesions. *Insights Imaging*. 2011; 2 (4): 493–500.
 12. Guo R, Lu G, Qin B, Fei B. Ultrasound imaging technologies for breast cancer detection and management: a review. *Ultrasound in Medicine and Biology*. 2018; 44 (1): 37–70.
 13. Perhimpunan Ahli Bedah Onkologi Indonesia (PERABOI). Protokol Peraboi 2020. 2nd ed. Jakarta: PERABOI; 2020.
 14. Wang M, He X, Chang Y, Sun G, Thabane L. A sensitivity and specificity comparison of fine needle aspiration cytology and core needle biopsy in evaluation of suspicious breast lesions: a systematic review and meta-analysis. *The Breast*. 2017; 31: 157–66.
 15. Willems SM, van Deurzen CHM, van Diest PJ. Diagnosis of breast lesions: fine-needle aspiration cytology or core needle biopsy? A review. *Journal of Clinical Pathology*. 2012; 65 (4): 287–92.
 16. Bennett IC, Saboo A. The evolving role of vacuum assisted biopsy of the breast: a progression from fine-needle aspiration biopsy. *World Journal of Surgery*. 2019; 43 (4): 1054–61.
 17. Park HS, Jeon CW. Learning curve for breast mass excision using a vacuum-assisted biopsy system. *Minimally Invasive Therapy & Allied Technologies*. 2014; 23 (4): 235–40.
 18. Rocha RD, Pinto RR, Tavares DPBA, Gonçalves CSA. Step-by-step of ultrasound-guided core-needle biopsy of the breast: review and technique. *Radiol Bras*. 2013; 46 (4): 234–41.
 19. Gradishar WJ, Anderson BO, Abraham J, Aft R, Agnese D, Allison KH, et al. Breast cancer, version 3.2020, NCCN clinical practice guidelines in oncology. *Journal of the National Comprehensive Cancer Network*. 2020; 18 (4): 452–78.
 20. Senkus E, Kyriakides S, Ohno S, Penault-Llorca F, Poortmans P, Rutgers E, et al. Primary breast cancer: ESMO clinical practice guidelines for diagnosis, treatment and follow-up. *Annals of Oncology*. 2015; 26: v8–30.
 21. Gaur S, Dialani V, Slanetz PJ, Eisenberg RL. Architectural distortion of the breast. *American Journal of Roentgenology*. 2013; 201 (5): W662–70.
 22. Ambinder EB, Plotkin A, Euhus D, Mullen LA, Oluyemi E, Di Carlo P, et al. Tomosynthesis-guided vacuum-assisted breast biopsy of architectural distortion without a sonographic correlate: a retrospective review. *American Journal of Roentgenology*. 2020; 1-10.
 23. Balic M, Thomssen C, Würstlein R, Gnant M, Harbeck N. St. Gallen/Vienna 2019: a brief summary of the consensus discussion on the optimal primary breast cancer treatment. *Breast Care*. 2019; 14 (2): 103–10.
 24. Greenwood E, Swanton C. Consequences of COVID-19 for cancer care — a CRUK perspective. *Nature Reviews Clinical Oncology*. 2021; 18 (1): 3–4.
 25. Fernández-García P, Marco-Doménech SF, Lizán-Tudela L, Ibáñez-Gual MV, Navarro-Ballester A, Casanovas-Feliu E. The cost effectiveness of vacuum-assisted versus core-needle versus surgical biopsy of breast lesions. *Radiologia*. 2017; 59 (1): 40–6.
 26. Klimberg VS, Rivere A. Ultrasound image-guided core biopsy of the breast. *Chinese Clinical Oncology*. 2016; 5 (3): 33.
 27. Badan Penyelenggara Jaminan Sosial Kesehatan. Data utilization review terkait kasus kanker. Jakarta: BPJS Kesehatan; 2020.
 28. Bennett I, de Viana D, Law M, Saboo A. Surgeon-performed vacuum-assisted biopsy of the breast: results from a multicentre Australian study. *World Journal of Surgery*. 2020; 44 (3): 819–24.
 29. Tikku G, Umap P. Comparative study of core needle biopsy and fine needle aspiration cytology in palpable breast lumps: scenario in developing nations. *Turkish Journal of Pathology*. 2016; 32 (1): 1-7.
 30. Boland MR, Al-Maksoud A, Ryan ÉJ, Balasubramanian I, Geraghty J, Evoy D, et al. Value of a 21-gene expression assay on core biopsy to predict neoadjuvant chemotherapy response in breast cancer: systematic review and meta-analysis. *British Journal of Surgery*. 2021; 108 (1): 24–31.

Correlation between Care Burden and Mental Health with the Perceived Social Support of Patients Relatives in Turkey

Mehtap ŞAHİNGÖZ TAHTA^{1*}, Elçin BALCI²

¹Lecturer Dr., Niğde Ömer Halisdemir University, Zübeyde Hanım Health Service Vocational School, Niğde, Turkey, ²Department of Public Health, Faculty of Medicine, Erciyes University, Kayseri, Turkey

Abstract

The people providing care for relatives always need support and accompaniment from their families and friends. This study aimed to evaluate the correlation among the care burden, mental health and social support perceptions of the patients' relatives that provide long-term care for patients receiving service from the home care service (HCS) unit in one city. This descriptive study was carried out with the relatives of patients receiving service from home health units. Among the relatives providing care for a total of 859 patients, those that did not comply with the inclusion criteria were excluded, which made a total population of 309 people. Individual information form, burden interview, brief symptom inventory and multidimensional scale of perceived social support were used for the assessment of the data. Descriptive statistics and Spearman's correlation coefficient were used for data analysis. The result showed a positive moderate significant correlation among the burden score, brief symptom inventory subscale and global index scores while, a negative moderate significant correlation was discovered between the family, significant other and multidimensional scale of perceived social support scores. Consequently, as the perceived social support level in the patients' relatives providing care increased, their care burden and mental health problems decreased.

Keywords: care burden, long term care, mental health, social support

Introduction

The increase in old age-disabled and chronic diseased people and the increased demand for care services after discharge, impacted the need for home care services along with the population increase in the world and Turkey.¹ Home care service (HCS) is described as providing health and social services professionally or by the family members in the living environment of the patients to protect, promote and rehabilitate their health.² The relatives that provide care may be defined as the relative or friend that meets the basic needs and follows medical care and hospital relations by living with the individual in need of care (with chronic or acute illnesses or disabilities) or allocating some of his/her time for the patient.³ It is seen that especially among the people, providing long-term care experience caused depression, anxiety, burnout, decrease in physical health, social isolation and economic difficulties due to the burden they experienced.⁴ Furthermore, due to the continuity of service need and the fact that the majority of service was provided by the family members, the efficiency of the service significantly affected the quality and satisfaction of life

and families of the people in need of care.⁵ People that provide care for their relatives always need support and accompaniment from families and friends in order to feel that they are not alone and also to obtain help for subjects such as money, information, education, social and emotional support.⁶

The process of home care giving burden, in terms of both patients and caregivers will have positive results for all parties involved when it is implemented within a certain system at the national level, especially by professionals. Furthermore, it was considered that the studies investigating the correlation between care burden and mental health, including the perceived social support were required to guide in planning and applying the interventions for decreasing the burden of caregivers, protecting their mental health and evaluating the results. This study was to investigate the correlation between care burden and mental health with the perceived social support of the patients' relatives providing long-term care in the HCS unit. The specific objectives were: 1) to assess the correlation of care burden with the perceived social support of patients' relatives in long-term care and 2) to as-

Correspondence*: Mehtap ŞAHİNGÖZ TAHTA, Niğde Ömer Halisdemir University, Zübeyde Hanım Health Service Vocational School, 51100, Niğde - Turkey, E-mail: sahingoz.tahta@gmail.com, Phone: +90-388 211 2821 - 2825

Received : December 08, 2020

Accepted : March 05, 2021

Published : August 24, 2021

sess the correlation between mental health and perceived social support of patients' relatives in long-term care.

Method

This descriptive study was carried out in the houses of the patients' relatives providing long-term care for the patients that received service from the HCS Unit of Niğde Education and Research Hospital in the city center of Niğde. The population was composed of the patients' relatives (the individual meeting the basic needs of the individual in need of care) providing care for 859 people receiving service from the HCS unit. From the Statistics Unit of Niğde Training and Research Hospital, name/surname, telephone numbers and addresses of the people receiving service from the HCS were obtained. Firstly, people were called by phone and those that met the study criteria were identified. In the telephone interview, the time of the respondents' availability was determined and would be visited at their houses.

The people at and over the age of 18, that have been providing patient care for three months and more, had no communication barrier, were not caregivers providing care for a fee and were volunteers, were included in the study. No sampling was selected from the population therefore, the whole population was included. Among the patients' relatives providing care to a total of 859 patients, those that took on patient care for less than three months (356 people), that applied for short-term home care (137 people), those with hearing and speech impairment preventing communication (12 people), the people providing care for a fee with a professional contract (45 people) were excluded from the study and the population became 309 people.

The study was completed by excluding five people that refused to participate, making a total of 304 (the reaching rate was 98.38%). After providing the required information to the participants for collecting the data, the people were included in the study voluntarily. The authors collected the survey data at a suitable time for the people with face-to-face interview technique, by visiting the houses after the consent was received.

Individual information form: The first part of the form consists of eleven questions for determining characteristics such as the demographic characteristics of the patients' relatives and their affinity degrees, caregiving period and the status of getting help in caregiving. Eight questions for determining the demographic characteristics and diagnosis of the patients were included in the second part.

Burden Interview (BI): Its Turkish reliability and validity study was carried out by İnci and Erdem,⁷ and its Cronbach Alpha value ranges between 0.87-0.99. It is composed of 22 items determining the effect of caregiving on the life of the individual. The scale includes Likert type assessment varying from 0 to 4: "never", "rarely", "some-

times", "often" and "always". The lowest and highest scores on the scale were 0 and 88 points, respectively. A high score indicates that the problem experienced is high. In scoring, 0-20, 21-40, 41-60 and 61-88 points represented "no care burden", "mild burden", "moderate burden" and "severe burden", respectively. Cronbach's Alpha value of this study was determined to be 0.94.

Brief Symptom Inventory (BSI): BSI is a scale composed of 53 items prepared to reveal psychiatric problems in various medical situations. The scale is composed of nine subscales (somatization, obsessive-compulsive disorder/OCD, interpersonal sensitivity, depression, anxiety, hostility, phobic anxiety, paranoid ideation and psychoticism), three global indices (distress severity index, positive symptom total index, positive symptom distress index) and additional items. Turkish adaptation of the inventory was carried out by Şahin and Batıgün,⁸ with minimum and maximum scores of 0 and 212. The high total scores obtained on the scale indicated that the symptoms of possible mental disorders of the individual increase.⁸ Meanwhile, Cronbach's Alpha internal consistency coefficients varied between 0.96 and 0.95 for the total score of the inventory and between 0.55 and 0.86 for the subscales. In this study, Cronbach's Alpha internal consistency coefficient was 0.91, which varied between 0.75 and 0.82 for the subscales.

Multidimensional Scale of Perceived Social Support (MSPSS): The Turkish validity and reliability study of the scale was carried out by Eker, *et al.*⁹ On the scale composed of 12 items, the participant may get a minimum of 1 point for the sentence he/she disagrees with and a maximum of 7 points for the sentence he/she agrees with. The scale has three subscales, with four items each to determine the family, friend and significant other's support. The lowest score that may be obtained from its subscales is 4 and the highest score is 28. Meanwhile, the lowest score that may be obtained from the overall scale is 12 and the highest score is 84. As the score given for each item increases, the perceived social support also increases.⁹ The reliability coefficient of the scale and its subscales is 0.89 for the overall scale and 0.85, 0.88 and 0.92 in the "family", "friend" and "significant other" subscales, respectively. In this study, the Cronbach's Alpha was 0.96 for the total scale, 0.84 in the "family" subscale, 0.83 in the "friend" subscale, and 0.83 in the "significant other" subscale.

The data were analyzed using the statistical software set up of Niğde Ömer Halisdemir University for academic staff. Descriptive statistics (number, percentage, mean) were used for data analysis and the Shapiro-Wilk test was used to test the compatibility of the data with the normal distribution. Furthermore, Spearman's correlation analysis was carried out in the examination of the correlation between care burden, the multidimensional scale of per-

ceived social support and its subscales as most of the data were not normally distributed. In all the statistical analyses, p-value <0.05 values were accepted to be significant.

Results

From this study, it was discovered that 48.0% of the patients’ relatives providing care were in the age range of 30-49 years. The population detail was 66.8% were female, 88.5% were married, 24.0% were high school graduates, 52.6% had social insurance and 72.0% were unemployed. The patients’ relatives providing care that had less income compared to their expenses were 45.1%, 31.6% were the parents of the patient, 53.6% provided care for 3-12 months, 48.7% received help for care and 38.5% obtained help from their children. The age average of the patients’ relatives providing care was 45.85±13.08 years and the average caregiving period was 30.95±50.85 months (Table 1). It was discovered that 58.6% of the patients receiving care were at and over the age of 65, 53.9% were female, 69.1% were married, 36.8% were literate and 46.1% had social insurance. The diagnosis of 17.8% of the patients receiving the care was

chronic obstructive pulmonary disease (COPD), 58.6% had at least one comorbidity, where 37.1% had hypertension. The income of 51.6% of the patients was equal to their expenses and their age average was 65.16±16.98 years (Table 2).

Among brief symptom inventory subscales, the participants obtained the highest and lowest scores from the somatization subscale (4.11±5.19) and the additional items subscale (2.43±2.98), respectively. The total score of the participants for the multidimensional scale of perceived social support was 71.63±18.37 points, obtaining the highest score in the significant other subscales (24.11±6.26). In addition, the score of the burden interview was 25.0±16.09 points (Table 3). It was discovered that 45.1% of the participants had no burden, 36.5% had a mild burden, 16.1% had a moderate burden and 2.3% had a severe burden. In detail, 66.5% of those with a burden had a mild burden, 29.3% had a moderate burden, and 4.2% had a severe burden (Table 4).

Table 1. Distribution of Demographic Characteristics of Caregiver Patients’ Relatives (n = 304)

Variable	Category	n	%
Age	18-29	38	12.5
	30-49	146	48.0
	50-64	94	30.9
	≥65	26	8.6
Gender	Male	101	33.2
	Female	203	66.8
Marital status	Single	35	11.5
	Married	269	88.5
Education status	Illiterate	17	5.6
	Literate	67	22.0
	Primary school	58	19.1
	Middle school	41	13.5
	High school	73	24.0
	University	48	15.8
Working status	Full day	77	25.3
	Half day	8	2.6
	Not working	219	72.0
Income status	Income is less than expenses	137	45.1
	Equal to the expense income	134	44.1
	Income is more than expenses	33	10.9
Degree of affinity with the patient	Parents	96	31.6
	Children	20	6.6
	Partner	92	30.3
	Relative	34	11.2
	Spouse’s parents	62	20.4
Provided care time	3-12 months	163	53.6
	13-24 months	61	20.1
	25-48 months	35	11.5
	≥49 months	45	14.8
The people taken to help care	Partner	35	23.6
	Parents	14	9.5
	Children	57	38.5
	Caregiver	22	14.9
	Sibling	20	13.5

Table 2. Distribution of Demographic Features of Patients Receiving Care (n = 304)

Variable	Category	n	%
Age	≤ 29	17	5.6
	30-49	28	9.2
	50-64	81	26.6
	≥65	178	58.6
Gender	Male	140	46.1
	Female	164	53.9
Marital status	Single	27	8.9
	Married	210	69.1
	Divorced/widowed	67	22.0
Education status	Illiterate	86	28.3
	Literate	112	36.8
	Primary school	57	18.8
	Middle School	15	4.9
Disease diagnosis	High school	24	7.9
	University	10	3.3
	Diabetes mellitus	28	9.2
	Hypertension	15	4.9
	Stroke	41	13.5
Additional diseases	Chronic obstructive pulmonary disease	54	17.8
	Chronic renal failure	8	2.6
	Heart disease	41	13.5
	Asthma	21	6.9
	Alzheimer	11	3.6
	Cancer	19	6.3
	Lumbar disc hernia	9	3.0
Additional diseases	Fracture	45	14.8
	Disabled	12	3.9
	Diabetes mellitus	27	15.2
	Hypertension	66	37.1
	Chronic obstructive pulmonary disease	11	6.2
	Diabetes mellitus-Hypertension	35	19.7
Income status	Asthma	15	8.4
	Heart disease	11	6.2
	Other*	13	7.3
	Income is less than expenses	125	41.1
	Equal to the expense Income	157	51.6
	Income is more than expenses	22	7.2

Note: *Stroke (5), Chronic Renal Failure (2), and Cancer (6)

Table 3. Distribution of the Scores from the Scales and Sub-Dimensions Used in the Study

Scale and Sub-Dimension	Min - Max	Mean ± SD
Somatization	0-28	4.11±5.19
Obsessive-compulsive disorder	0-24	3.78±4.54
Interpersonal sensitivity	0-16	2.60±3.14
Depression	0-24	3.81±4.53
Anxiety	0-24	3.65±4.62
Hostility	0-20	3.01±3.64
Phobic anxiety	0-20	3.01±3.73
Paranoid ideation	0-20	3.19±3.55
Psychoticism	0-20	2.70±3.27
Additional items	0-16	2.43±2.98
Distress severity index	0-3.47	0.53±0.59
Symptom total index	0-56	20.12±15.76
Symptom distress index	1-4	1.42±0.58
Multidimensional scale of Perceived Social Support–Total	12-84	71.63±18.37
Family	4-28	24.01±6.07
Significant other	4-28	24.11±6.26
Friend	4-28	23.52±6.82
Care Burden–Total	0-70	25.00±16.09

Note: SD: Standard Deviation

Table 4. Distribution of the Care Burden Scale Scoring (n = 304)

Scoring	n	%
No burden	137	45.1
Mild burden	111	36.5
Moderate burden	49	16.1
Severe burden	7	2.3

The positive moderate significant correlation was discovered between burden score and somatization, OCD, interpersonal sensitivity, depression, anxiety, hostility, phobic anxiety, paranoid ideation, psychoticism, additional items, distress severity index, positive symptom total index and positive symptom distress index (p-value <0.01). The burden score was directly proportional to the above listed scores e.g., an increase in the burden score leads to an increase in the other scores (Figure 1). While a negative weak correlation was discovered between the family, significant other and multidimensional scale of perceived social support total scores, a moderately significant correlation was discovered between the family, significant other, multidimensional scale of perceived social support total scores and friend score (p-value <0.01). Burden score was indirectly proportional to the family, significant other, friend and multidimensional scale of social support total scores (Figure 1). Furthermore, it was discovered that there was a negative moderate significant correlation between brief symptom inventory subscale and global index scores and the family, significant other, friend and multidimensional scale of perceived social support scores (p-value <0.01). Somatization, OCD, depression, anxiety disorder, hostility,

phobic anxiety, paranoid ideation, psychoticism, additional items, distress severity index, positive symptom total index and positive symptom distress index were inversely proportional to family, significant other, friend and multidimensional scale of perceived social support total scores (Figure 1).

Discussion

In this study, 48.0% of the patients’ relatives providing care were in the age group of 30-49 years, 66.8% were female, 88.5% were married and 24.0% were high school graduates. The studies carried on caregivers, stated that caregivers were mostly married, female, under the age of 50, literate and at least primary school graduate.¹⁰⁻¹² The results were in accordance with that of this study. The reason “why caregiving was perceived as the role of women in the societies” might be because women were considered first in the household chores and child growth processor when adults need care; such as old age and health problems. Furthermore, it was observed that 58.6% of the patients were 65 years old and over, their age average was 65.16±16.98, 53.9% were female, 69.1% were married, 36.8% were literate, 46.1% were insured by Supplemental Security Income (SSI) and the income of 51.6% of them was equal to their expenses. As understood from the results of the related studies,^{13,14} it was observed that most of the people receiving service from the HCS unit were over the age of 65 years, which was in accordance with the results of this study.

It was observed that the score of the patients’ relatives for burden interview was 25.0±16.09 points. Some studies carried out on care burden have revealed that burden interview total score was low,^{15,16} moderate,¹⁷⁻¹⁹ and high.^{10,20} However, in this study, it was discovered that the total interview score was low, similar to the first two studies. This result might be because it was carried out among the patients’ relatives that received service from the HCS unit and were supported by this unit anytime needed.

This study stated that the total score of the patients’ relatives for the multidimensional scale of perceived social support was 71.63±18.37. The scores were 24.01±6.07, 24.11±6.26 and 23.52±6.82 points in the family, significant other and friend subscales, respectively. The total score average of the multidimensional perceived social support scale was found to be 53.93±19.24 in the study conducted by Tarı Selçuk and Avcı,¹⁹ in 2016 and 57.01±11.62 in the study conducted by Çiçek,²¹ in 2014. Contradict to these studies about caregivers, it was observed that the perceived social support level by the caregivers was high, which supports the results of the current study.^{16,22-24} Those differences might occur because of the cultural gap since the studies were carried out in different cities.

	Care Burden	Somatization	Obsessive-Compulsive Disorder	Interpersonal Sensitivity	Depression	Anxiety	Hostility	Phobic Anxiety	Paranoid Ideation	Psychoticism	Additional Items	Distress Severity Index	Symptom Total Index	Symptom Distress Index	Family	Significant Other	Friend	Multidimensional Scale of Perceived Social Support - Total	
Care Burden	1.000																		
Somatization	0.396**	1.000																	
Obsessive-Compulsive Disorder	0.402**	0.833**	1.000																
Interpersonal Sensitivity	0.402**	0.749**	0.682**	1.000															
Depression	0.360**	0.811**	0.831**	0.712**	1.000														
Anxiety	0.453**	0.802**	0.766**	0.711**	0.797**	1.000													
Hostility	0.358**	0.755**	0.767**	0.693**	0.759**	0.812**	1.000												
Phobic Anxiety	0.332**	0.737**	0.719**	0.652**	0.711**	0.677**	0.707**	1.000											
Paranoid Ideation	0.395**	0.752**	0.757**	0.673**	0.757**	0.768**	0.703**	0.656**	1.000										
Psychoticism	0.393**	0.756**	0.759**	0.722**	0.782**	0.759**	0.749**	0.768**	0.717**	1.000									
Additional Items	0.388**	0.739**	0.748**	0.627**	0.738**	0.782**	0.768**	0.669**	0.748**	0.738**	1.000								
Distress Severity Index	0.438**	0.880**	0.903**	0.802**	0.901**	0.897**	0.880**	0.816**	0.864**	0.872**	0.857**	1.000							
Symptom Total Index	0.410**	0.896**	0.880**	0.798**	0.888**	0.867**	0.856**	0.832**	0.835**	0.872**	0.827**	0.974**	1.000						
Symptom Distress Index	0.339**	0.595**	0.648**	0.529**	0.574**	0.634**	0.606**	0.462**	0.651**	0.517**	0.585**	0.680**	0.533**	1.000					
Family	-0.290**	-0.378**	-0.387**	-0.334**	-0.413**	-0.457**	-0.434**	-0.403**	-0.353**	-0.390**	-0.422**	-0.455**	-0.417**	-0.399**	1.000				
Significant Other	-0.235**	-0.318**	-0.327**	-0.255**	-0.355**	-0.425**	-0.371**	-0.317**	-0.305**	-0.327**	-0.366**	-0.383**	-0.359**	-0.322**	0.840**	1.000			
Friend	-0.311**	-0.430**	-0.431**	-0.407**	-0.467**	-0.491**	-0.468**	-0.410**	-0.400**	-0.435**	-0.439**	-0.509**	-0.468**	-0.392**	0.825**	0.768**	1.000		
Multidimensional Scale of Perceived Social Support -Total	-0.297**	-0.407**	-0.413**	-0.369**	-0.440**	-0.495**	-0.453**	-0.408**	-0.387**	-0.414**	-0.435**	-0.488**	-0.446**	-0.409**	0.941**	0.900**	0.927**	1.000	

** p-value<0.01

Figure 1. Examining the Relationship between Care Burden, Multidimensional Perceived Social Support Scale, Short Symptom Inventory and Sub-Dimensions

In this study, a positive moderate significant correlation was discovered between burden score and brief symptom inventory subscales and global indices. Öksüz, *et al.*,²⁵ stated in their study that there was a significant positive correlation between burden interview mean scores of the caregivers and their somatization, OCD, interpersonal sensitivity, depression, anxiety, hostility, phobic anxiety, additional items, distress severity index and positive symptom distress index mean scores. The results of this study shared similar things with Öksüz, *et al.*,²⁵ as the care burden increased in people providing care, mental problems also increased. In this study, negative weak correlation was discovered between the burden score and the family, significant other and multidimensional scale of perceived social support total scores. The previous studies also stated that there was a negative correlation between the multidimensional scale of perceived social support and care burden. In addition, the increasing score of the multidimensional scale of perceived social support was a factor decreasing the care burden.^{19,22,23} The increase in the multidimensional scale of perceived social support total score and the subscale scores appeared to be associated with the decrease of care burden level.

Furthermore, it was discovered that the correlations of the brief symptom inventory subscale scores and multidimensional scale of perceived social support total score, and the subscale scores were significant. It was observed that there was a negative, moderate correlation between somatization, OCD, depression, anxiety, hostility, phobic anxiety, paranoid ideation, psychoticism, ad-

ditional items, distress severity index, symptom total index and symptom distress index scores, which were there—among the brief symptom inventory subscales and the family, significant other, friend multidimensional scale of perceived social support scores. The study by Dökmen,²² stated that the correlations between social support total score and family subscale score and the brief symptom inventory subscale scores were significant. In addition, a decrease was observed in the negative mental health symptoms, especially in the caregivers that perceived family support as high. The results stating the positiveness of the correlation between social support and mental health situation were supported by the previous studies.^{22,26}

Conclusion

This study discovered that the patients’ relatives obtained the highest and lowest scores from the somatization subscale of the brief symptom inventory and the additional items subscale, respectively. Furthermore, the patients’ relatives obtained the highest score from the significant other subscales of the multidimensional scale of perceived social support and those that had a mild burden. As the perceived social support level in patients’ relatives increased, the care burden and mental health problems decreased. However, this study has a limitation which the care burden and social support needs of caregivers of the patients that received service from the HCS unit are limited in Turkey. The authors may recommend holding a similar study with larger sample groups and

establishing the units to provide support especially according to the results of the brief symptom inventory.

Abbreviations

HCS: Home Care Services, BI: Burden Interview, BSI: Brief Symptom Inventory, OCD: Obsessive-Compulsive Disorder; MSPSS: Multidimensional Scale of Perceived Social Support, COPD: Chronic Obstructive Pulmonary Disease; SSI: Supplemental Security Income.

Ethics Approval and Consent to Participate

This study was approved by Erciyes University Clinical Trials Ethics Committee (Ethics No: 2016/535). Furthermore, the written institutional approval was received from T.R Ministry of Health, General Directorate of Public Hospitals, Niğde Provincial Directorate of Health, Niğde Training and Research Hospital. All study participants provided verbal informed consent before participating in the survey.

Competing Interest

The authors declare that there are no significant competing financial, professional, or personal interests that might have affected the performance.

Availability of Data and Materials

The data are not publicly available owing to their containing information that could compromise the study' participant privacy and consent. However, the data which supported the results of this study were made available by the first author upon reasonable request.

Authors' Contribution

MŞT and EB were involved in the design of the study, where MŞT took on the task of collecting, analyzing, interpreting and writing the data for this study. Meanwhile, EB outlined the study and supervised the data analysis. All authors read and approved the final manuscript.

Acknowledgment

The authors express gratitude to the Home Care Service Unit of Niğde Education and Research Hospital that agreed to collaborate in this study. Furthermore, to the patients' relatives that provided long-term care for the patients receiving service from the Home Care Services Unit.

References

- Gürer A, ÇIRPAN FK, Özlen NA. Yaşlı bakım hizmetleri. *Journal of Health Services and Education*. 2019; 3 (1): 1-6.
- Karabulut S. Evde bakım hizmeti sunulan hastalarda stresin ölçülmesi. Yüksek Lisans tezi, Beykent Üniversitesi, İstanbul; 2015.
- Lund L, Ross L, Petersen MA, Petersen MA, Groenvold M. Cancer caregiving tasks and consequences and their associations with caregiver status and the caregiver's relationship to the patient: a survey. *BMC Cancer*. 2014; 14: 541.
- Atagün Mİ, Balaban ÖD, Atagün Z, Elagöz M, Özpolat AY. Kronik hastalıklarda bakım veren yükü. *Psikiyatride Güncel Yaklaşımlar*. 2011; 3: 513-52.
- Güldem Ökem Z, Can M. Avrupa Birliği ülkelerinde yaşlılara yönelik uzun süreli bakım sistemleri ve uygulamaları. 1.basım, Ankara, Nobel Akademik Yayıncılık Eğitim Danışmanlık Tic.Ltd.Şti; 2014.
- Galvin M, Carney S, Corr B, Mays I, Pender N, Hardiman O. Needs of informal caregivers across the caregiving course in amyotrophic lateral sclerosis: a qualitative analysis. *BMJ Open*. 2018; 8 (1): e018721.
- İnci FH, Erdem M. Bakım verme yükü ölçeği'nin Türkçeye uyarlanması, geçerlilik ve güvenilirliği. *Atatürk Üniversitesi Hemşirelik Yüksekokulu Dergisi*. 2008; 11(4): 85-95.
- Şahin NH, Batıgün AD, Uğurtaş S. Kısa Semptom Envanteri (KSE): ergenler için kullanımının geçerlilik, güvenilirlik ve faktör yapısı. *Türk Psikiyatri Dergisi*. 2002; 13 (2): 125-35.
- Eker D, Arkar H, Yıldız H. Çok boyutlu algılanan sosyal destek ölçeğinin gözden geçirilmiş formunun faktör yapısı, geçerlik ve güvenilirliği. *Türk Psikiyatri Dergisi*. 2001; 12 (1): 17-25.
- Karaağaç H, Çalık Var E. Investigation of the effect between care burden and quality of life in caregivers of schizophrenia patients (tur). *Journal of Clinical Psychology*. 2019; 22 (1): 16-26.
- Rodríguez-Pérez M, Abreu-Sánchez A, Rojas-Ocaña MJ, Del-Pino-Casado R. Coping strategies and quality of life in caregivers of dependent elderly relatives. *Health and Quality of Life Outcomes*. 2017; 15 (1): 71.
- Tayaz E, Koc A. Assessment of relationship between perceived care burden and quality of life in disabled persons caregivers. *Bakırköy Tıp Dergisi*. 2018; 14: 44-52.
- Karaman D, Kara D, Yalçın Atar N. Evde Sağlık Hizmeti verilen bireylerin hastalık durumlarının ve bakım ihtiyaçlarının değerlendirilmesi: Zonguldak örneği. *Gümüşhane University Journal of Health Sciences*. 2015; 4 (3): 347-59.
- Kouta C, Kaite CP, Papadopoulos I, Phellas CN. Evaluation of home care nursing for elderly people in Cyprus. *International Journal of Caring Sciences*. 2015; 8 (2): 376-84.
- Özdemir Ü, Taşcı S, Kartın P, Çürük GN, NEMLİ A, Karaca H. Kemoterapi alan bireylerin fonksiyonel durumu ve bakım verenlerin yükü. *Erciyes Üniversitesi Sağlık Bilimleri Fakültesi Dergisi*. 2017; 4 (1): 49-61.
- Nehir Türkmen S, Dirgen Ö, Biçici Y, Uzun M. Ruhsal bozukluğu olan bireylerin ailelerinde bakım yükü ve algılanan sosyal destek. *Uluslararası Hakemli Psikiyatri ve Psikoloji Araştırmaları Dergisi*. 2016; 3 (5): 55-75.
- Jafari H, Ebrahimi A, Aghaei A, Khatony A. The relationship between care burden and quality of life in caregivers of hemodialysis patients. *BMC Nephrology*. 2018; 19 (1): 321-6.
- Kaya Y, Öz F. Şizofreni hastalarının genel sosyal işlevsellik düzeyi ve hastalara bakım veren yakınlarının bakım yükü. *Journal of Psychiatric Nursing*. 2019; 10 (1): 28-38.
- Tarı Selçuk K, Avcı D. Kronik hastalığa sahip yaşlılara bakım verenlerde bakım yükü ve etkileyen etmenler. *SDÜ Sağlık Bilimleri Enstitüsü Dergisi*. 2016; 7 (1): 1-9.
- Goday-Ramirez AM, Pérez-Verdún MÁ, Doménech-del Rio A, Prunera-Pardell MJ. Caregiver burden and social support perceived by patients with chronic obstructive pulmonary disease. *Rev Calid Asist*. 2014; 29 (6): 320-4.
- Çiçek Z. Parkinson hastalığı olan bireye bakım verenlerin algıladıkları sosyal destek ile bakım yükü arasındaki ilişkinin incelenmesi. Yüksek Lisans tezi, Dokuz Eylül Üniversitesi, İzmir; 2012.

22. Dökmen ZY. Yakınlarına bakım verenlerin ruh sağlıkları ile sosyal destek algıları arasındaki ilişkiler. Ankara Üniversitesi Sosyal Bilimler Enstitüsü Dergisi. 2012; 5 (1): 5-38.
23. Göriş S, Kılıç Z, Elmal F, Tutar N, Taktı Ö. Care burden and social support levels of caregivers of patients with chronic obstructive pulmonary disease. Holistic Nursing Practice. 2016; 30 (4): 227-35.
24. Pehlivan S, Özgür YF, Yıldız H, Dalkılıç HE, Pehlivan Y. Romatolojik hastalıklarda sosyal destek ve bakım veren yükü. Uludağ Üniversitesi Tıp Fakültesi Dergisi. 2018; 44 (1): 19-25.
25. Öksüz E, Barış N, Arslan F, Ateş MA. Kemoterapi alan hastalara bakım verenlerin psikiyatrik semptom düzeyleri ve bakım verme yükleri. Anatolian Journal of Clinical Investigation. 2013; 7 (1): 24-30.
26. Harandi TF, Taghinasab MM, Nayeri, TD. The correlation of social support with mental health: a meta-analysis. Electron Physician. 2017; 9 (9): 5212-22.

Correlation between Dental Environment and Perceived Stress Scale among Dental Students during the COVID-19 Pandemic in Indonesia

Tri Erri Astoeti^{1*}, Howis Josephine², Armelia Sari Widyanman³, Widijanto Sudhana¹

¹Department of Preventive and Public Health, Faculty of Dentistry, Trisakti University, West Jakarta, Indonesia, ²Undergraduate Student, Faculty of Dentistry, Trisakti University, West Jakarta, Indonesia, ³Department of Oral Biology, Faculty of Dentistry, Trisakti University, West Jakarta, Indonesia

Abstract

Academic stressors in a medical educational environment are related to two factors. This study was carried out in order to analyze the correlation between the dental environment and perceived stress among dental students during the COVID-19 pandemic. The respondents were 422 undergraduate dental students and the validated Modified Dental Environmental Stress (DES) and Perceived Stress Scale (PSS) questionnaires were used. Furthermore, the Spearman correlation analysis was used to measure the correlation between DES and PSS score. The result showed that five dental stressors were noted to have the strongest correlations with PSS (p-value >0.40). They include expectation towards dental school (p-value = 0.431), lack of confidence to be a successful dentist (p-value = 0.424), lack of confidence to become a successful dental student (p-value = 0.408), dental school regulations (p-value = 0.401) and criticism of school work (p-value = 0.400). In addition, all six DES categories showed a positive correlation with the PSS. Therefore, the dental students collectively displayed moderate perceived stress scores. The overall discoveries from this study showed a positive correlation between the DES and PSS among dental students during the COVID-19 pandemic.

Keywords: dental environment, dental student, perceived stress scale

Introduction

The data on October 21, 2020 obtained by the Indonesia Medical Council stated that there are only 35,863 dentists in Indonesia. However, this number still remains low and is yet to meet the needs of the Indonesian population.¹ Perceived stress among dental students has become an obstacle towards increasing graduation productivity, especially during the pandemic.² This implies that the coronavirus disease 2019 (COVID-19) pandemic has an impact on dental education.³

A pandemic is defined as an "epidemic that occurs worldwide or in a very wide region, crossing international borders and typically affecting a large number of individuals".⁴ The outbreak that occurred in Wuhan, China, in December 2019, is a newly discovered infectious disease caused by a beta coronavirus called severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), which was later officially known as the COVID-19.⁵ The World Health Organization (WHO) stated that the COVID-19 outbreak is a global health emergency on January 30, 2020, and finally declared it as a global pandemic on March 11, 2020, due to its rapid and uncontrollable

transmission.⁶ As of October 2020, WHO reported more than 1 million death cases linked to COVID-19 infection worldwide.⁷

Since the beginning of this pandemic, WHO has been publicly recommending several measures to control the spread of SARS-CoV-2 infection. They include the avoidance of crowds and poorly ventilated areas, good hygiene practices such as hand washing and wearing face masks, as well as practicing social distancing.⁸ Although, these measures were initially aimed at reducing the global mortality rate, they have somehow significantly altered the world's orders in many aspects, including daily routine, economy, the stock market and even the world's educational system.⁸ Consequently, many nations have implemented lockdown (general constraints on the population, including instructions to stay at home and work/learn from home) and this has impacted the lives of employees and students across the globe, ranging from elementary to college students, due to the closedown of public places including offices, companies and educational institutions.^{7,9} In the world of dentistry, both in terms of dental practice and education, like other educational majors,

Correspondence*: Tri Erri Astoeti, Department of Dental Public Health and Preventive Dentistry, Faculty of Dentistry, Trisakti University, Kyai Tapa Street No. 260, Grogol, West Jakarta, Jakarta 11440, Indonesia, E-mail: erriastoeti@trisakti.ac.id, Phone: +62 81 1957 969

Received : January 11, 2021
Accepted : March 10, 2021
Published : August 24, 2021

faced challenges in implementing the new procedures, to protect the health of students and dental faculty staffs, while ensuring the continuity of the quality of dental education.¹⁰ Furthermore, the prevalence of stress and anxiety, especially among dental students, increased with the closure of universities and enforcement of social distancing regulations during this pandemic.¹¹

Academic stressors in a medical educational environment are related to several factors, such as large number of difficult materials and the ability of comprehensive examinations to be mastered by students that require a lot of time to study, leaving them with little time to release accumulated stress and anxiety.² The health profession has higher stress levels compared to other field of study. It has been observed that 56.4% of health professions have high-stress levels and only 20.6% of non-health-related professions have high-stress levels.¹²

Meanwhile, dental students are more likely to experience high-stress levels compared to other health fields. A study found that dental students have higher stress levels compared to other medical students in academic performance with average scores of 2.56 and 2.37, respectively (p-value <0.1), clinical responsibility towards patients with average scores of 2.39 and 2.21 (p-value <0.1), and faculty relationship with average scores of 2.38 and 1.87, respectively.¹³ Furthermore, based on a study by Al-Sowygh, *et al.*,¹⁴ the mean and median score of the Perceived Stress Scale (PSS) among dental students is 22.82 and 23, respectively. This study was performed in Saudi Arabia and stated that dental students in the fourth academic year had the highest stress levels (23.97). Meanwhile, they had the lowest stress levels (22.35) in the third academic year.¹⁴

The dentistry curriculum requires students to have theoretical knowledge and clinical skills simultaneously. In the preclinical period, they are expected to acknowledge theoretical materials in a short time and be introduced to complex dental equipment. Furthermore, during clinical practice, they are required to perform irreversible procedures on frightened patients. These experiences are new and were never carried out during the pre-clinic study period.¹⁵⁻¹⁷

Therefore, this academic demand requires dental students to be competitive and encourages them to study hard in order to obtain a good education. However, for some students, this stressor causes high-stress levels.¹⁸ One of the undesirable effects of stress on dental students is intellectual dysfunction and failure to learn. They become ineffective in fulfilling the requirements in the dentistry curriculum due to high-stress levels, with or without physical symptoms. The stress levels also put them in conflicting situations where they have to choose between spending time studying, relaxing, or doing other things outside the scope of dentistry.¹⁹

A study stated that identifying the stress-causing factors and the levels of stress among dental students may be of assistance in building a strategy to reduce stress levels.²⁰ Appropriate strategies contribute to increasing the number of graduates and quality of dental education. This solution is expected to address the ratio of dentists to the population in some countries. Consequently, the stress-causing factors and stress levels among dental students need to be studied in order to formulate an appropriate strategy.²¹ A study of stress levels among dental students at the Faculty of Dentistry Trisakti University has never been carried out. Therefore, this study aims to acknowledge the relation of the stress-causing factors and perceived stress among dental students at the Faculty of Dentistry Trisakti University, primarily during the COVID-19 pandemic.

Method

This study was based on analytic observation, using cross-sectional study methods. The subjects were undergraduate students at the Faculty of Dentistry Trisakti University, representing the class of 2017-2019. Using the random sampling method, the minimal sample was calculated and the minimal size obtained was 212 (N = 1,500). The respondents were 422 undergraduate dental students. This study was approved by the Ethics Commission of Faculty of Dentistry Trisakti University with approval number 267/S1/KEPK/FKG/2/2020. Furthermore, all questionnaires were developed and confirmed after expert review.

The data used was collected from completed questionnaires. The questionnaires were divided into the Perceived Stress Scale (PSS) and Modified Dental Environment Stress (DES) questionnaire. Perceived Stress Scale questionnaire measured the perceived stress level of the student using Likert scale from 0-4 as follows: 0: never, 1: almost never, 2: sometimes, 3: almost often, 4: often. Subsequently, total scores were calculated by changing the scores for questions number 4, 5, 6, 7 and 8 into 0 = 4, 1 = 3, 2 = 3, 3 = 1, 4 = 0. The total score of the PSS questionnaire analysis was divided into three scales, namely low-stress level (0-13), middle-stress level (14-26) and high-stress level (27-40).^{14,22}

Meanwhile, Dental Environment Stress was measured by events, experiences or stimuli originating from the environments that are able to cause stress. This study modified the DES questionnaires with excluding patient care category. The questions were divided into six categories, namely: self-efficacy, lecturers, workload, clinical training, academic performance pressure and personal/others and scaled with Likert from 1-5 as follows: 1: no stress, 2: less stressful, 3: simply stressful, 4: very stressful, 5: not applicable.^{14,23} Data from the DES questionnaire was categorized with a calculated mean and standard de-

viation.

The validity of the DES and PSS questionnaires was tested, but due to the modification of questionnaires in this study, the validity was re-tested. The modified DES questionnaires consisted of 29 questions which had an r count more than r table (0.428-0.800). Meanwhile, the PSS questionnaires consisted of 10 questions which had an r count more than r table (0.420-0.867). Therefore, all the questions from both questionnaires were valid.

Reliability tests for both questionnaires were carried out using the Chronbach coefficient alpha, which was also used to determine the reliability of the measuring instrument. According to Bernstein, the minimum coefficient for measuring an instrument is 0.7 and is said to be reliable.²⁴ The result of the reliability test for both questionnaires are shown in Table 1. It was concluded that questionnaires are usable since both the DES and PSS were classified as having very high and high reliability respectively.

Data between genders were compared using an Independent Sample T-test. Furthermore, Spearman correlation analysis was used to measure the correlation between the DES and PSS score. Data analysis was carried out using IBM SPSS Statistic Version 24 (IBM Corp., New York, USA).

Results

A total of 422 responses were recorded in Table 2, among which 87.7% were female and 12.3% were male. Furthermore, the mean PSS score for the study population was 20.5 (±5.644) with a range of 5-38. The male students showed a mean PSS score of 19.3 (±5.090), while that of the female students was 20.6 (±5.712). From all the DES factors in Table 3, five factors with the highest mean were selected (Table 4). The factor with the highest mean among the stress-causing factors was ‘Fear of failing a module,’ which was included in the ‘Academic performing pressure category. The DES factor

categories of ‘academic performance pressure’, ‘workload’ and ‘clinical training’, predominated with the mean score of each category being 2.86, 2.69 and 2.85 respectively. The result of the Spearman correlation test indicated that there was a positive correlation between all DES factors and PSS scores (p-value <0.01) (Table 5). Among all DES items, the 5-items with the strongest positive correlations (p-value >0.4) were noted in Table 6.

Discussion

During the COVID-19 pandemic, many faculties all over the world, including dentistry greatly transformed the traditional face-to-face form of the educational system into online learning in order to pass the educational substances between tutors and students. Despite the adoption of new approaches that are capable of suppressing the spread of COVID-19, the uncertainty about how and when the pandemic will end could significantly im-

Table 1. Chronbach Coefficient Alpha of Dental Environment Stress and Perceived Stress Scale Questionnaires

Questionnaire	Cronbach Coefficient α
Dental environment stress	0.957
Perceived stress scale	0.775

Table 2. Comparison of Mean Scores, Data Range and Perceived Stress Scale Score between Gender

Participant	n (%)	Mean (SD)	Data Range	PSS Category
All	422	20.5 (5.644)	5-38	Moderate stress
Male	52 (12.3%)	19.3 (5.090)	6-38	Moderate stress
Female	370 (87.7%)	20.6 (5.712)	5-38	Moderate stress

Notes: PSS: Perceived Stress Scale, SD: Standard Deviation

Table 3. Dental Environment Stress Factors

Variable	Mean	SD
Self-efficacy	2.53	0.763
Lack of confidence to be a successful dental student	2.60	0.891
Lack of confidence to be a successful dentist	2.71	0.918
Insecure feeling towards the future	2.91	0.906
Consider changing to another major	1.76	0.950
Lecturers	2.03	0.714
Faculty environment	2.11	0.940
Number of dishonest faculty in dentistry	2.27	1.027
Rules and regulations for faculty of dentistry	2.12	0.950
Respondent expectation towards faculty of dentistry vs. reality	2.28	0.913
Lack of input in decision making by faculty of dentistry	2.140	0.950
Gestures of faculty of dentistry towards female students	1.531	0.860
Race discrimination, class status and ethnic group	1.581	0.875
Inconsistency of feedback on respondent work by different lecturers	2.100	0.965
Workload	2.69	0.834
Number of assignments	2.50	0.926
Less time for relaxation	2.97	0.925
Less time to carry out assignments	2.58	0.950
Clinical training	2.85	0.857
Difficulty in studying clinical procedure	2.94	0.981
Difficulty in learning the skills needed in pre-clinic and lab work (skills lab)	2.74	0.911
Academic performance pressure	2.86	0.720
Difficulties in assignments	2.52	0.926
Competition among academic peers	2.46	1.019
Examinations and grades	3.17	0.849
Fear of failing a module	5.31	0.823
Requirements for graduation (Bachelor’s degree)	2.88	0.958
Fear of not being able to catch up if sitting at the back of the class	2.47	0.997
Criticism of the work	3.03	0.720
Personal/Others	1.91	0.760
Financial issue	2.53	1.068
Forced postponement of marriage/engagement	1.43	0.842
Personal physical health	1.96	0.944
Away from home/homesick	1.78	0.983
Problems with family/spouse regarding the choice to become a dentist	1.45	0.856

Note: SD: Standard Deviation

Table 4. The Stress-Causing Factor with the Highest Means in Dentistry

DES Factor	Category	Mean	SD
Fear of failing a module	Academic performance pressure	3.31	0.825
Examinations and grades	Academic performance pressure	3.17	0.850
Fear of not being able to catch up if sitting at the back of the class	Academic performance pressure	3.03	0.936
Less time for relaxation	Workload	2.97	0.925
Difficulty in studying clinical procedure	Clinical training	2.94	0.981

Notes: DES: Dental Environment Stress, SD = Standard Deviation

Table 5. Correlation between Scores of Dental Environment Stress Categories and Perceived Stress Scale

DES Category	ρ*	p-value
Self-efficacy	0.426	<0.001
Lecturers	0.424	<0.001
Workload	0.299	<0.001
Clinical training	0.358	<0.001
Academic performance pressure	0.429	<0.001
Personal/others	0.361	<0.001

Notes: DES: Dental Environment Stress, * Spearman’s correlation coefficient rho

pact the mental health of educational staff members and dental students due to increased stress and anxiety.^{3,25} The educational process of a profession can be an experience with full psychological stress and pressure, which is a psychological response to various demands in mental, emotional, or physical forms. Stress is a normal response and acts as a protective-adaptive process in the life of an individual, but stress is also capable of causing an individual to experience certain conditions such as anxiety, depression and exhaustion, which have a negative impact on the quality of life.^{26,27}

The impact of stress on each individual varies. Sometimes it serves as a source of motivation for students to gain achievement. However, with stressful stimulations and excessive stress, it is possible for them to experience negative impacts in terms of academic performance. This is due to differences in each individual in terms of stress tolerance and motivation.²⁸ The consequences of high and intolerable stress levels do not always have a direct impact on student academic performance, but it might have psychological impacts. Therefore, such student feels incapable of continuing his or her education and decides to quit being a dentistry major.²⁹ It has been observed that this is one of the reasons for the decline in the number of dentistry graduates. The low number of dentistry graduates leads to a reduction in number of dentists in an area, resulting in an imbalanced dentists-to-patients ratio.³⁰ This imbalanced ratio shows that the population in the area will not receive ideal den-

Table 6. Strongest Positive Correlations between Scores of Dental Environment Stress Items and Perceived Stress Scale

DES Item	ρ*	p-value
Respondent expectation towards faculty of dentistry vs. reality	0.431	<0.001
Lack of confidence to be a successful dentist	0.424	<0.001
Lack of confidence to be a successful dental student	0.408	<0.001
Rules and regulations for faculty of dentistry	0.401	<0.001
Criticism of the work	0.400	<0.001

Notes: DES: Dental Environment Stress, * Spearman’s correlation coefficient rho

tal treatments.³¹

Studies in the past three decades showed that dental students experience high-stress levels.¹⁴ However, this study indicated that the stress level of dental students at the Faculty of Dentistry Trisakti University was categorized into moderate stress level (20.5±5.64). Furthermore, the mean score comparison between genders indicated that female students have higher perceived stress levels compared to males. This result was in accordance with the studies carried out in Canada, Saudi Arabia and Russia, which stated that female students have higher perceived stress levels compared to males.^{32,33} The collected data ranged from 6, which was in the ‘low-stress level’ category or ‘low stress,’ to 38, which was in the ‘high-stress level’ category or ‘high perceived stress’.

The stress-causing factor in dental education needs to be identified in order for the objectives of this study to be fulfilled. Therefore, an analysis was performed on six categories of stress-causing factors. The stressor category with the highest mean score was ‘academic performance pressure’ (2.86±0.720). This implies that the academic performance pressure put on students, has a had a high potential of increasing students’ stress levels due to expectations and goals that are self-imposed, family or society and also, the general thought that academic performance plays a crucial role in shaping one’s career. Dental students were faced with the demanding nature of the dental curriculum in order to reach the goal. Therefore, this was one of the many factors contributing to the higher level of stress among them compared to other health-related students.^{13,34}

The second dental environmental stressor category with the second highest mean score was the ‘clinical training’ (2.85±0.857), followed by the ‘workload’ category (2.69±0.834). The lowest mean score came from the ‘personal/others’ category (1.91±0.760). Although, studies on dental students from various countries showed different causes of stress, majority discovered that the top stress-causing factors originated from the categories of ‘academic performance pressure’, ‘clinical training’

and 'workload'. Furthermore, the results of this study were consistent with previously published studies.^{35,36}

In addition correlations between dental environments and stress levels in this study showed positive correlations between all DES factors and perceived stress (p-value <0.01). However, a study in Saudi Arabia showed different results, as there were positive correlations between only five DES factors (clinical training, workload, self-efficacy, lecturers and education personnel and academic performance pressure) and perceived stress.¹⁴

Conclusion

The stress level of dental students at the Faculty of Dentistry Trisakti University was categorized into moderate stress level. This study showed there is a significant correlation between the dental environment and perceived stress levels among dental students at the Faculty of Dentistry Trisakti University during the COVID-19 pandemic. However, future studies are needed to investigate proper stress management for students. Moreover, the stress-causing factor in dental education needs to be analysed further. This is because, proper stress management techniques are capable of motivating students to measure and overcome stress in order to increase their academic and clinical performance.

Abbreviations

DES: Dental Environment Stress; PSS: Perceived Stress Scale; COVID-19: Coronavirus Disease 2019; SARS-CoV-2: Severe Acute Respiratory Syndrome Coronavirus 2; WHO: World Health Organization.

Ethics Approval and Consent to Participate

This study has been ethically reviewed and approved by the Ethics Commission of Faculty of Dentistry Trisakti University with approval number 267/S1/KEPK/FKG/2/2020.

Competing Interest

The author declares that there are no significant competing financial, professional, or personal interests that might have affected the performance or presentation of the work described in this manuscript.

Availability of Data and Materials

All data that support the results of this study are with the corresponding author [TEA] and will be made available upon reasonable request.

Authors' Contribution

TEA and HJ conceptualized and designed this study. HJ carried out data collection, while WS carried out data analysis and interpretation. Furthermore, TEA, ASW, and HJ analyzed the data and edited the manuscript. All authors discussed the study and contributed to the manuscript preparation and review.

Acknowledgment

The authors express their gratitude to the Faculty of Dentistry, Trisakti

University for their support for this study.

References

1. Ministry of Health of the Republic of Indonesia. Indonesia health data profile 2018. Jakarta; 2019.
2. Halboub E, Nasser Alhaji M, Mohammed AlKhairat A, Madani Sahaqi A-A, Faeq Ali Quadri M. Perceived stress among undergraduate dental students in relation to gender, clinical training and academic performance. *Acta stomatologica Croatica*. 2018; 52 (1): 37–45.
3. Machado RA, Bonan PRF, Perez, DESC, Martelli Júnior, Hercílio. COVID-19 pandemic and the impact on dental education: discussing current and future perspectives. *Brazilian Oral Research*. 2020; 34: e083.
4. Qiu W, Rutherford S, Mao A, Chu C. The pandemic and its impacts. *Health, Culture and Society*. 2017; 9: 5.
5. Lai CC, Shih TP, Ko WC, Tang HJ, Hsueh PR. Severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) and coronavirus disease-2019 (COVID-19): the epidemic and the challenges. *International Journal of Antimicrobial Agents*. 2020; 55 (3): 105924.
6. Abebe EC, Dejenie TA, Shiferaw MY, Malik T. The newly emerged COVID-19 disease: a systemic review. *Virology Journal*. 2020; 17 (96): 1-8.
7. Alwan NA, Burgess RA, Ashworth S, Beale R, Bhadelia N, Bogaert D, et al. Scientific consensus on the COVID-19 pandemic: we need to act now. *Lancet*. 2020.
8. World Health Organization. Coronavirus disease (COVID-19) advice for the public. Geneva: World Health Organization; 2020 [updated 2020 Oct 13].
9. Wyse AE, Stickney EM, Butz D, Beckler A, Close CN. The potential impact of COVID-19 on student learning and how schools can respond. *Educational Measurement: Issues and Practice*. 2020; 39 (3): 1-5.
10. Deery C. The COVID-19 pandemic: implications for dental education. *Evidence-Based Dentistry*. 2020; 21: 46–7.
11. Gautam R, Sharma M. 2019-nCoV pandemic: a disruptive and stressful atmosphere for Indian academic fraternity. *Brain, Behavior, and Immunity*. 2020; 88: 948-9.
12. Aamir IS. Stress level comparison of medical and nonmedical students: a cross sectional study done at various professional colleges in Karachi, Pakistan. *Acta Psychopathologica*. 2017; 3 (2): 1–6.
13. Murphy RJ, Gray SA, Sterling G, Reeves K, DuCette J. A comparative study of professional student stress. *Journal of Dental Education*. 2009; 73 (3): 328–37.
14. Al-Sowayh ZH. Academic distress, perceived stress and coping strategies among dental students in Saudi Arabia. *Saudi Dental Journal*. 2013; 25 (3): 97–105.
15. Elani HW, Allison PJ, Kumar RA, Mancini L, Lambrou A, Bedos C. A systematic review of stress in dental students. *Journal of Dental Education*. 2014; 78 (2): 226–42.
16. Crego A, Carrillo-Diaz M, Armfield J, Romero M. Stress and academic performance in dental students: the role of coping strategies and examination-related self-efficacy. *Journal of Dental Education*. 2016; 80 (2): 165-72.
17. Alzahem A, van der Molen H, Alaujjan A, Schmidt H, Zamakhshary M. Stress amongst dental students: a systematic review. *European Journal*

- of Dental Education. 2011; 15 (1): 8-18.
18. Bergmann C, Muth T, Loerbroeks A. Medical students' perceptions of stress due to academic studies and its interrelationships with other domains of life: a qualitative study. *Medical Education Online*. 2019; 24 (1): 1603526.
 19. Alhaji MN, Khader Y, Murad AH, Celebic A, Halboub E, Márquez JR, et al. Perceived sources of stress amongst dental students: a multicountry study. *European Journal of Dental Education*. 2018; 4 (258): 271.
 20. Alzahem A, van der Molen, Alaujan, de Boer. Stress management in dental students: a systematic review. *Advances in Medical Education and Practice* 2014; 167.
 21. Alzahem A, Van der Molen H, De Boer B. Effectiveness of a dental students stress management program. *Health Professions Education*. 2015; 1 (1): 34-42.
 22. Das.nh.gov. Perceived stress scale; 2020 [Accessed 21 February 2021].
 23. Ersan N, Fisekcioglu E, Dolekoglu S, Oktay I, Ilguy D. Perceived sources and levels of stress, general self-efficacy and coping strategies in clinical dental students. *Psychology, Health & Medicine*. 2017; 22 (10): 1175-85.
 24. DeVellis RF. Scale development: theory and applications. Los Angeles: Sage; 2012.
 25. AlAteeq DA, Aljhani S. Perceived stress among students in virtual classrooms during the COVID-19 outbreak in KSA. *Journal of Taibah University Medical Sciences*. 2020; 15 (5): 398-403.
 26. Basudan S, Binanzan N, Alhassan A. Depression, anxiety and stress in dental students. *International Journal of Medical Education*. 2017; 8: 179-86.
 27. McEwen B, Bowles N, Gray J, Hill M, Hunter R, Karatsoreos I, et al. Mechanisms of stress in the brain. *Nature Neuroscience*. 2015; 18 (10): 1353-63.
 28. Tan SY, Yip A. Hans Selye (1907-1982): founder of the stress theory. *Singapore Medical Journal*. 2018; 59 (4): 170-1.
 29. Bhayat A, Madiba T. The self-perceived sources of stress among dental students at a South African dental school and their methods of coping. *Journal of the Dental Association of South Africa*. 2017; 71 (1): 1-5.
 30. Mahendradhata Y, Trisnantoro L, Listyadewi S, Soewondo P, Marthias T, Harimurti P, et al. The Republic of Indonesia health system review. New Delhi: World Health Organization (on behalf of the Asia Pacific Observatory on Health Systems and Policies). 2017; 7 (1): 1-328.
 31. Yadav S, Rawal G. The current status of dental graduates in India. *Pan African Medical Journal*. 2016; 23: 22.
 32. Abu-Ghazaleh SB, Sonbol HN, Rajab LD. A longitudinal study of psychological stress among undergraduate dental students at the University of Jordan. *BMC Medical Education*. 2016; 16: 90.
 33. Myrvold B. Stress among dental students. *International Journal of Science and Research*. 2018; 7 (7): 891-3.
 34. Moridi G, Khaledi S, Valiee S. Clinical training stress-inducing factors from the students' viewpoint: a questionnaire-based study. *Nurse Education in Practice*. 2014;14 (2): 160-3.
 35. Sangiorgio JPM, Araujo PM, Navarro CH, Zen IR, da Costa SC, Ribeiro PHV, et al. Dental environment stress: findings among lusophone dental students. *Pesquisa Brasileira em Odontopediatria e Clínica Integrada*. 2016.
 36. Gordon NA, Rayner CA, Wilson VJ, Crombie K, Shaikh AB, Yasin-Harnekar S. Perceived stressors of oral hygiene students in the dental environment. *African Journal of Health Professions Education*. 2016; 8 (1).

Characteristics of Cognitive Status in Sub-Population of Sub-Acute Stage of Ischemic Stroke Patients in West Nusa Tenggara, Indonesia

Herpan Syafii Harahap^{1,2*}, Muhammad Akbar³, Jumraini Tammase³, Andi Kurnia Bintang³, Andi Alfian Zainuddin⁴

¹Doctoral Program, Faculty of Medicine Universitas Hasanuddin, Makassar, Indonesia, ²Department of Neurology, Faculty of Medicine, Universitas Mataram, Mataram, Indonesia, ³Department of Neurology, Faculty of Medicine, Universitas Hasanuddin, Makassar, Indonesia, ⁴Department of Public Health, Faculty of Medicine, Universitas Hasanuddin, Makassar, Indonesia

Abstract

Cognitive decline is a significant complication that affects most stroke survivors. Early detection of cognitive decline in ischemic stroke patients and identification of risk factors improves their clinical outcomes. This study aimed to determine the characteristics of cognitive status in the sub-acute phase of ischemic stroke. A cross-sectional study was conducted on 89 sub-acute ischemic stroke patients in three hospitals in West Nusa Tenggara recruited consecutively from August 2019 to April 2020. The data collected were demographic and clinical characteristics, cognitive status, and functional outcome. The association between clinical and demographic characteristics and cognitive decline was analyzed using logistic regression. In addition, the relationship between cognitive status and functional outcomes of these patients was examined using the chi-square test. This study revealed that the prevalence of cognitive decline in these subjects was 71.9%. Multiple logistic regression showed that age was the only characteristic associated with cognitive decline in the subjects (OR = 5.12, 95% CI = 1.08-24.28). Furthermore, the frequency of cognitive decline in these subjects was significantly associated with functional outcomes (p-value = 0.014). Thus, there was a high prevalence of cognitive decline in sub-acute ischemic stroke patients associated with increasing age and poor functional outcomes.

Keywords: brain ischemia, cognitive dysfunction, neuropsychological tests, stroke

Introduction

Cognitive decline is considered an essential complication of ischemic stroke, increasing to 80% in a few weeks post-stroke.¹ It may involve one or more cognitive domains ranging from mild to that which interferes with functional capacities, regardless of their neurological deficits.² Approximately 59% of mild ischemic stroke patients of productive age and higher education level remain unable to return to work after six months of follow-up due to stroke-related cognitive decline.³ On long-term evaluation, about 30% of ischemic stroke patients with cognitive decline tend to be stable in the first four years or even progress to dementia if not appropriately treated.⁴ These patients will eventually increase the health, social, and economic burden on their careers, families, and the healthcare system.⁵ Meanwhile, early intervention of cognitive decline after ischemic stroke may delay its progression to dementia and provide better clinical outcomes.⁶ Therefore, early evaluation of cognitive function in ischemic stroke patients, especially in the sub-acute phase, is important.

Typically, older age, lower educational level, hypertension, diabetes mellitus, atrial fibrillation, brain region affected, and size and location of infarction are the clinical and demographic characteristics known as risk factors for cognitive decline after ischemic stroke.⁷ Older age is the most important independent risk factor for the cognitive decline from all causes, including stroke.⁶ Among the well-identified vascular risk factors, hypertension and diabetes mellitus are the most critical risk factors for cognitive decline in the general population.⁸ Therefore, in most cases, it is difficult to ascertain whether the cognitive decline observed in patients after ischemic stroke is solely due to an ischemic stroke event. However, cognitive decline after ischemic stroke is predominantly due to interactions between the ischemic stroke event and risk factors for cognitive decline after ischemic stroke.¹ Therefore, the intervention of the risk factors for ischemic stroke must also be considered to manage cognitive decline after ischemic stroke.

Regarding the evaluation of cognitive function among ischemic stroke patients, previous studies had employed

Correspondence*: Herpan Syafii Harahap, Department of Neurology Faculty of Medicine Universitas Mataram, Pendidikan Street No.57 Mataram 83125, Indonesia, E-mail: herpanharahap@unram.ac.id, Phone: +62-817 577 0062

Received : October 6, 2020
Accepted : April 29, 2021
Published : August 24 2021

diverse research methods, determining the appropriate time frame and selection of instruments for the assessment of cognitive function.² Previous studies also showed diversity in the ethnicity of the subjects, which could increase the variability of the demographic characteristics of the patients and modified their susceptibility to cognitive decline after ischemic stroke.⁹ However, similar studies that have evaluated the cognitive functions among these patients remained scarce, including those in Indonesia.

Determining the appropriate time for evaluating cognitive function among ischemic stroke patients to provide relevant results to be used as a basis for early intervention in cognitive decline in these subjects is also important. Several studies have evaluated the acute and sub-acute outcomes beyond three months after the onset of ischemic stroke, with or without the follow-up of the progression of cognitive decline.^{10,11} The primary data collection on cognitive status and cognitive decline early detection in post-ischemic stroke patients is mandatory. It is based on cognitive decline after the ischemic stroke that can improve due to activities of neural plasticity in the brain that generally occur optimally in the first three months.¹² In the acute stage of ischemic stroke, patients can experience delirium due to ischemic stroke-associated cerebral edema and the involvement of the right hemisphere, affecting patients' performance in the evaluation of cognitive function.^{13,14} Since cerebral edema generally undergoes resolution within the first weeks, the assessment of cognitive disorders should be performed in the sub-acute stage.¹⁵

This study aimed to investigate the cognitive status of the sub-acute stage in patients with ischemic stroke. This is the first study conducted in a sub-population of ischemic stroke patients in the sub-acute stage of rural areas in West Nusa Tenggara to represent the rural regions in Indonesia. The results of this study are essential for local health authorities to assess the importance of early detection and management of cognitive decline in the sub-acute stage of ischemic stroke.

Method

This study employed a cross-sectional design that involved ischemic stroke patients in the sub-acute stage consecutively recruited in Nusa Tenggara Barat General Hospital, Mataram General Hospital, and Siti Hajar Hospital. This study was conducted between August 2019 and April 2020. The sample size was calculated using the sample calculation formula $(Z\alpha 2PQ)/d^2$. Since $\alpha = 0.05$, $Z\alpha = 1.96$, P (prevalence) = 70%, $Q = 1-P$, and d (margin of error) = 10%, the sample size was 81. Eight samples (10% of the calculated sample size) were added; thus, the final sample size of the study was 89.

The inclusion criteria for the subjects were ischemic

stroke confirmed by head computed tomography (CT) in the sub-acute stage (2–12 weeks after stroke onset). The subjects were fully conscious, aged 40–70 years, with at least a primary school graduation (6-year-education). The age of the subjects was determined to be between 40–70 years to minimize the confounding effect of the possibility of cognitive decline related to neurodegenerative processes in patients above 70 years of age.¹⁶ This study employed a cognitive evaluation instrument that required patient awareness of the concept of time and aspects of knowledge. This concept was only obtained when the patient reached the fourth grade and was established at the sixth grade of elementary school education level. For this reason, the subjects were selected to have a minimum education level of primary school graduates.

Meanwhile, the exclusion criteria for the subjects were patients with significant vision and hearing disorders that could not be corrected, prior history of dementia, psychiatric disorders, benzodiazepines, antipsychotics, and antidepressant medication at the time of cognitive evaluation. This study was approved by the Health Research Ethics Commission of Universitas Mataram (Register number: 214/UN18.F7/ETIK/2019). All subjects provided written informed consent before participation.

Demographic and clinical variables collected in this study were age, gender, level of education, side of the lesion in the brain based on head CT scan, infarction size, hypertension, diabetes mellitus, cigarette smoking, atrial fibrillation, cognitive status, and functional outcomes. Before data analysis, categorization of both demographic and clinical characteristics was performed. In terms of the demographic characteristics of the subjects, age was categorized as young adults (40–59 years) and older (60–70 years); gender was categorized as male or female, and level of education was categorized as elementary school, high school, and college.

Based on the head CT scan examination results, the side of the lesion in the brain was classified as the right hemisphere, left hemisphere, and bilateral. In contrast, infarction size was categorized into small (≤ 5 mm in diameter), medium (6–14 mm in diameter), and large (≥ 15 mm in diameter), which was a modification of the categories used in previous studies.^{17,18} Subjects were categorized as having hypertension if they had a systolic blood pressure of ≥ 140 mmHg, and/or diastolic blood pressure ≥ 90 mmHg, and/or any use of antihypertensive medication, and/or self-reported history of hypertension. They were categorized as having diabetes mellitus if they had fasting blood glucose levels of ≥ 126 mg/dL (7.0 mmol/L), and/or any use of anti-diabetic medication, and/or self-reported history of diabetes mellitus as described in previous studies.^{19,20} In terms of cigarette smoking, subjects were categorized as smokers and non-

smokers. Twelve-lead electrocardiogram (ECG) examinations were performed on all subjects, and an independent cardiologist reviewed the results to identify the presence of atrial fibrillation.

Cognitive status was determined based on the grade of the Montreal Cognitive Assessment in the Indonesian version (MoCA-Ina) score. The MoCA-Ina is an instrument for evaluating global cognitive functions that have been validated for Indonesian populations.²¹ Its total score ranges from 0–30. Subjects with a score of 26–30 were categorized as normal, while those with 0–25 were indicated to have a cognitive decline. Subjects with an education time of ≤12 years were given an additional score of 1 as a correction factor for the effects of education.

The functional outcome of patients was established based on the Barthel index (BI) score. The Barthel index is a valuable instrument for assessing the functional outcome of subjects with ischemic stroke regarding their independence in carrying out basic daily activities.²² This instrument has a score in the range of 0–100. Subjects with a score of 80–100 were categorized as functionally independent, while those with 0–79 were classified as functionally dependent as described in the previous study.²³

The first analysis was carried out to verify the association between demographic and clinical variables and cognitive status in the sub-acute stage of ischemic stroke.

In this step, the association between categorical independent variables, including age, gender, level of education, side of the lesion in the brain, infarction size, hypertension, diabetes mellitus, cigarette smoking, atrial fibrillation, and cognitive status of the subjects were initially analyzed using simple binary logistic regression and crude odds ratio (OR) with 95% confidence interval (CI). In the second analysis, the independent variables (p-value <0.25 in simple binary logistic regression analysis) were then grouped into multiple logistic regression models and had the OR adjusted with 95% CI. The third analysis was administered using the chi-square test to ascertain the relationship between these subjects' cognitive status and functional outcomes. Statistical significance was set at p-value <0.05.

Results

Table 1 shows the results of simple binary logistic regression analysis examining the association between demographic and clinical variables and cognitive decline among subjects with ischemic stroke in the sub-acute stage (n = 89). This analysis revealed that age group and infarction size were the eligible variables for the final model of multiple logistic regression (p-value <0.25). Although only age had a significant association (OR = 4.86, 95%CI = 1.04–22.68), medium (OR = 3.17, 95% CI = 0.69–14.46) and large infarct size (OR = 3.06, 95% CI = 0.78–11.10) also appeared to modulate an increased

Table 1. Simple Binary Logistic Regression Analysis Showing Variables Associated with Cognitive Decline in the Sub-Acute Stage of Ischemic Stroke

Variable	Category	Cognitive Status				Crude OR (95% CI)	p-value
		Normal (n = 25)		Decline (n = 64)			
		n	%	n	%		
Age group	Older	2	9.5	19	90.5	4.86 (1.0–22.68)	0.040*
	Young adult	23	33.8	45	66.2	Reference	
Gender	Male	20	31.2	44	68.8	1.82 (0.60–5.54)	0.293
	Female	5	20.0	20	80.0	Reference	
Level of education	College	8	27.6	21	72.4	1.31 (0.4–3.76)	0.612
	High school	13	33.3	26	66.7	0.62 (0.1–2.41)	
	Elementary school	4	19.0	17	81.0	Reference	
Side of the lesion	Right hemisphere	10	27.8	26	72.2	1.04 (0.29–3.69)	0.952
	Left hemisphere	10	28.6	25	71.4	1.00 (0.28–3.54)	
	Bilateral	5	27.8	13	72.2	Reference	
Infarction size	Large (≥15 mm)	3	13.6	19	86.4	3.17 (0.69–14.46)	0.137*
	Medium (6-14 mm)	7	33.3	14	66.7	3.06 (0.78–11.10)	
	Small (≤5 mm)	15	32.6	31	67.4	Reference	
Hypertension	Yes	21	26.2	59	73.8	0.44 (0.11–1.82)	0.259
	No	4	44.4	5	55.6	Reference	
Diabetes mellitus	Yes	9	26.5	25	73.6	0.88 (0.34–2.29)	0.789
	No	16	29.1	39	70.9	Reference	
Cigarette smoking	Smokers	12	34.3	23	65.7	1.64 (0.64–4.20)	0.297
	Non-smokers	13	24.1	41	75.9	Reference	
Atrial fibrillation	Yes	0	0.0	7	100.0	0.00 (0.00–0.00)	0.999
	No	25	30.5	57	69.5	Reference	

Notes: *eligible for multiple logistic regression analysis, OR: Odds Ratio, CI: Confidence Interval

Table 2. The Final Model of Multiple Logistic Regression Showing Eligible Variables Associated with Cognitive Decline in the Sub-Acute Stage of Ischemic Stroke

Variable	Category	Cognitive Status				Crude OR (95% CI)	p-value
		Normal (n = 25)		Decline (n = 64)			
		n	%	n	%		
Age group	Older	2	9.5	19	90.5	5.12 (1.08–24.28)	0.040*
	Young adult	23	33.8	45	66.2	Reference	
Infarction size	Large (≥15 mm)	3	13.6	19	86.4	3.38 (0.72–15.95)	0.124
	Medium (6-14 mm)	7	33.3	14	66.7	3.27 (0.81–13.12)	
	Small (≤5 mm)	15	32.6	31	67.4	Reference	

Notes: *significant association, OR: Odds Ratio, CI: Confidence Interval

Table 3. The Association between Cognitive Status and Functional Outcomes of the Subjects with Sub-Acute Stage of Ischemic Stroke

Functional Outcome	Cognitive Status				p-value
	Normal (n = 25)		Decline (n = 64)		
	n	%	n	%	
Functionally independent	25	32.5	52	67.5	0.014*
Functionally dependent	0	0.0	12	100.0	

Notes: *significant difference (p-value <0.05), chi-squared test

risk of ischemic stroke-associated cognitive decline.

Table 2 shows the results of the final model of multiple logistic regression analysis in examining the association between eligible variables and cognitive decline among subjects with ischemic stroke in the sub-acute stage (n = 89). This final model of multiple logistic regression revealed that age was the only variable associated with cognitive decline in the subjects (OR = 5.12, 95% CI = 1.08-24.28). Consistent with the simple logistic regression analysis results presented previously, older subjects had a greater risk of ischemic stroke-associated cognitive decline.

Table 3 shows the chi-square test results in investigating the association between cognitive status and functional outcomes of ischemic stroke patients in the sub-acute stage. The chi-square test revealed that cognitive status was associated with the clinical outcomes of the subjects (p-value = 0.014). Subjects with ischemic stroke-associated cognitive decline had higher functional dependence than those with normal cognitive status.

Discussion

This initial study aimed to investigate the characteristics of cognitive status in the sub-acute stage of ischemic stroke in West Nusa Tenggara, representing rural areas in Indonesia. This study showed a high prevalence of cognitive decline in the sub-acute stage of ischemic stroke, amounting to 71.9%. This result was in line with the

findings of previous studies.^{24,25} Therefore, this result added to previous data on the prevalence of ischemic stroke-associated cognitive impairment. Since the majority of ischemic stroke continues to increase with higher survival rates in its patients, including in Indonesia, the results of this study suggested that ischemic stroke-associated cognitive decline has the potential to become a significant health problem in the future. The relatively consistent data on the prevalence of ischemic stroke-associated cognitive decline between this study and previous studies also suggested that ischemic stroke-associated cognitive decline will also become a global health problem, both in urban and rural areas. Suppose an adequate management strategy is not developed earlier. In that case, this health problem has the potential to cause a decrease in their productivity and an increase in the economic burden of their families and the existing healthcare system.

This study also showed that increasing age was the only variable significantly associated with cognitive decline in the sub-acute stage of ischemic stroke in West Nusa Tenggara. The results of this study were in accordance with previous studies, which showed that increasing age was the most substantial risk factor for post-stroke cognitive decline, including in ischemic stroke.^{6,26} Since patients over 70 years old were excluded from this study, the role of neurodegenerative processes predominantly involving brain amyloid-beta (Aβ) deposition in

the presence of a cognitive decline in patients with sub-acute ischemic stroke is unlikely. The negative impact of increasing age on cognitive flexibility needs to be considered to play an important role in the pathophysiology of cognitive decline after stroke. Povroznik, *et al.*,²⁷ showed that increasing age exacerbates stroke-related cognitive flexibility deficits, leading to cognitive decline in stroke patients. Since the success of cognitive impairment interventions is primarily determined by the patients' ability to understand the instructions given during the intervention program, the management of ischemic stroke-associated cognitive decline associated with ischemic stroke in elderly patients will be a challenge for existing health-care providers in the province of West Nusa Tenggara. Therefore, these results can be considered as a basis for the development of intervention strategies for ischemic stroke-associated cognitive decline by health authorities in this province.

However, other variables, including gender, level of education, lesion side in the brain, infarction size, hypertension, diabetes mellitus, cigarette smoking, and atrial fibrillation, were not related to cognitive decline in the patients. In general, the level of education of the population living in rural areas is lower than that of those living in urban areas, which will cause a higher prevalence of cognitive decline after ischemic stroke in rural areas compared to those in urban areas.¹⁰ Nonetheless, previous studies investigating the risk factors for cognitive decline in ischemic stroke, including increasing age, level of education, ethnicity, geography, hypertension, diabetes mellitus, brain region affected, cardioembolic type of ischemic stroke, and the size and location of infarction had shown varied results. Zulkifly, *et al.*,⁷ showed that the level of education, hypertension, diabetes mellitus, brain region affected, and the size and location of infarction were variables related to cognitive decline after stroke. In contrast, Levine, *et al.*,²⁸ showed that age and cardioembolic stroke were the main risk factors for cognitive decline. These varying results were determined primarily by the study population, methods, and cognitive evaluation tools used. Nevertheless, intervention on modifiable vascular risk factors remains an essential part of the management strategy for cognitive decline after ischemic stroke.

This study also indicated that the cognitive status of the sub-acute stage of ischemic stroke was associated with their functional outcome measured using the Barthel Index (BI) score. The frequency of the sub-acute stage of ischemic stroke patients who were functionally dependent in performing basic activities of daily living was higher than in those with normal cognitive function. This result was also in accordance with previous studies conducted by Abzhandadze, *et al.*,²⁹ and Li, *et al.*²² Early rehabilitation therapy is the most important factor that de-

termines the significance of cognitive status and functional outcomes in ischemic stroke patients. Since brain plasticity is optimally improved within the first three months, early rehabilitation therapy should be initiated during this period. Therefore, this result can also be used to develop rehabilitation strategies for stroke-related cognitive decline by local health authorities.

This study had some limitations. The first was dealing with the lack of facilities used to establish a diagnosis of cognitive decline in the sub-acute stage of ischemic stroke. Since the CT scan was the only diagnostic facility available in this study, the clinical characterization of ischemic stroke was difficult to achieve. This hinders the presentation of data on the analysis of the relationship between clinical characteristics and cognitive decline in ischemic stroke patients in more detail. The second was the absence of baseline data on cognitive status prior to stroke events from the subjects in this study. It was difficult to determine whether this cognitive decline was from a pre-existing condition or as a result of an ischemic stroke event.

Nevertheless, the results of this study can be used as a basis for developing detection and intervention strategies by local health authorities in West Nusa Tenggara and other parts of Indonesia having similar characteristics. It was based on data for the prevalence of cognitive decline associated with sub-acute ischemic stroke, and its risk factors were still very limited, especially among Indonesian populations living in rural regions. A longitudinal study aimed at investigating the benefits of early intervention in the sub-acute stage of ischemic stroke patients on cognitive improvement and functional outcomes is needed.

Conclusion

The present study revealed a high prevalence of cognitive decline in the sub-acute stage of ischemic stroke. Age was the only variable significantly associated with cognitive decline. The sub-acute stage of ischemic stroke in patients with increasing age has a higher risk of cognitive decline. The high prevalence of cognitive decline in these subjects was associated with poor functional outcomes. These results add to previous data regarding the characteristics of stroke-associated cognitive decline in Indonesia and other developing countries. More importantly, these results can be used as a basis for developing strategies for early detection, intervention, and rehabilitation of stroke-related cognitive decline in West Nusa Tenggara and other regions in Indonesia with similar characteristics.

Abbreviations

CT: Computed Tomography; ECG: Electrocardiogram; MoCA-Ina: Montreal Cognitive Assessment in Indonesian version; BI: Barthel

Index; A β : Amyloid-Beta.

Ethics Approval and Consent to Participate

This study was approved by the Health Research Ethics Commission of Universitas Mataram, Mataram (Register number: 214/UN18.F7/ETIK/2019). All subjects provided were informed under written consent prior to their participation.

Competing Interest

The author declares that there is no significant competing financial, professional, or personal interest that might have affected the performance or presentation of the work described in this manuscript.

Availability of Data and Materials

Data and Materials of the present study are available from the corresponding author for reasonable request and non-commercial purposes.

Authors' Contribution

HSH, MA, JT, AKB, and AAZ conceptualized and designed the study, analyzed and interpreted the study results. HSH drafted the manuscript. HSH, MA, JT, AKB, and AAZ revised the manuscript.

Acknowledgment

The authors would like to acknowledge the hospital staff of Nusa Tenggara Barat General Hospital, Mataram General Hospital, and Siti Hajar Hospital that supported this study.

References

1. Sun J-H, Tan L, Yu J-T. Post-stroke cognitive impairment: epidemiology, mechanisms and management. *Annals of Translational Medicine*. 2014; 2 (8): 80.
2. Melkas S, Jokinen H, Hietanen M, Erkinjuntti T. Poststroke cognitive impairment and dementia: prevalence, diagnosis, and treatment. *Degenerative Neurological and Neuromuscular Disease*. 2014; 4: 21–7.
3. Kauranen T, Turunen K, Laari S, Mustanoja S, Baumann P, Poutiainen E. The severity of cognitive deficits predicts return to work after a first-ever ischaemic stroke. *Journal of Neurology, Neurosurgery, and Psychiatry*. 2013; 84: 316–21.
4. Makin SDJ, Turpin S, Dennis MS, Wardlaw JM. Cognitive impairment after lacunar stroke: systematic review and meta-analysis of incidence, prevalence and comparison with other stroke subtypes. *Journal of Neurology, Neurosurgery, and Psychiatry*. 2013; 84: 895–900.
5. Rohde D, Williams D, Gaynor E, Bennett K, Dolan E, Callaly E, et al. Secondary prevention and cognitive function after stroke: a study protocol for a 5-year follow-up of the ASPIRE-S cohort. *BMJ Open*. 2017; 7: e014819.
6. Kalaria RN, Akinyemi R, Ihara M. Stroke injury, cognitive impairment and vascular dementia. *Biochimica et Biophysica Acta - Molecular Basis of Disease*. 2016; 1862 (5): 915–25.
7. Zulkifly MFM, Ghazali SE, Din NC, Singh DKA, Subramaniam P. A review of risk factors for cognitive impairment in stroke survivors. *The Scientific World Journal*. 2016; 2016: 3456943.
8. Takeda S, Rakugi H, Morishita R. Roles of vascular risk factors in the pathogenesis of dementia. *Hypertension Research*. 2020; 45: 162–7.
9. Lo JW, Crawford JD, Desmond DW, Godefroy O, Jokinen H, Mahinrad S, et al. Profile of and risk factors for poststroke cognitive impairment in diverse ethnoregional groups. *Neurology*. 2019; 93: e2257–71.
10. Danovska M, Stamenov B, Alexandrova M, Peychinska D. Post-stroke cognitive impairment - phenomenology and prognostic. *Journal of International Medical Association Bulgaria*. 2012; 18: 290–7.
11. Obaid M, Flach C, Marshall I, Wolfe CDA, Douiri A. Long-term outcomes in stroke patients with cognitive impairment: a population-based study. *Geriatrics*. 2020; 5 (2): 32.
12. Lo Coco D, Lopez G, Corrao S. Cognitive impairment and stroke in elderly patients. *Vascular Health and Risk Management*. 2016; 12: 105–16.
13. Balami JS, Chen R-L, Grunwald IQ, Buchan A. Neurological complications of acute ischemic stroke. *The Lancet Neurology*. 2011; 10 (4): 357–71.
14. Dostovic Z, Dostovic E, Smajlovic D, Ibrahimagic OC, Avdic L, Becirovic E. Predictors for post-stroke delirium outcome. *Materiasocio-medica*. 2016; 28 (5): 382–6.
15. Battey TWK, Karki M, Singhal AB, Wu O, Sadaghiani S, Campbell BC V, et al. Brain edema predicts outcome after nonlacunar ischemic stroke. *Stroke*. 2014; 45: 3643–8.
16. Morley JE, Morris JC, Berg-Weger M, Borson S, Carpenter BD, del Campo N, et al. Brain health: the importance of recognizing cognitive impairment: an IAGG consensus conference. *Journal of the American Medical Directors Association*. 2015; 16 (9): 731–9.
17. Asdaghi N, Pearce LA, Nakajima M, Field TS, Bazan C, Cermenon F, et al. Clinical correlates of infarct shape and volume in lacunar strokes the SPS3 trial. *Stroke*. 2014; 45 (10): 2952–8.
18. He Y, Wei L, Li W. Comparison of application values of CT and MRI in the diagnosis of early lacunar infarction. *Pakistan Journal of Medical Sciences*. 2018; 34 (1): 190–3.
19. Lou H, Dong Z, Zhang P, Shao X, Li T, Zhao C, et al. Interaction of diabetes and smoking on stroke: a population-based cross-sectional survey in China. *BMJ Open*. 2018; 8: e017706.
20. Lu S, Bao M-Y, Miao S-M, Zhang X, Jia Q-Q, Jing S-Q, et al. prevalence of hypertension, diabetes, and dyslipidemia, and their additive effects on myocardial infarction and stroke: a cross-sectional study in Nanjing, China. *Annals of Translational Medicine*. 2019; 7 (18): 436.
21. Rambe AS, Fitri FI. Correlation between the Montreal cognitive assessment- Indonesian version (MoCA-Ina) and the Mini-mental state examination (MMSE) in elderly. *Open Access Macedonian Journal of Medical Sciences*. 2017; 5 (7): 915–9.
22. Li Q-X, Zhao X-J, Wang Y, Wang D-L, Zhang J, Liu T-J, et al. Value of the Barthel scale in prognostic prediction for patients with cerebral infarction. *BMC Cardiovascular Disorders*. 2020; 20 (1): 14.
23. Ghosal MK, Burman P, Singh V, Das S, Paul N, Ray BK, et al. Correlates of functional outcome among stroke survivors in a developing country – a prospective community-based study from India. *Journal of Stroke and Cerebrovascular Diseases*. 2014; 23 (10): 2614–21.
24. Yu K-H, Cho S-J, Oh MS, Jung S, Lee J-H, Shin J-H, et al. Cognitive impairment evaluated with vascular cognitive impairment harmoniza-

- tion standards in a multicenter prospective stroke cohort in Korea. *Stroke*. 2015; 44: 786–8.
25. Qu Y, Zhuo L, Li N, Hu Y, Chen W, Zhou Y, et al. prevalence of post-stroke cognitive impairment in China: a community-based, cross-sectional study. *PLoS One*. 2015; 10 (4): e0122864.
26. Tang EYH, Amiesimaka O, Harrison SL, Green E, Price C, Robinson L, et al. Longitudinal effect of stroke on cognition: a systematic review. *Journal of the American Heart Association*. 2018; 7 (2): e006445.
27. Povroznik JM, Ozga JE, Haar CV, Engler-Chiurazzi EB. Executive (dys) function after stroke: special considerations for behavioral pharmacology. *Behavioural Pharmacology*. 2018; 29 (7): 638–53.
28. Levine DA, Wadley VG, Langa KM, Unverzagt FW, Kabeto MU, Giordani B, et al. Risk factors for post-stroke cognitive decline: the REGARDS study. *Stroke*. 2018; 49 (4): 987–94.
29. Abzhandadze T, Rafsten L, Lundgren-Nilsson Å, Sunnerhagen KS. Feasibility of cognitive functions screened with the montreal cognitive assessment in determining ADL dependence early after stroke. *Frontiers in Neurology*. 2018; 9: 705.
27. Povroznik JM, Ozga JE, Haar CV, Engler-Chiurazzi EB. Executive

Reasons for Unwanted Pregnancy among Women of Childbearing Age (15-19 Years) in Jambi Province

Ummi Kalsum^{1*}, Renny Listiawaty², Dato Noor A M Awal³

¹Public Health Study Program, Faculty of Medicine and Health Sciences, Universitas Jambi, Jambi, Indonesia, ²Public Health Study Program, STIKes Harapan Ibu Jambi, Jambi, Indonesia, ³Centre for International Law and Siyar, Faculty of Law, Universiti Kebangsaan Malaysia, Malaysia

Abstract

The occurrence of unwanted pregnancy (UP) among women of childbearing age (WCA) has been reported to be increasing in various regions, however, this incidence has not been assessed among the adolescents of 15-19 years age group, in Jambi City. The factors influencing this occurrence includes individual, family, and environmental determinants. This study aimed to determine the prevalence of UP among WCA (15-19 years) in Jambi Province. A cross-sectional design was used, while the participants (307 women aged 15-19 years) were selected in Jambi City and West Tanjung Jabung District, using the Multistage Random Sampling. The analytical method used was the Multiple Logistic Regression of alpha 5%. The results showed that the prevalence of UP among WCA (age 15-19 years) was 1.6%, compared to 50% of those that were married. The dominant factor of UP includes the use of contraceptives with an adjusted-odds ratio of 74.5 (95% CI = 3.58-1,549.02), while the control used were the job of WCA, knowledge, dating behaviour, accesses to information media and health facilities, as well as family education. Therefore, it is suggested that creative, innovative, informative promotions, and education were needed via the social media. Besides, the optimization and strengthening of the Gen-Re go to school program should be carried out, as well as synergizing the cross-sectoral activities, government, private sector, and the community (especially parents).

Keywords: adolescents, childbearing age, unwanted pregnancy, women

Introduction

Unwanted pregnancy (UP) is defined as the conception which occurs when one or both parties in a relationship do not want a child, or desired, however, not at that particular time (mismatch), with its occurrence being faster than planned.¹ Approximately 38% of UP (75 million) cases were estimated by the World Health Organization (WHO), among the reported 208.2 million pregnancies per year.² Generally, unwanted pregnancy occurs among 16 million women of childbearing age (15-19 years), as they are known to deliver every year. In Asia, 38% of this incidence occur among 118.8 million pregnancies.³ The prevalence of this condition among 15-19 year-old-girls in developing countries in 2016, amounted to 21 million, as one-third of teenage maternal births are unwanted or un-planned (43%, 45%, and 74% in Asia, Africa, and Latin America/Caribbean, respectively).^{4,5}

Some of the factors that cause many teenagers to get pregnant out of wedlock while still in school are teenagers' curiosity, promiscuity, rampant pornographic

information, and disharmonious families. Currently, the increase in teenage pregnancies is estimated at more than 500 pregnancies each year. According to the 2017 Indonesian Health Demographic Survey (IDHS), the cause of the increase in pregnancy among adolescents is a significant decrease in the use of modern contraceptives in the young age segment (15-29 years) around 4% of the total population of Indonesia. In addition, this is also due to the low knowledge of adolescents on reproductive health and the lack of access to accurate and reliable information about contraception.⁶

According to the IDHS in 2017, approximately 45% of female adolescents in Indonesia started dating when they were not up to 15-17 years old, as this figure had increased compared to the 2012 data, which was at 33.3%. Most of them do not have adequate life skills at that age, as they are at risk of having unhealthy dating behaviours, such as engaging in pre-marital sex, which possesses the dangers of sexually transmitted diseases and unwanted pregnancy.⁶⁻⁸

Unwanted pregnancy is known as the main cause of

Correspondence*: Ummi Kalsum, Public Health Study Program, Faculty of Medicine and Health Sciences, Universitas Jambi, Letjend Soeprapto Street No. 33, Telanaipura, Jambi, Indonesia, Email: ummi2105@unja.ac.id, Phone: +62 741-60246

Received : September 29, 2019
Accepted : April 5, 2021
Published : August 24, 2021

unsafe abortion in Indonesia and the world, at approximately 48%.² However, it has negative impacts on women and fetus, which is conceived. The impact is likely to be death and morbidity in women, due to complications of pregnancy and delivery, defects and low birth weight, prematurity, with other health related problems.¹ Moreover, results of the previous study stated that women with UP do not provide exclusive breastfeeding and complete basic immunization, as pregnancy care was also not carried out according to the criteria.^{3,9}

Also, UP is caused by unhealthy behaviours and conditions at the time before or during pregnancy, such as rape, lack of knowledge about contraception, too many children, health reasons, fetal defects, young age, irresponsible spouses, and unstable relationship with partners. This is closely related to the sociodemographic conditions of the family (low income), culture, and societal beliefs. Government programs in reproductive health, such as family planning and adolescent wellness services, which are less successful, are also thought to be one of the triggers for UP. Besides being caused by the failure of family planning, unwanted pregnancy cases are likely experienced by those that have not used contraceptives in the last three months, even though they are sexually active.^{10,11}

A study in the working area of Pakem Primary Health Care in 2017,¹² discovered that low knowledge about reproductive health, permissive attitude and influence of close friends in social interactions, easy access to pornographic media, and parenting patterns in applying permissive indifference, were factors that affect the occurrence of UP in adolescents. However, the results of a study in Madiun,¹³ observed that risky sexual behaviour had a direct effect on UP, with that of the indirect being the negative influence of peers, media exposure, detrimental attitude, parental roles, knowledge, and level of religiosity.

The number of children, age, socioeconomic status, and access to health services, are also factors associated with UP.¹⁴ Also, low education, housing, living together without marriage, parity, complications of pregnancy, contraceptive use, and history of diseases, are associated with unwanted pregnancy in Indonesia.¹⁰ In adolescents, UP occurs due to not being ready to undergo pregnancy psychologically, socially, physically, or economically. Also, premarital sex carried out by adolescents tends to be directly related to the incidence of UP. According to the results of a survey conducted by the non-government organization (NGO), *Sentra Informasi dan Konsultasi Orang Kito* (SIKOK) Jambi, 8% among 1,182 adolescents at 10 high schools, were observed to often engage in sexual intercourse,¹⁵ as unwanted pregnancies were discovered to be at 14% (7% each, not at the right time and desired).¹⁰

Also, the National Basic Health Research/*Riset Kesehatan Dasar* (Riskesdas) data analysis in 2013, observed that the prevalence of unwanted pregnancy was 15% in women at 10-54 years of age.¹⁶ However, the incidence of UP at the age of 15-19 years in Jambi Province, is still unknown. There has never been a result of data analysis or surveys conducted specifically to determine the incidence of UP in Jambi Province, especially in adolescents. As a result of that, there was need for a study to be conducted, in order to determine the prevalence of UP, especially in adolescents within 15-19 years, with other related factors in Jambi Province. Therefore, this study aimed to determine the prevalence of UP in women of childbearing age (15-19 years) in Jambi Province, with related determinants.

Method

The study design in this study was cross-sectional, as samples amounted to 307 women of childbearing age (15-19 years) in Jambi and West Tanjung Jabung Districts, which were selected by Multistage Random Sampling. The first step was to select a random cluster, which was one of the selected districts or cities. Afterwards, the second step was to proportionally select villages in selected sub-districts, with the third stage being the selection of respondents by simple random sampling in each chosen location. In West Tanjung Jabung District, Merlung and Betara were randomly selected from 13 existing sub-districts, which consisted of nine villages. However, in Jambi City, South Jambi and Paalmerah were selected randomly from 11 sub-districts, which consisted of five villages. The samples successfully interviewed were 307 women of childbearing age (WCA), with 153 and 154 of them located in West Tanjung Jabung District and Jambi City, respectively. The study time for this study was six months, which occurred from June to November 2017.

The dependent variable was the incidence of unwanted pregnancy, as measured by interviews in this study. The variables measured were WCA (age, education, occupation, marital status, contraceptive use, history of illness, level of knowledge and religiosity, sexual and dating behaviours, with access to information media), family (socioeconomic, family size, the work and education of the family head, with parental supervision) and environmental (area of residence, Adolescent Reproductive Health/*Kesehatan Reproduksi Remaja* (KRR) program policies, and access to health care facilities) factors.

Moreover, the questionnaire used was developed by the authors, which referred to the theory and some questions from the IDHS data collection instrument. The questionnaire included several questions about general data (location information), sociodemographic characteristics of respondents (age, education, occupation, ad-

dress, number of household members, monthly average income, and marital status), knowledge level of women about reproductive health and family planning, with sexual behaviour (consisting of 18 question items). It also included dating attitude (consisting of four question items), religiosity level (consisting of 12 question items), use of contraceptives, history of illness, access and contact to media, parental supervision, access to facilities health services, and questions about unwanted pregnancy as the dependent variable.

An unwanted pregnancy occurred when one or both parties of the relationship do not want children at all. It is also likely to be a desired pregnancy, which was not readily needed, as it occurred earlier than planned. This was categorized as either "Yes" or "No" in the study questionnaire.

However, the independent variables consisted of Age: it was categorized as less than, more than, or equal to 17 years; Education: it was categorized as high and low, when \geq and \leq completing junior high school, respectively; Work: it is the activity carried out by a WCA, in order to earn a living or additional income for the family. This was routinely classified into work/not working; Marital status: it was classified as married or not; the Use of contraceptives: it aims to prevent or delay pregnancy, by women that are assessed as using hormonal contraceptives, namely pills, injections, and implants. This was grouped into the usage or non-usage of contraceptives; Disease history: this is the condition of disease morbidity, which had been experienced by WCA during the last six months. It was also categorized as yes/no; Knowledge: it is defined as the awareness of the respondent, about the meaning, impact, and the causes of unwanted pregnancy, which includes knowledge or understanding of risky sexual behaviours, and other factors related to preventing adverse events. This was categorized into a high and low category, when the criteria is \geq and \leq score 75% of the total score, respectively; Sexual behaviour: it is the perception of WCA towards promiscuity or premarital sexual behaviours, which involves whether or not they have ever had risky intercourse activity, which had led to an adverse event with their partner. This was further categorized as risky and non-risky; Dating behaviour: it is the perception of dating, which is carried out by WCA with their partners, including the intensity of meetings and activities, which in turn leads to unwanted pregnancy after sexual intercourse. This was categorized as risky and non-risky; Access to information media: It is the respondent's access, exposure or contact with information media, such as television, radio and print channels (newspapers, magazines, and tabloids). This was grouped as ever or never; Level of religiosity: it is the closeness and understanding of religion to religious orders, which are being adhered to, in the daily life of WCA. This was further

grouped into religious and non-religious; Socio-economy: it is the level of family ability or purchasing power, especially in fulfilling household needs, as observed from the average income per capita per month. It was categorized as poor and rich, when the income was less and more than the poverty line, respectively, according to Satic Indonesia/*Badan Pusat Statistik* (BPS),⁷; Family size: this is the number of household members, which are borne by the head of the family in one house and kitchen. This was grouped into small and large, when household members are less and more than five, respectively; Work of the family head: it is the activity of the family head, which is carried out regularly, in order to earn income used in supporting the household. This was categorized as permanent and temporary works, or not working; Education of the family head: this was classified as high and low, when \geq and \leq completing junior high school, respectively; Parental supervision: this is an effort made by parents in supervising the activities or behaviours of their children, especially in sexual or dating aspects, in order to prevent premarital sex. This was also categorized as good and bad; the Area of residence: this was categorized as rural/urban; Policy: this is defined as whether there is a statutory regulation, which contains efforts to protect the reproductive health of female prostitutes (teenagers), or binding provisions against unwanted pregnancy; KRR program: This is defined as the presence or absence of an activity, which is related to adolescent reproductive health, at the sub-district or city level; and Access to health service facilities: this is the affordability of health facilities, including the availability of different types, the ease of reaching them according to the distance or length of time from the respondent's house, and the means of transportation commonly used. This was grouped into easy and difficult accesses.

The analyzation of data carried out included several stages, such as the univariate, bivariate, and multivariate analysis, which was conducted to determine the frequency distribution and proportion of the variables in this study, on both nominal and ordinal scales. It was also used as a description of data variations at the interval or ratio scale, by looking at the mean, standard deviation, variance, and detection of outlier information. Bivariate analysis was also conducted by using the chi-square test with the alternative Fisher's Exact Method, when the number of the Expected Value was $>20\%$ of cells, or there were one or more groups with an indication of zero. In order to observe the results of significance, statistical calculations were used, with p-value <0.05 , which indicated a significant relationship. The stage was multivariate analysis, which used Binary Logistic Regression to obtain the most dominant factor on the incidence of adverse events. The independent variables included in the modeling were those that had p-value <0.25 or substan-

tially considered important, even though statistically it does not meet the requirements. This determination of p-value <0.25 was based on empirical experience from various previous studies, where identification of important variables were often unsuccessful, when being placed into the usual p-value (0.05). Furthermore, the candidate selection stage and several modeling tests were carried out, until the final robust model, confounding, and interaction test was also conducted.

Results

The results of this study indicated that the proportion of unwanted pregnancy among WCA of 15-19 years, was relatively low in Jambi Province (1.6%), as it was larger in married women (aged 15-19 years), reaching around 50%. Table 1 shows the characteristics of respondents, as the proportion of the age group was relatively equal between those that were less than 17 years old and older. More of the respondents were highly educated (completed high school), do not work, and were not married. They

Table 1. Characteristic of Respondents

Variable	Category	Total	%
Age	<17 years	140	45.6
	≥ 17 years	167	54.4
Education	High	193	62.9
	Low	114	37.1
Work	Does not work	288	93.8
	Work	19	6.2
Marital status	Not	297	96.7
	Mate	10	3.3
Morbidity	Not	241	78.5
	Yes	66	21.5
Use of contraceptive	Not	297	96.7
	Yes	10	3.3
Knowledge	High (>median)	146	47.6
	Low (\leq median)	161	52.4
Sexual behaviour	Not at risk	264	86.0
	At risk	43	14.0
Dating behaviour	Not at risk	282	91.9
	At risk	25	8.1
Religiosity	Yes	265	86.3
	Not	42	13.7
Media access	Well	129	42.0
	Not good	178	58.0
Parental supervision	Well	136	44.3
	Less	171	55.7
Residence	City	154	50.2
	Village	153	49.8
Family size	Small (≤ 5)	232	75.6
	Large (> 5)	75	24.4
Head of family's education	High	132	43.0
	Low	175	57.0
Head of family's work	Permanent	53	17.3
	Not fixed	254	82.7
Head of family's social economy	Not poor	268	87.3
	Poor	39	12.7
Access to health facilities	Easy	154	50.2
	Relatively difficult	153	49.8
Regional policy	There is no	153	49.8
	There is	154	50.2

also had good health and do not make use of contraceptives. The knowledge level of women at reproductive age was also relatively low, as they claimed to have sexual behaviours that were not at risk. Also, most do not have dating behaviour risks, and have claimed to possess good levels of religiosity.

Access to the media was good enough for most of the respondents, as they do not have good parental supervision. The characteristics of the family were more with the small size of the family (less than five peoples), as the education level of most family heads were low. The work of most family heads were also not permanent jobs, as the socioeconomic level of the respondents' families was quite good. Moreover, WCA that resided in cities had better access to medical facilities, as there were local government policy related to adolescent reproductive health, compared to those living in districts (rural areas).

There were several variables related to UP at WCA (15-19 years), namely work, marital status, the use of contraceptives, and risky sexual behaviours. WCA that have jobs, were married, used contraceptives, and have risky sexual behaviours, had greater risk of UP, compared to those that were jobless and single, with no endangered intercourse attitudes and use of prevention measures (Table 2).

The determinants of unwanted pregnancy in WCA (15-19 years) were the use of contraception, possession of work, unwanted pregnancy knowledge, dating behaviour, access to information media & health care facilities, with the educational level of households. The most dominant factor was the use of contraceptives, accompanied by women's work, knowledge, dating behaviour, access to information media & health facilities, with education of the family head. Women that used contraceptives had higher risks of UP, compared to those that did not. Also, WCA that had a job had a higher risk for UP occurrence, compared to those that were jobless. The low knowledge level of WCA also increased the tendency of UP occurrence, compared to those with higher awareness. Risky dating behaviour and poor access to information media were also observed to have greater tendencies of UP occurrence, compared to those that did otherwise. However, easy access to health facilities reduced the risk of UP, compared to WCA possessing much difficulties (Table 3).

Discussion

Unwanted pregnancy (UP) is often experienced by a woman that has no desire in getting pregnant anymore. The occurrence of UP was often due to some reasons, such as rape, unexpected pregnancy time, severe disability compound of fetus, and premarital sexual intercourse. Therefore, the consequences of UP triggers abortion or result in the birth of an unwanted child, which

Table 2. The Relationship between Individual, Family, and Environmental Characteristics of the Incidence of Unwanted Pregnancy in Woman of Childbearing Age (15-19 years) in Jambi Province

Variables	Category	Unwanted Pregnancy				Odds Ratio	95% CI	p-value
		Yes		No				
		n	%	n	%			
WCA education	Low	0	0.0	114	100.0	0.97	0.952-0.997	0.162
	High	5	2.6	188	97.4		Reference	
WCA's work	Work	2	10.5	17	89.5	11.18	1.75-71.43	0.033
	Does not work	3	1.0	285	99.0		Reference	
Marital status	Mate	5	50.0	5	50.0	2.00	1.08-3.72	<0.001
	No	0	0.0	297	100.0		Reference	
Morbidity	Yes	1	1.5	65	98.5	0.91	0.10-8.30	1.000
	No	4	1.7	237	98.3		Reference	
Use of contraceptive	Yes	3	30.0	7	70.0	63.2	9.09-439.83	<0.001
	No	2	0.7	295	99.3		Reference	
Knowledge of UP	Low	4	2.5	157	97.5	3.69	0.41-33.44	0.374
	High	1	0.7	145	99.3		Reference	
Sexual Behavior	At risk	5	11.6	38	88.4	1.13	1.02-1.26	<0.001
	Not at risk	0	0.0	264	100.0		Reference	
Dating behavior	At risk	1	4.0	24	96.0	2.90	0.31-26.95	0.348
	Not at risk	4	1.4	278	98.6		Reference	
Religiosity	No	1	2.4	41	97.6	1.59	0.17-14.59	0.523
	Yes	4	1.5	261	98.5		Reference	
Media access	Not good	4	2.2	174	97.8	2.94	0.33-26.64	0.403
	Well	1	0.8	128	99.2		Reference	
Parental supervision	Less	4	2.3	167	97.7	3.23	0.36-29.27	0.387
	Well	1	0.7	135	99.3		Reference	
Residence	Village	3	2.0	150	98.0	1.52	0.25-9.23	0.684
	City	2	1.3	152	98.7		Reference	
Large family	Large (>5)	0	0.0	75	100.0	0.98	0.96-0.98	0.340
	Small (≤5)	5	2.2	227	97.8		Reference	
Head of family's education	Low	2	1.1	173	98.9	0.50	0.08-3.02	0.655
	High	3	2.3	129	97.7		Reference	
Head of family's work	Not fixed	5	2.0	249	98.0	1.02	1.00-1.04	0.592
	Permanent	0	0	53	100		Reference	
Family social economy	Poor	0	0	39	100	0.98	0.97-1.00	1.000
	Not poor	5	1.9	263	98		Reference	
Regional policy	Yes	2	1.3	152	99	0.66	0.11-3.99	0.684
	No	3	2	150	98		Reference	
Access health facilities	Difficult	3	2	150	98	1.52	0.25-9.23	0.684
	Easy	2	1.3	152	99		Reference	

Notes: WCA: Women of Childbearing Age, UP: Unwanted Pregnancy, CI: Confidence Interval

Table 3. Determinants of Unwanted Pregnancy in Women of Childbearing Age (15-19 years) in Jambi Province

Variable	p-value	OR-Adjusted	95% CI	
WCA's work	4.018	0.026	55.59	1.63-1,892.60
Contraception Use	4.311	0.005	74.50	3.58-1,549.02
Knowledge of UP	2.402	0.230	11.05	0.22-557.92
Head of family's education	-0.508	0.722	0.60	0.04-9.85
Access to media	0.547	0.691	1.73	0.12-25.66
Access to health facilities	-1.210	0.453	0.30	0.01-7.01
Dating behavior	1.164	0.412	3.20	0.20-51.60
Constant	-7.228	<0.001	0.00	

Notes: WCA: Women of Childbearing Age, UP: Unwanted Pregnancy, CI: Confidence Interval, OR: Odds Ratio

further leads to the disruption of psychological development, due to poor care, with inadequate treatment and affection from parents or their family.¹⁷

In this study, the prevalence of UP in WCA (15-19 years) was much lower than the results of studies conducted by previous researchers. A meta-analysis study

conducted in Iran, stated that the incidence of unwanted pregnancy was 27.9%.¹⁸

However, the study that used 2013 Riskesdas data, analyzed that the occurrence of unwanted pregnancy in WCA (10-54 years) in Indonesia, amounted to 15%.¹⁰ These results differed from those of this study, since the researchers previously analyzed WCAs, which were 10-54 years of age, making it difficult to compare both studies. In the previous study, the highest age group that did not wish to conceive were those above 35 years, which were at high risk of becoming pregnant.

However, this study at least showed a similar pattern, which mentioned that the prevalence of UP in all adolescents (15-19 years) was less than 10% (relatively rare), as stated in the 2012 IDHS results that the incidence of unwanted pregnancy was 7% (this was among the WCA 15-49 years).¹⁴ According to data from Riskesdas (2013), it was also stated that the proportion of pregnancies occurring at the age of 15-19 years was 1.97%, as this figure strengthened the results of this study.¹⁶ The prevalence observed in this study was also in line with that of a survey by the Jambi City NGO, SIKOK Jambi, which provided information that about 8% of adolescents have had sexual intercourse. Unhealthy adolescent sexual behaviour also had an impact on the incidence of unwanted pregnancy.¹⁵

The results of this study are almost the same as the study conducted in Jimma Ethiopia, which found that the prevalence of unintended pregnancy was 32.5% among the study sample.¹⁹ It can also be said to be similar to that found in Nigeria which reported that the overall unintended pregnancy prevalence rate of 29%, ranging from 10.8% in Nigeria to 54.5% in Namibia. As compared to women aged 15–19 years, women of all other age categories had higher odds of unintended pregnancies. Married women were 6 times more probable to report unintended pregnancy as compared to women who had never married (OR = 6.29, 95% CI = 5.65–7.01).²⁰ Study in India and Bangladesh found that amongst the total women (n = 41,689), overall, 19.1% pregnancies were reported as unintended (ranging from 11.9% in India to 28.4% in Bangladesh).²¹

Although among the adolescents' population (15-19 years), the prevalence of UP discovered was very small, compared to those that were married, which was half. Generally, when further analyzed, the union of currently married WCA (15-19 years) was caused by pregnancies, which occurred as a result of premarital sex. Moreover, this study showed that dating behaviour tended to increase the risk of UP in WCA. The WCA that were already dating with stimulant attitudes, such as lip kissing or other stimulating actions, were at risk of unwanted pregnancy (data not shown).

Many factors influenced the occurrence of UP in

WCA. The results in this study were not in line with that of a previous study conducted by Saptarini and Suparmi,¹⁰ where the dominant factor of UP was the use of contraceptives. Women that have used or were currently using contraceptives had higher risks of UP, compared to those not using them. This further explained that WCA using contraceptives, were indeed pregnant or do not want pregnancy. Logically, WCA that experienced failure in family planning and conceived as a result, did not want the pregnancy.¹⁰

This result was in line with research conducted in India and Australia, where couples who use contraceptives were more likely to have unwanted pregnancies than those who did not use contraception. Couples who were used contraception, but an unwanted pregnancy may be caused by the failure of contraception used. Contraceptive failure was a case of pregnancy in active acceptors who at that time used contraceptive methods. This contraceptive failure can be caused by failure of the contraceptive method itself or because of non-compliance and imperfections in accepting contraception.^{2,22}

Further in this study, half of the currently married WCA were family planning acceptors (currently using contraception). The use of contraception was another form for WCA to prevent pregnancy. This relatively young age in marriage caused unpreparedness in having children. The tendency of UP in WCA of 15-19 years of age, was because psychologically, it was still classified as a teenager. The ideal age for marriage in women is more than 20 years old, where they are physically and psychologically considered ready to perform their reproductive health functions.⁸

This study discovered that the use of contraceptives in WCA (15-19 years), increased the risk for unwanted pregnancy, after being controlled by working status, knowledge, dating behaviour, access to information media & health care facilities, with family head's education. Employed WCA (15-19 years old) are related to the occurrence of UP, when compared to those that are jobless. In this study, most of the WCA were still students (not working), as those that attended school did not engage in active sexual activity, and indeed did not desire pregnancy. However, employed WCA no longer attended school, as most of them already had married statuses. Also, employed WCA have more opportunities and time to carry out their sexual activities because they are no longer in school.

Furthermore, WCA's employment status was related to the occurrence of UP observed in this study, as it was not in line with the results of Saptarini and Suparmi's study,¹⁰ which stated that maternal working level was not related to the incidence of unwanted pregnancy in Indonesia, based on 2013 Riskesdas data analysis. This difference was also due to the respondents studied, as

WCA in this study were only teenagers, compared to previous studies (10-54 years old).

In this study, results showed that WCA's knowledge of reproductive health was related to the incidence of UP, where those with low awareness had a greater risk of unwanted pregnancy. These results were consistent with that of Azinar's study,²³ which discovered that in the case group of UP, most WCA do not have enough knowledge (60%) of unwanted pregnancies. Inadequate knowledge caused respondents not to understand the factors that led to unwanted pregnancy. However, in the control group (not UP), most of the respondents had good knowledge.²³

Moreover, the results of Mutiara, Budihastuti, and Pamungkasari's study discovered that low knowledge was an indirect factor in the occurrence of UP.¹³ Also, the qualitative study conducted by Ismarwati and Utami,¹² showed low knowledge as a factor related to UP occurrence. Kusmiran's study,²⁴ results further stated that 46.2% of adolescents still think women do not become pregnant after engaging only once in sex. This misperception was mostly believed by young men (49.7%), compared to girls (42.3%). In the control group that did not experience UP, most of them had good knowledge about unwanted pregnancy (73.3%).^{12,13,25}

The factors that influences a person's knowledge are education, self-experience, social media, and residential environment. Also, the results of Saptarini I and Suparmi study,¹⁰ discovered a significant relationship between educational level and the occurrence of UP, where good education was directly proportional to the knowledge status. The study also discovered that good access to information media, prevented the occurrence of UP. This result was in line with Azinar's study,²³ which stated that there was a significant relationship between media access and contact information, with premarital sexual behaviours, which was at higher risk of UP. Also, Ismarwati and Utami,¹² observed that the effect of easy access to media, especially pornographic channels, increased the risk of unwanted pregnancy occurrences in adolescents. This was also under Sarlito's statement,¹⁹ which stated that teenagers in an exploration period (wanting to know and try) were likely to imitate all they observe or listen to from the mass media, due to their low knowledge of sex problems or lack of sexual education from their parents. Through various channels, both printed and electronic, sharing information should be accepted by the community, as someone with much exposure to mass media (television, radio, magazines, pamphlets, etc.) is likely to obtain more information than those with low knowledge. This means that exposure to the mass media, both printed and electronic, influences a person's level of knowledge.²⁴

Many researchers acknowledged that both printed

and electronic media showed significant contribution to the emergence of the premature sexual maturity phenomenon. Brown JD and Bobkowski PS that studies adolescents with sexual exploitation in video clips, magazines, and television, turned out to encourage teenagers to engage in free sex.²⁶ This was also in line with the results of Ismarwati and Utami's study,¹² which further stated that media access to information about pornography, were related to the incidence of UP in adolescents. Also, Rusmilawaty, Yuniarti, and Tri Tunggal's study,²⁷ mentioned that the intake of sexual content from the media, increased the risk of adolescent sexual behaviour by 2.5 times, compared to those without access.

Sex education was mostly obtained from mass media. This was following the results of Brown's study from North Carolina, which generally stated that the most sexually motivated adolescents tended to have sex at the ages of 14 to 16 years, which was 2.2 times higher than other teens that observed less sexual exploitation from the media.²⁶ This was also under Green's theory, which stated that media as one of the enabling factors associated with sexual behavior, was closely related to the incidence of unwanted pregnancy.¹³

Furthermore, the results of this study also discovered that dating behaviour relationship was risky for the occurrence of UP. These results were in line with the study of Mutiara, Budihastuti, and Pamungkasari,¹³ which observed a direct relationship between negative (risky) sexual behaviour and the incidence of UP in Madiun adolescents. However, peers with negative influences and attitudes, parental supervision roles, detrimental media exposure, low knowledge, and lack of religiosity, were the indirect causes of the UP incidence in adolescents.

Modern developments and advancements influences sexual behaviour in dating teens. For example, it had been observed that the things known as taboo by teenagers few years ago, such as kissing and flirting, were being justified by them now. There were even a small percentage of them also agreeing with free sex. It was also discovered in this study that, being permissive to risky sexual behaviour, having erotic perceptions, and also portraying negative attitudes during dating stimulation, such as lip kissing or other things, enhanced the occurrence of UP.^{12,13} The study also discovered that there were unmarried WCA using contraception (five peoples), with two women further claiming to live together without marriage ties. The results of this study were also in line with the discoveries by the SIKOK, which stated that 8% of adolescents in Jambi City, had engaged in sexual relations.¹⁵

The results of this study further discovered that the educational level of the family head was also related to the occurrence of UP in adolescents (15-19 years). Similarly, access to health care facilities at the regional

level also influenced the incidence of UP. Prevention of UP occurrence in adolescents should be possible, when the access to health facilities becomes easy. Woman of childbearing age 15-19 years or adolescents should also have access to information and reproductive health services counseling, from medical facilities around their neighborhood. Also, easy access provides conveniences in receiving services and information about adolescent reproductive health.¹³

Adolescent Reproductive Health/*Kesehatan Reproduksi Remaja* (KRR) services have been carried out by the Government through various institutions. The Ministry of Health had launched the Adolescent Care Health Service/*Pelayanan Kesehatan Peduli Remaja* (PKPR) and the National Population and Family Planning Board/*Badan Kependudukan dan Keluarga Berencana Nasional* (BKKBN) programs, which are specific in handling and fostering adolescent families (Adolescent Family Development). Dozen years ago, they also implemented Youth Information and Counseling Center/*Pusat Informasi dan Konseling Remaja* (PIK-R), which began in 2010 with the implementation of PIK activities, KRR that was currently changed to PIK-R. This PIK-R program was observed to have a target group of adolescents. These activities applied the empowerment of peer counselors, in order to provide education, communication, and information about reproductive health, especially triad problems. At about that time, the BKKBN launched the Planning Generation/*Generasi Berencana* (Gen-Re) program, which actively involved students to become the brand ambassadors. In some regions, the "Gen-Re goes to school" program is also after the acquisition of younger targets.^{28,29}

Further in this study, the related UP determinant models were contraceptive use, adolescent knowledge, dating behaviour, access to information media and health care facilities, with family head education. It was also necessary to improve the knowledge level of adolescents about UP and reproductive health. Innovative, creative, and educative public service advertisements should also make use of popular social media, which were widely used by teenagers. Alternatively, the use of instructive, informative, innovative, and enhanced creativity games, which are likely to be developed up-to-date and online, should be encouraged, in order to bolster and improve the knowledge level of adolescents. Also, the use of these instruments provides access to information on reproductive health, which in turn is very useful in fostering the WCA physical, psychological, and emotional readiness in planning for the family, with the right concept.

Adolescence is a period of rapid growth and development, physically, psychologically, and intellectually. The characteristics of adolescents includes curiosity, affection for adventures and challenges, while also tending to be

brave enough to take risks for actions, without careful consideration. When the decisions made in dealing with conflict were not right, most of them fall into negative behaviours, and have to bear the short and long-term consequences of various physical and psychosocial health problems, such as adverse events and other medical effects.^{9,30}

The increase of knowledge by providing exposure information, needs to be provided according to their age. This should be carried out through the use of promotional media, which are light, informative, and educative. Also, the use of social media platforms, such as Facebook, Instagram, Twitter, Line, WhatsApp, WeChat, and more, are encouraged. This was also the target and goal of Gen-Re, which had been carried out by selecting Ambassadors, through BKKBN. The Gen-Re program is an activity developed in the context of preparing adolescents for family life, as they look to carry out education, work in a career, and get married in full planning, according to the reproductive health cycle. The objectives of this program were to increase understanding, knowledge, and positive attitudes of adolescents towards health and reproductive rights, in order to improve their sexual wellness and prepare them for family life. The Gen-Re further helped in improving the quality of future generations, by targeting unmarried youths (10-24 years), with families and community caring for teenagers.²⁶

The Gen-Re program and activities that are knowledge building for adolescents, whether carried out by BKKBN, such as Ambassador Gen-Re or PIK-R, as well as those carried out by the Ministry of Health in PKPR programs and a thousand-day life movement to prevent various adverse health effects adolescents as prospective mothers need to be synergized so that they can achieve their goals to be achieved and reach the set targets.²⁷ The "Gen-Re goes to school" program needs to be optimized and improved and synergized with School Health Efforts/*Usaha Kesehatan Sekolah* (UKS) in junior high schools and senior high schools, so the incidence of unwanted pregnancies, as well as triads of KRR, can be prevented as early as possible.

The results of this study also recommends the involvement of the Religion Ministry, as program that touches young women, such as the "Ustadz" (religion teacher), should be synergized between officers health (health promotion) and Field Counselor of Family Planning/*Penyuluh Lapangan Keluarga Berencana* (PLKB), which are the spearheads of activities.

Furthermore, the need to increase and revitalize the activities of the *Remaja Masjid*, which is a place of education in the promotion of adolescent reproductive health knowledge, should also be synergized with *Karang Taruna's* events. Also, the involvement of parents in fos-

tering families, especially those with teenagers, is highly recommended.

Many programs have been developed by the Government, specifically the BKKBN and the Ministry of Health. This study strengthened the programs launched by BKKBN, such as Gen-Re, which was carried out with two steps, namely the approach to adolescents themselves, through the development of the PIK-R and approaches to parents of adolescents, by means of group development (Youth Family Development/*Bina Keluarga Remaja* (BKR)) services. Therefore, strengthening is needed for the increase and sustainability of this program.

Moreover, the Family Planning program currently being carried out does not only focus on the number of acceptors, it also focuses more importantly on the improvement of quality services, which is directed on WCA (15-19 years), as a target group that needs priority programs. According to the main tasks and functions of each cross-sector, it is also important to formulate the division of tasks, which are related to preventing the occurrence of UP in 15-19 years WCA (adolescents performing the job, by synergizing existing funds, facilities, and infrastructures).

The need for equity and increasing accessibility of health care facilities in all regions, while also improving the quality and funding for PKPR, UKS, and PIK-R activities, should also be performed. Also, increased knowledge through more informative media, such as the installation of billboards in public places with messages to prevent unwanted pregnancies and reproductive health of adolescents, should be carried out as well.

This study was the first to be conducted in this location, as one of the performance assessments of the National Family Planning Coordinating Agency of Jambi Province. There were some limitations to this research, which includes the study of UP being a sensitive and difficult problem to ask, as there was possibility of dishonesty from respondents when asked by enumerators, which then leads to bias, due to the skills of different coordinators in probing or conducting interviews. In order to overcome this problem, efforts were made by providing structured training to enumerators before conducting data collection. Being public health students, all enumerators were selected as females, in order for respondents to feel comfortable and willingly open up to sensitive matters being asked, which were also supervised during data collection.

Validation of the questionnaire was also carried out by the authors daily, until the end period of data collection. During the period of data collection, meeting up with respondents that were mostly still in school was an obstacle, as the process of obtaining information had to be carried out in the afternoon, after they had finished their

activities. Therefore, many predetermined samples were unable to be discovered after many visits, with most even refusing to become respondents. However, the response rate in this study was 77%. Besides that, formation of the determinant model of UP in Jambi Province was not full because there were still many other variables that were directly or indirectly related to the occurrence of unwanted pregnancy, which were not examined in this study.

Conclusion

The prevalence of UP in WCA (15-19 years) was relatively low in Jambi. Also, the determinant models were contraceptive use, low knowledge, risky dating behaviour, lack of access to information media and health care facilities, with reduced educational level of family head. Increase in intervention and promotion to groups of WCA (15-19 years) was carried out, with the main focus on preventing the occurrence of unwanted pregnancies. Moreover, targets are also made to the head of the family (parents of teenagers), as optimization and strengthening of the Gen-Re program through "Gen-Re goes to school" extended the focus to senior and junior high institution students. The strengthening of BKR activities was also synergized between various Agencies (BKKBN, Ministry of Health, Ministry of Religious Affairs, and Ministry of Education and Culture). It was also necessary to preserve social norms and religious culture, based on the synergy of the government and the people that accepted or preserved these practices, (parents, teachers, extended families, religious, traditional, and community leaders, with the involvement of NGOs).

It was also necessary to target advocacy efforts and coordination, to the provincial, district, and sub-district levels, with priority on improving the quality of family planning and medical services, with adolescent reproductive health programs.

Abbreviations

UP: Unwanted Pregnancy; WCA: Women of Childbearing Age; WHO: World Health Organization; IDHS: Indonesia Demography and Family Survey; NGO: Non-Government Organization; SIKOK: *Sentra Informasi dan Konsultasi Orang Kito*; Riskesdas: *Riset Kesehatan Dasar* (National Basic Health Research); KRR: *Kesehatan Reproduksi Remaja* (Adolescent Reproductive Health); BPS: *Badan Pusat Statistik Indonesia* (Statistic Indonesia); PKPR: *Pelayanan Kesehatan Peduli Remaja* (Adolescent Care Health Service); BKKBN: *Badan Koordinasi Keluarga Berencana Nasional* (National Family Planning Board); PIK-R: *Pusat Informasi dan Konseling Remaja* (Youth information and counseling); Gen-Re: *Generasi Berencana* (Planning Generation); UKS: *Usaha Kesehatan Sekolah* (School Health Effort); PLKB: *Petugas Penyuluh Lapangan Keluarga Berencana* (Field Counselor of Family Planning); BKR: *Bina Keluarga Remaja* (Youth Family Development).

Ethics Approval and Consent to Participate

Participants were briefed before providing their agreement through the PSP form (Explanation form), which clearly allows them to refuse when they are not willing to participate, or want to stop during an interview. Informed Consent was voluntarily signed by each participant after receiving an explanation, without coercion. The participants were further provided with a souvenir, as a token of appreciation for contributing to the provision of data and time. Also, the Ethics approval of this research was obtained from the Research Ethics Commission of the Faculty of Medicine and Health Sciences, University of Jambi, with the No: 158/UN.21.17/PP/2017.

Competing Interest

The author declares that there are no significant competing financial, professional, or personal interests that might have affected the performance or presentation of the work described in this manuscript.

Availability of Data and Materials

The data are available upon request to the first author.

Authors' Contribution

UK was the principal investigator in charge of this research activity, the process of preparing proposals and research instruments, training enumerators, collecting data, and analyzing the compilation of draft articles. RL was also a research member that assisted in preparing the research proposal, piloting the research instrument, carrying out the process of collecting data, and helping to draft the article. NAM advised on the draft article and helped with the arrangement of the discussion.

Acknowledgment

The authors are grateful to the National Family Planning Coordinating Agency (BKKBN), as the source of funding. The authors are also grateful to the Chairman of LPPM (Research and Community Services Agency) of Universitas Jambi, for all their support and participation. Also, the authors are grateful to the District Health Office of West Tanjung Jabung and Jambi City, the Head of South Jambi, Paalmerah, Betara, Merlung Sub-district, and every member of their staffs, that facilitated this research activity.

References

- Nurchayani DA, Trihandini I. Kehamilan yang tidak diinginkan dan berat badan lahir bayi: unintended pregnancy and birth weight. *Kesmas: Jurnal Kesehatan Masyarakat Nasional*. 2013; 7 (8): 354-9.
- Singh S, Sedgh G, Hussain R. Unintended pregnancy: worldwide levels, trends, and outcomes. *Studies in Family Planning*. 2010; 41 (4): 241-50.
- Dini LI, Riono P, Sulistiyowati N. Pengaruh status kehamilan tidak diinginkan terhadap perilaku ibu selama kehamilan dan setelah kelahiran di Indonesia (analisis data SDKI 2012). *Jurnal Kesehatan Reproduksi*. 2016; 7 (2).
- Woog V, Kågesten A. The sexual and reproductive health needs of very young adolescents in developing countries. *The Guttmacher Institute*. 2017; 10-1.
- Darroch JE, Woog V, Bankole A. Adding it up: costs and benefits of meeting the contraceptive needs of adolescents. *New York Guttmacher Inst*. 2016; 1-16.
- Standart Diagnosis Keperawatan Indonesia. *Survei demografi dan kesehatan reproduksi remaja*. 2017; 125-7.
- Badan Pusat Statistik, Badan Koordinasi Keluarga Berencana Nasional, Departemen Kesehatan, Macro International. *Survei demografi dan kesehatan Indonesia 2012*. SDKI. 2013. p. 16.
- Kementerian Kesehatan Republik Indonesia. *Infodatin reproduksi remaja. Situasi Kesehatan Reproduksi Remaja*. 2014. p. 1.
- Sunardi KS, Martha E, Guspaneza E. Potret self-system remaja dengan perilaku tindakan seksual berisiko di Provinsi Jambi. *Jurnal Promosi Kesehatan Indonesia*. 2020; 15 (2): 59-64.
- Saptarini I, Suparmi. Determinan kehamilan tidak diinginkan di Indonesia (analisis data sekunder Riskesdas 2013). *Jurnal Kesehatan Reproduksi*. 2016; 7 (1): 118-31.
- Aminatussyadiah A, Prastyoningsih A. Faktor yang mempengaruhi penggunaan kontrasepsi pada wanita usia subur di Indonesia (analisis data survei demografi dan kesehatan Indonesia tahun 2017). *Jurnal Ilmu Kesehatan*. 2019; 12 (2): 525-33.
- Ismarwati I, Utami I. Faktor-faktor yang mempengaruhi kejadian kehamilan tidak diinginkan pada remaja. *JHes: Journal of Health Studies*. 2017; 1 (2): 168-77.
- Mutiara B, Budihastuti UR, Pamungkasari EP. Path analysis on the determinants of unwanted pregnancy among adolescents in Madiun, East Java. *Journal of Maternal and Child Health*. 2018; 3 (3): 216-24.
- Syafitri YD. Hubungan jumlah anak dengan kejadian kehamilan tidak diinginkan (KTD) pada wanita pernah kawin usia 15-49 tahun di Indonesia [Skripsi]; 2012.
- Martinus Y. 10 Persen remaja wanita Jambi tidak perawan. *Tribunnews.com*; March 6, 2013.
- Badan Penelitian dan Pengembangan Kesehatan. *Riset kesehatan dasar (RISKESDAS) 2013. Laporan Nasional 2013*. Jakarta: Badan Litbang Kesehatan Kementerian Kesehatan RI. 2013. p. 1-384.
- Dixit P, Ram F, Dwivedi LK. Determinants of unwanted pregnancies in India using matched case-control designs. *BMC Pregnancy Childbirth*. 2012; 12 (84).
- Jalali R, Mohammadi M, Vaisi-Raygani A, Ghobadi A, Salari N. Prevalence of unwanted pregnancy in Iranian women: a systematic review and meta-analysis. *Reproductive Health*. 2019; 16 (1): 1-8.
- Hamba N, Ayele M, Amsalu T. Prevalence and associated factors of unintended pregnancy among pregnant women attending antenatal care unit at Jimma University Medical Center: a cross sectional study. *Biomedical Journal of Scientific & Technical Research*. 2020; 30 (4): 25576-82.
- Ameyaw EK, Budu E, Sambah F, Baatiema L, Appiah F, Seidu AA, et al. Prevalence and determinants of unintended pregnancy in sub-Saharan Africa: A multi-country analysis of demographic and health surveys. *Plos One*. 2019; 14 (8): e0220970.
- Sarder A, Islam SMS, Maniruzzaman, Talukder A, Ahammed B. Prevalence of unintended pregnancy and its associated factors: evidence from six south Asian countries. *Plos One*. 2021; 16 (2): e0245923.
- Taft AJ, Shankar M, Black KI, Mazza D, Hussainy S, Lucke JC.

- Unintended and unwanted pregnancy in Australia: a cross-sectional, national random telephone survey of prevalence and outcomes. *Medical Journal of Australia*. 2018; 209 (9): 407–8.
25. Azinar M. Perilaku seksual pranikah berisiko terhadap kehamilan tidak diinginkan. *KEMAS: Jurnal kesehatan Masyarakat*. 2013; 8 (2): 153–60.
24. Kusmiran E. Kesehatan reproduksi remaja dan wanita. Jakarta: Salemba Medika; 2011.
25. Pinandari AW, Wilopo SA, Ismail D. Pendidikan Kesehatan reproduksi formal dan hubungan seksual pranikah remaja Indonesia. *Kesmas: Jurnal kesehatan Masyarakat Nasional*. 2015; 10 (1): 44-50.
26. Brown JD and Bobkowski PS. Older and newer media: pattern of use and effects on adolescents' health and well being. *Journal of Research on Adolescence*. 2011; 21 (1): 95–11.
27. Rusmilawaty, Yuniarti, Tunggal T. Communication of parents, sexual content intake and teenage sexual behavior at senior high school in Banjarmasin City. *Kesmas: National Public Health Journal*. 2016; 10 (3): 113–9.
28. Wirdhana I. Program Gen Re dalam penyiapan kehidupan berkeluarga bagi remaja. BKKBN; 2010.
29. Badan Kependudukan dan Keluarga Berencana Nasional. Kesehatan reproduksi remaja 2017. BKKBN. 2017; 1–606.
30. Widyarningsih. Pengalaman keluarga merawat anak remaja dengan kehamilan tidak diinginkan (KTD) di Kabupaten Cilacap, Provinsi Jawa Tengah studi fenomenologi [Skripsi]; 2011: 20282720.

Factors Shaping Uptake of Antenatal Care in Surabaya Municipality, Indonesia: A Qualitative Study

Lisa Jones^{1*}, Nyoman Anita Damayanti², Nicola Wiseman^{1,2}, Neil Harris^{1,2}

¹School of Medicine and Dentistry, Griffith University, Queensland, Australia, ²Department of Health and Administration Policy, Faculty of Public Health, Universitas Airlangga, Surabaya, Indonesia

Abstract

Five focus group discussions (FGDs) with 61 pregnant women were conducted in June and July 2019 at primary health care (PHC) services within five urban areas of Surabaya, Indonesia. In addition, five semi-structured interviews with five midwives were carried out to explore the experiences of pregnant women accessing Antenatal Care (ANC) and the factors shaping uptake of ANC services. Data were audio-recorded, transcribed, and translated into English, and analyzed using thematic analysis. Findings from focus group discussions suggested that fears of negative diagnosis before initial ANC appointment and personal beliefs and myths surrounding pregnancy may delay uptake of ANC. Further, the influence of husbands, family, and friends and long waiting times with overcrowding leading to limited seating shaped timely access and return visits. In addition, feeling comfortable with the quality of the service and receiving a friendly service from the practitioners assisted women in feeling comfortable to return. Finally, midwives acknowledged feeling afraid of being referred to a hospital if deemed a high-risk pregnancy-shaped return ANC visits. The findings highlighted several factors needing to be addressed to increase the promptness of first ANC visits and ensure return visits to achieve great ANC coverage.

Keywords: antenatal care, maternal mortality, qualitative methods, thematic analysis

Introduction

Antenatal Care (ANC) is central to adequate health-care to reduce maternal morbidity and mortality while improving infant survival and health. The leading causes of maternal mortality and morbidity in women aged 15 to 49 years in low and middle-income countries are complications during pregnancy and childbirth.¹ Whilst hemorrhage (after birth), infections, pre-eclampsia and eclampsia during pregnancy, complications from delivery, and unsafe abortion as the major causes of nearly 75% of all maternal deaths.² Namely, ANC provides essential education to women on recognizing signs of complication, consequently reducing mortality and promoting birth preparedness with a skilled birth attendant and/or facility.^{3,4} Further, ANC can provide effective interventions for preventing and treating other conditions such as anemia, pre-clampsia, and eclampsia.³ Since the consensus suggests that most maternal mortalities and morbidities are preventable, utilizing ANC as a preventative tool is essential, particularly for avoiding complications in childbirth.

Within Indonesia in 2017, it was estimated that ANC coverage for women aged 15-49 years was 77% (women attending at least four ANC visits)⁵ This coverage rate has decreased since 2012, with data showing a slow decline from 88% coverage.⁵ Although the national ANC coverage (minimum four visits) may be considered acceptable at the current rate of 77%, the maternal mortality ratio (MMR) of 126 per 100,000 live births in Indonesia remains unacceptably high compared to high-income country counterparts.^{5,6}

Although this demonstrates a decrease from the year 2000 (265 per 100,000 live births), this decline occurs at a much slower rate when compared to the Southeast Asian region, despite remarkable improvements in essential health and economic indicators.^{6,7} Whilst maternal mortality trends are steadily declining, uncertainty remains regarding the high ANC coverage rates not translating to lower MMRs.⁸

A study suggested that several factors may shape the uptake of ANC services across Indonesia. These factors can be conceptualized as individual circumstances, cul-

Correspondence*: Lisa Jones, School of Medicine and Dentistry, Griffith University, 1 Parklands Dr, Southport, 4215 Queensland, Australia, E-mail: lisa.jones@griffith.edu.au, Phone: +617 5552 7820

Received : March 02, 2021
Accepted : April 28, 2021
Published : August 24, 2021

tural and social dynamics, and community and health care conditions.⁹⁻¹⁷ Within Indonesia, this literature indicates that personal events influencing ANC uptake may include socioeconomic status, income, age, education, and whether a woman is pregnant with her first child.⁹⁻¹² These factors interact with broader cultural and social factors within which a woman lives to shape ANC uptake.^{9,13-15} Further, community and health care conditions are believed to shape accessibility and uptake of ANC services, with women in urban areas much more likely to achieve adequate ANC visits.^{10,16} Shortage of qualified health providers and overcrowded facilities has also been suggested to influence ANC uptake.^{7,11,17}

This study would explore the experiences of pregnant women accessing ANC within the urban areas of Surabaya. While current research indicated several influencing factors, there was limited qualitative literature exploring pregnant women's views in Surabaya City or elsewhere in Indonesia on utilizing ANC services. In addition, although national and local quantitative data could link specific determinants with ANC health-seeking behaviors, it did not explain or provide insight on potential community-based strategies for reducing maternal mortality. The findings would guide future research and support the planning of public health interventions improving both ANC services and uptake within this area. Public health promotion strategies and interventions must focus on ANC due to the evident link with reducing maternal mortality.

Method

Five focus group discussions (FGDs) with 61 pregnant women alongside five semi-structured individual interviews (SSIs) with five midwives within the city and urban areas of Surabaya were conducted to explore factors shaping uptake ANC services in Surabaya. Demographics were collected on FGD participants using self-reporting methods. Demographics of the midwives were not collected due to the low number of midwives interviewed and to keep confidentiality and anonymity when sharing the findings. The study was conducted at five separate primary health care (PHC) services located in North, North-East, South, West, and South-West Surabaya to include various facilities serving different demographic populations. A *Puskesmas*, hereby referred to as PHC, are a central plank of the Indonesian public health care system, with 63 situated within Surabaya. The PHC is considered to provide front-line health care for pregnant women accessing ANC services. Most PHC services offer comprehensive ANC, including access to pathology collection, dentistry services, onsite nutritionists and dieticians, ultrasound (sonography) equipment, and an onsite pharmacy with access to prenatal supplementation. All PHC that offered ANC services

could be included within the study setting, with the final five facilities being chosen due to the connections between Universitas Airlangga and the Chiefs of the PHC services.

Five FGDs were conducted because it was in line with the scope of the research and with literature suggesting that four FGDs were sufficient to achieve code saturation.¹⁸ To be eligible to be involved within the FGDs, participants had to be pregnant or post-partum (gave birth within the last six months), an Indonesian Citizen who resided in Surabaya, 18 years or older, and had attended a PHC service for ANC. Participants who were post-partum or had already had multiple pregnancies were asked to report on their most recent pregnancy. In addition to the FGDs, five SSIs were carried out with midwives who had a direct role in the care of pregnant women at the five PHC services to offer additional perspective on the factors shaping uptake of ANC services.

FGD participants were purposively recruited from the targeted community. This ensured that the individuals associated with the phenomena were selected to be part of the study while accounting for limited resources.¹⁹ Through the connections between Universitas Airlangga and the PHC services around Surabaya, 61 pregnant women were recruited into the FGDs. These pregnant women either had attended the PHC services in the past or were there for the first appointment on the same day as FGD. Participants were recruited through the assistance of the midwife coordinator of the PHC services during their routine appointments. Alternatively, those attending the facility for their first appointment were recruited through the midwife coordinator by asking community health volunteers and the pregnant women in the community to know anyone or would like to be a part of the study. Further, one midwife working at each facility was approached by the FGD facilitators and asked if they would like to participate in the research and be involved in an SSI on the day of the FGD.

FGDs and SSIs were carried out in June and July of 2019 by a native Bahasa Indonesia speaker author in the national language of Bahasa Indonesia to ensure the inclusion of all participants. As the study was a collaboration between Australian and Indonesian authors, English translations were also provided at FGDs and SSIs to the non-Bahasa Indonesia speaking author to follow the discussion and direct where appropriate. The topic guides for the FGDs and SSIs were developed in English and translated to Bahasa Indonesia after a literature review and discussion with academic authors within the maternal and child health field at Universitas Airlangga, Surabaya. These translations were checked by a minimum of two native Bahasa Indonesia-speaking authors who were also fluent in English. An overview of the FGD and SSI guide is provided in Table 1 and Table 2, respec-

tively. The method of FGDs with pregnant women was well suited to this study as it encouraged participants to explore and share their personal views to build a shared understanding of the factors shaping their access to ANC services.²⁰ This method was particularly appropriate given the sensitivity of cultural and family factors shaping access. Utilizing SSIs with midwives respected their expert status in delivering ANC services and enabled the collection of a different operational perspective on access to ANC services.²¹ This approach facilitated a more comprehensive understanding of the uptake of ANC by encouraging the convergence of information from various sources. All FGDs and SSIs were recorded, transcribed, and translated into English for analysis. A minimum of two native Bahasa Indonesia-speaking authors carried out and checked translations to ensure accuracy. Further, once the results were analyzed, a copy was sent to the translators and the second author fluent in both languages to ensure no meaning was misinterpreted by the non-Bahasa speaking primary author.

Thematic analysis was utilized to identify and describe both implicit and explicit ideas from the data collected. This approach includes coding and classifying data into concepts, categories, or themes and consequently interpreting the resulting thematic structures by seeking commonalities, relationships, and patterns within the data.²² Data from the transcripts were linked to these overarching ideas, then further organized into themes and sub-

themes to help interpret and evidence the results.

Ethics approval was obtained from Griffith University (GU) Human Research Ethics Committee (GU ref no: 2019/424) and Universitas Airlangga (ref no: 15494-KEPK). All participants gave informed written consent. All FGDs and SSIs were audio-recorded and later translated and transcribed to English after approval was obtained from all participants. In addition to informed consent, ethical considerations were followed to ensure participants were informed about their rights to withdraw from the study at any time, confidentiality, and assured no harm would come to their reputation at the PHC service or their career. No financial incentive was provided to the participants. However, individuals in the FGDs were provided a free lunch while SSI participants were provided with lunch and a small token of appreciation.

Results

Sixty-six participants were involved in this study, including sixty-one FGD participants and five semi-structured interview participants. Demographic details of FGD participants are summarized in Table 3. The FGDs and SSIs identified several, often interrelated factors shaping the uptake of ANC. These findings were aligned with several broad categories, including individual circumstances, cultural and social dynamics, and community and health care conditions. Table 4 presents a taxonomy of the categories, themes, sub-themes, and associ-

Table 1. An Overview of the Focus Group Discussion Guide

Theme	Guiding Questions
Perceptions	What does Antenatal Care (ANC) mean to you?
Comfort of facility	When you first arrived at the facility, how did you feel? Did you feel comfortable attending this PHC service? Why/Why not?
Potential barriers to ANC	What is your experience accessing ANC – did you experience any barriers to arriving here today, e.g., transport, money, weather?
Cultural factors in attending ANC	Did you alone decide to utilize ANC for your pregnancy or most recent pregnancy?
Promoting ANC	Would you promote ANC to your friends and family? Could you see your friends and family using these services?

Table 2. An Overview of the Semi-Structured Interview Guide

Theme	Selected Questions
Comfort of facility	How important do you think it is for the pregnant women accessing this this PHC service to feel safe with the quality of the services? Why/Why not?
Accessibility of Antenatal Care (ANC)	Do you often have space and availability every day to book an appointment and see a pregnant woman? How long does it usually take from booking an ANC appointment to seeing a health professional staff?
Potential barriers to ANC	Are there any barriers you can think of that would stop someone from accessing ANC? Transport, weather, money, disapproving family members, traditional birth attendants instead, or other cultural factors?
Cultural factors in attending ANC	Who, other than the pregnant women, usually attends the ANC sessions? Family members, friends? Do you think this is important for pregnant women?

Table 3. Demographics of Study Sample in Focus Group Discussion (n = 61)

Variable	Category	n	%
Age (years)	18-24	4	6.6
	25-29	6	9.8
	30-34	4	6.6
	35+	7	11.5
	Unknown	40	65.5
Pregnancy number at time of focus group discussion (FGD)	1 (first pregnancy)	8	13.1
	2	16	26.3
	3	6	9.8
	4	7	11.5
	5+	2	3.3
		Has been pregnant before (pregnancy number not disclosed)	11
Marital/relationship status	Unknown	11	18.0
	Married	49	80.3
	Unknown	12	19.7
Highest level of education	Elementary	10	16.4
	Junior high school	11	18.0
	Senior high school	26	42.6
	Diploma	2	3.3
	Bachelor	1	1.7
	Unknown	11	18.0
Employment Status	Not working	37	60.6
	Employed part time	2	3.3
	Employed full time	3	4.9
	Self-employed	1	1.7
	Other (Homemaker)	2	3.3
	Unknown	16	26.2
Monthly household income (IDR)	<500,000 (<55 USD)	1	1.7
	500,000–1,000,000 (55–70 USD)	4	6.6
	1,000,001–2,000,000 (71–138 USD)	12	19.7
	2,000,001–3,000,000 (139–207 USD)	9	14.7
	3,000,001–4,000,000 (208–278 USD)	9	14.7
	4,000,001–6,000,000 (279–414 USD)	4	6.6
	Unknown	22	36.0

ated quotes shaping the uptake of ANC derived from the thematic analysis of the data.

Individual Circumstances

Several midwives commented that women often had limited knowledge of pregnancy risks or emergency signs. One midwife explained:

“They (pregnant women) think that pregnancy is the normal process. So, they have in their mind that it is okay if they do not go to PHC.”

Further, a delay in the uptake of ANC was shaped by not experiencing nausea or feeling that they were too old to be pregnant.

“First time I came to midwife when my pregnancy had been three months. I did not realize that I was pregnant already because there is no symptom like dizziness or nausea.”

Despite the shared understanding of ANC's importance, with a consensus of wanting to “know my baby is healthy and developing,” a standard view reported by the pregnant women was a fear of receiving a negative diagnosis upon their first visit to the PHC service. For example, one mother explained:

“...There was a mother who felt scared to check from the first time she knew she was pregnant to 9 months of pregnancy; she never went to the PHC service... her condition became critical in labor. Fortunately, both mother and baby were okay.”

The majority of women within the current study population held *Badan Penyelenggara Jaminan Sosial Kesehatan* (BPJS), which administers the Indonesian national health insurance making ANC services accessible. Similarly, for those who do not have BPJS, it was shared that the services were perceived as inexpensive, so there was no financial problem in accessing ANC.

“I choose this PHC service because the PHC service is cheap.”

Cultural and Social Dynamics

The results of this study showed that nearly all the participants had a personal belief about pregnancy or shared the views of others when considering when they could come to PHC and when they could safely leave the house. It emerged from this study that there was often a delayed initiation of ANC due to upholding beliefs.

“I came to PHC service for the first time in the fifth

Table 4a. Summary of Categories, Themes, Sub-Themes, and Associated Quotes Shaping Uptake of Antenatal Care

Category	Theme	Sub-theme	Associated Quote	
Individual circumstances	Perceptions	Perceived knowledge of pregnancy	<p><i>"They (pregnant women) think that pregnancy is the normal process. So, they have in their mind that it is okay if they do not go to PHC."</i> (MW5-P3)</p> <p><i>"I didn't realize. One day my body was not feeling well; only in the third month, I started to feel nauseous. I did a check-up at the hospital, and it turns out I am 3 months pregnant. *Imitates talking to the doctor* "Really, doctor? I'm already old, I am 40 years old". (FGD2-P1)</i></p> <p><i>"First time I came to midwife when my pregnancy had been three months. I did not realize that I was pregnant already because there is no symptom like dizziness or nausea."</i> (FGD5-P1)</p>	
		Perceived importance of Antenatal Care (ANC)	<p><i>"It is important to go to the PHC service because I want to know not only my pregnancy but the nutrition needs and dietary habits whilst I am pregnant."</i> (FGD1-P3)</p> <p><i>"To know my baby is healthy and developing."</i> (FGD5-P2)</p>	
		Fears associated with attending Primary Health Care (PHC)	<p><i>"...There was a mother who felt scared to check from the first time she knew she was pregnant to 9 months of pregnancy; she never went to the PHC service ... her condition became critical in labor. Fortunately, both mother and baby were okay."</i> (FGD3-P2)</p> <p><i>"I had a fear for the first time I came to the PHC service... I was afraid to be diagnosed with a problem in my pregnancy. I was afraid to find out."</i> (FGD1-P4)</p> <p><i>"I am afraid at the PHC service if it does not give me an excellent service. But the service is okay, but I am more concerned if there is something wrong with my baby."</i> (FGD1-P4)</p>	
		Affordability of ANC	<p><i>"I choose this PHC service because the PHC service is cheap."</i> (FGD1-P5)</p> <p><i>"There is no problem with accessibility or transportation or cost because if they have a national identity or health insurance, it is all free."</i> (MW1-P3)</p>	
Cultural and social dynamics	Myths associated with pregnancy		<p><i>"After I came to the PHC service, my beliefs do not change my mind about going outside after 5 pm, except if there is an emergency like if the baby is sick, or if I am sick... I do not know the reason why I can't go outside. It is just from my family."</i> (FGD1-P5)</p> <p><i>"I came to PHC service for the first time in the fifth month ... The reason I only came in the fifth month is that I had nausea before, and I was told (by my family) that nausea should end first before I can go to the PHC service."</i> (FGD1-P6)</p> <p><i>"I cannot eat after 9 pm. Sometimes I feel hungry at midnight, but I am not allowed to eat... It is not good, for my health, my parents said."</i> (FGD1-P1-2)</p> <p><i>"It is pivotal (for pregnant women to feel safe). Most of the people in this area are middle-to-low-income and have a low level of education. So, they have to be taken care of. If not, they will easily believe in myths..."</i> (MW3-P2)</p>	
		Influence of family and friends	<p>Decision making</p> <p><i>"My husband recommends this PHC service for me. I have heard from my family and friends to come here."</i> (FGD1-P1)</p> <p><i>"...it is my body, my authority, not my husbands. I don't need permission from my husband."</i> (FGD3-P3)</p>	
			<p>Attendance within ANC</p> <p><i>"Most of them are accompanied by a friend, their mother, or their husband."</i> (MW4-P3)</p> <p><i>"It is pivotal (for both pregnant woman and father of the baby to attend the visits) for the information to be known by the pregnant woman but also by her husband. Perhaps, the husband has something they want to share with the midwife. So, there is good communication between everyone."</i> (MW3-P2)</p>	
			<p>Shame from the community</p> <p><i>"When she (neighbor) went to give birth, she had only checked her pregnancy once. One month before giving birth. Sometimes it is a shame when the pregnancy is too close to the first child."</i> (FGD2-P4)</p>	
				<p><i>month... The reason I only came in the fifth month is that I had nausea before, and I was told (by my family) that nausea should end first before I can go to the PHC service."</i></p>
				<p><i>income and have a low level of education... So, they have to be taken care of. If not, they will easily believe in myths..."</i> (MW3-P2)</p>

month... The reason I only came in the fifth month is that I had nausea before, and I was told (by my family) that nausea should end first before I can go to the PHC service."

Midwives within this study commented on the importance of health promotion and education to debunk such myths within the community.

"It is pivotal (for pregnant women to feel safe). But, unfortunately, most people in this area are middle-to-low-

income and have a low level of education... So, they have to be taken care of. If not, they will easily believe in myths..." (MW3-P2)

Within this study, several women commented that their husbands, friends, or family members had recommended primary health care through PHC services. Due to the significant influence from partners or family members on recommendations regarding health care, midwives of this study suggested involving husbands within

Table 4b. Summary of Categories, Themes, Sub-Themes, and Associated Quotes Shaping Uptake of Antenatal Care

Category	Theme	Sub-theme	Associated Quote	
Community and health care conditions	Availability of services	Waiting area	“They need to add more seats, as sometimes I have to stand up. There are a lot of pregnant women that wait by standing.” (FGD1-P5) “We have facilitated the patient who comes here with some entertainment such as reading stations and a playground for children... We hope they will not feel bored while waiting.” (MW5-P4)	
		Timely services	“I went to a midwife clinic for my first pregnancy because I did not need to wait.” (FGD4-P1) “I think they should add more professionals because there are many patients, so we need more time with the professional to consult more.” (FGD1-P5) “They (pregnant women) feel the queue is the biggest barrier... the wait” (MW1-P3)	
		Online bookings	“Nowadays, we can register it online. The registration is fast, but the queue is long. The service sometimes does not match to the time written as it is some times delayed.” (FGD4-P5)	
		Variety of services offered	“In the first visit, a pregnant woman will get a general health check and laboratory examination or complete blood examination, regarding HIV, Hepatitis B, and others...If there are problems or risks, the pregnant woman will be referred.” (MW3-P1)	
	Getting to the facility	Transport	“No, there is no problem because the transportation is easy.” (FGD1-P4) “For transportation, actually there is no barrier, but for one village far from here, the village provides transport for the patient to the PHC service. Cadre accompanies them. It is 10 km, because of the traffic jam, so it takes 30 minutes at least.” (MW4-P3)	
		The closeness of the facility	“I choose here (PHC) because it's nearby.” (FGD4-P2) “In the future, I would come here, but not for pregnancy (plans to not have anymore children) but for other services. It is because this PHC service is the nearest place to come, and it is complete with services.” (FGD1-P5)	
	Patient-practitioner rapport			“The service is excellent and efficient– the same as in the hospital. The quality of health service is good, and the midwives here are good as we know them from our previous pregnancies.” (FGD1-P5) “Sometimes there are doctors who care. Sometimes there are people who are too annoyed by their patients.” (FGD2-P6) “The doctor is pleasant, he asks, “What do you feel? What's the complaint?” It is nice for someone to care like that...” (FGD2-P6) “There is a rumor at this public PHC service that the staffs are not good, which is why some women choose not to come here. I have sacrificed a lot to improve the coverage of pregnant women to come here.” (MW5-P6)
				“The reason (pregnant women drop off for appointments) are they are afraid when they are referred to the hospital, or they go back to their hometown or their family who can help them to take care of their baby.” (MW5-P5) “Commonly, they (pregnant women) come back to here because they know the process, and they're familiar with the staff so they feel comfortable to come back.” (MW1-P5)
				“We, as a midwife, arrange the schedule for the upcoming antenatal visit routinely. So, they have already known when they have to come back. In addition, I also have cadre as my extension to follow up the condition of pregnant woman and remind them to come to the PHC service.” (MW2-P1)
Midwife perceptions on 'no-shows'				

the ANC visits as pivotal:

“It is pivotal (for both pregnant woman and father of the baby to attend the visits) for the information to be known by the pregnant woman but also by her husband. Then, perhaps, the husband has something they want to share with the midwife. So, there is good communication between everyone.” (MW3-P2)

Despite the potential influence of family and friends in decision making, many women from this study population shared that ultimately the decision was their own:

“...it is my body, my authority, not my husbands. I don't need permission from my husband”.

This study discussed the shame felt by the pregnant

women from the community if the pregnancy was too close to a previously born child. Indeed, the participants shared that not seeking ANC or slow uptake of ANC was often shaped by this shame experienced,

“So when she (neighbor) went to give birth, she had only checked her pregnancy once. One month before giving birth. Sometimes it is a shame when the pregnancy is too close to the first child.”

Community and Health Care Conditions

The participants in this study expressed their concern over the limited waiting seats within PHC services. This often resulted in the pregnant women having to “wait by

standing”, and several suggested additional seats would facilitate a more comfortable waiting area. While women reported choosing other, sometimes less equipped facilities due to the waiting time:

“I went to a midwife clinic (private) for my first pregnancy because I did not need to wait.”

If women choose not to go to a PHC service, other ANC options include private hospitals, traditional birth attendants, or private midwife clinics. Although often conventional birth attendants or private midwives have access to all the necessary facilities or the skills required to provide comprehensive ANC. However, despite the want for more seats in the waiting area, the midwives shared that the staff tried their best to provide an engaging waiting area through.

“...entertainment such as reading stations and a playground (inside) for children... We hope they will not feel bored while waiting.”

Despite the long waiting times, the participants of this study commented on the effectiveness of the online booking system and the ability to book through WhatsApp streaming processes.

“Nowadays, we can register it online. The registration is fast, but the queue is long. The service sometimes does not match to the time written as it is sometimes delayed.”

Further, participants commented that their consults would often be short due to the high number of patients at the PHC services. Participants felt that they were unable to receive all the information they required.

“I think they should add more professionals because there are many patients, so we need more time with the professional to consult more.”

In this study, participants shared that there was no problem getting to the facility due to living close to the facility and/or having access to transport. In addition, several women shared that the facilities could easily be accessed by walking or riding their scooters in less than 10 minutes, and many would come to the facility for reasons other than their pregnancy.

“In the future, I would come here, but not for pregnancy (plans to not have any more children) but for other services. This is because this PHC is the nearest place to come, and it is complete with services.”

One midwife shared that cadre, or community health volunteers, also have a vital role as maternal health promoters, often accompanying pregnant women from their community to the PHC service.

“For transportation, actually there is no barrier, but for one village far from here, the village provides transport for the patient to the PHC service. Cadre accompanies them. It is 10 km, because of the traffic jam, so it takes 30 minutes at least.”

The patients highlighted the importance of satisfac-

tion between the patient and the health care providers within this study. Namely, the quality (perception of) and friendliness of service delivered, alongside feeling like enough information was shared, “The doctor is pleasant, he asks, “What do you feel? What's the complaint?” It is nice for someone to care like that.” In contrast, rumors associated with one PHC staff being inadequate influenced the pregnant women in the area accessing that facility. One of the midwives explained that women in the area chose not to come to the facility, as they believed the staff were “not good”. Further, this midwife shared that “I have sacrificed a lot to improve the coverage of pregnant women to come here”, such as spending time outside of work hours to build rapport and trust with the pregnant women in the community. Conversely, one midwife explained that several patients come to their PHC service due to the connections and relationships made with their patients.

In some cases, the midwives shared that it was because the pregnant women were afraid that if they attend an ANC appointment and there are concerns with their pregnancy, they will be referred to the hospital. For many women, this raises feelings of apprehension. It was believed that being referred to a hospital with a high-risk pregnancy means they would need to undergo a cesarean section at childbirth. Conversely, some women also no longer returned for follow-up appointments as they moved away or back to their hometowns.

“The reason (pregnant women drop off for appointments) is they are afraid when they are referred to the hospital, or they go back to their hometown or their family who can help them to take care of their baby.”

In contrast, midwives suggested that the comfortable feeling facilitated return visits and to avoid no-shows. It was essential to deliver a friendly and caring service.

“Commonly, they (pregnant women) come back here because they know the process and familiar with the staff, so they feel comfortable to come back.”

While midwives shared the importance of the *kader-kader/cadre* (community health volunteers) as a critical service within communities facilitating outreach and promoting utilization of ANC to stop ‘no-shows’.

“We, as a midwife, arrange the schedule for the upcoming antenatal visit routinely. So, they have already known when they have to come back. In addition, I also have cadre as my extension to follow up the condition of the pregnant women and remind them to come to the PHC service.”

Discussion

The findings suggested that limited awareness of being pregnant, alongside personal beliefs and myths in some women, shaped the rapid uptake of ANC. In a separate study, it was demonstrated that some women as-

sociate symptoms of nausea as the first signs of pregnancy. However, the authors acknowledge that this symptom typically occurs during pregnancy weeks 6-8 and peaks in weeks 11-13.²³ Consequently, not having nausea until the first trimester could shape the early uptake of ANC.²³ Promotion and investment in female education in Surabaya district should be considered to improve the early recognition of pregnancy and early uptake of ANC. At the same time, personal beliefs and myths had a significant role in this study population in delaying ANC uptake. Although midwives shared that they would consult their patients one-on-one and work with *kader-kader* to help counteract any myths within the community, these myths still influenced ANC uptake. Likewise, within a South African study, one of the well-documented risk factors for late uptake of ANC was cultural beliefs.²⁴ Therefore, efforts to debunk myths at the community level are essential due to the importance of these myths by communities.

It must be noted that finances or accessibility were not considered a constraint within this study. Although it is well recognized in the literature within low-middle income countries, the challenge that financial constraints and proximity of services impose on ANC uptake.^{25,26} Therefore, for this study population, there was a consensus that ANC was both affordable and accessible, this needs to be continued to be considered in future health promotion interventions as the finding cannot be generalized for the whole of Surabaya and Indonesia. Certainly, the strong beliefs and attitudes towards pregnancy held by husbands, families, and friends could influence pregnant women's ideas on pregnancy and ANC uptake.

In a Balinese study on pregnant women, the findings showed that pregnant women tend to take advice from their family without questioning because of trust.²⁷ Further, several admitted that they followed their family's advice to please them.²⁷ A qualitative study in the United Kingdom investigating delayed access to ANC reported that women postponed uptake to avoid adverse family reactions on how they might cope with the birth of another child.²⁸ Next, it was shown in Ethiopia that women who reported at least one ANC visit with their husbands were 6.27 times more likely to use skilled birth attendants than their counterparts who attended ANC alone.²⁹ Consequently, it is vital to encourage partners, families, and friends in ANC and any current and future maternal and infant health promotion and educational campaigns to support positive outcomes in pregnancy.

A pressing finding of this study suggested that feeling comfortable with the facilities may be essential in shaping ANC uptake and return visits. Separate research explained that the long waiting times made the facilities less convenient and limited the enjoyment of the ser-

vice.³⁰ In some cases, it could act as a barrier to service uptake, with participants of this study choosing to leave the clinic or seek a private midwife rather than queuing at the PHC.³⁰ Although the PHC services within this study utilized technology for booking appointments, the technology failed to inform women about the waiting time. A mixed-methods evaluation of e-booking in medical practices showed that patients appreciate using technology for appointments due to the flexibility and time savings.³¹ While, a review on mHealth applications to improve antenatal and postnatal care in low and middle-income countries suggested that utilizing mHealth for education and behavior change communication such as short message service (SMS) or voice message reminder may enhance the uptake of health services.³² Current technology in Surabaya for booking appointments could include a function to inform patients on waiting times and if a delay in their appointment will reduce long waiting times and improve the overall comfort of attending ANC appointments.

Finally, receiving quality care (perception of) and friendly, trustworthy service from the practitioners at the PHC services was a theme across all FGDs. In particular, one of the pregnant women receiving ANC from her local hospital exclaimed that she changed health care providers and health facilities due to the perceived adverse treatment from her doctor where she felt she was more of an annoyance, "Sometimes there are doctors who care, sometimes there are people who are too annoyed by their patients." While none of the other participants highlighted any negative patient-provider relationship interactions as a reason influencing their uptake of ANC, many believed it was a reason shaping the uptake of ANC within their communities. A qualitative study conducted in Malawi on the patient-provider relationship and ANC uptake showed that the patient-provider relationship appears to have a significant impact on ANC participation.³³ Further, the study results suggested the attitudes of the health care provider can influence uptake of ANC and improve the patient-provider relationship, may increase ANC attendance, and consequently decrease pregnancy complications.³³ In addition, a study exploring the provision and uptake of routine ANC services in low and middle-income countries reported that perceived poor quality of ANC could influence the uptake of services.³⁴ Certainly, improving the (perception of) quality of the ANC delivered within the communities could improve ANC uptake and patient satisfaction.

Despite the study following a strict protocol, it is essential to recognize the limitations. First, all pregnant women were welcome to participate within the FGDs, whether it was their first pregnancy or returning after already having multiple pregnancies. It could have influenced results as a first-time mother could have different

thoughts on ANC compared to mothers who have already experienced multiple pregnancies. Moreover, before the commencement of one FGD, the head of the PHC services was present, organizing the room and greeting the participants. Even though the head left before FGD, the presence at the beginning of FGD might have impacted the results. However, it was made clear within the informed consent that all thoughts shared were confidential and would not affect the participants' relationship with the health facility. In addition, in one FGD, a husband was present due to cultural factors. It could have altered the results of the study again. However, to have this participant involved within the FGD, it was vital to respect the wishes and allow the husband to sit in.

Due to the scope of the study, only five FGDs and SSIs were conducted. Therefore, the study's findings were limited to a small sample in the city and urban areas of Surabaya and those attending ANC services in PHC services. Consequently, the results should not be considered generalizable to the broader population. In contrast, it was also essential to consider that under-reporting was a distinct possibility within this setting due to potential recall bias or the sensitive nature of the questions. Finally, due to the FGDs and SSIs being a joint research project between Australian and Indonesian authors, translations from Bahasa Indonesia to English of the data were required. At times, meanings could be lost in translation; therefore, interpretation of the results in English could miss the true sense. In order to overcome this limitation, translations were checked by a minimum of two individuals, and the qualitative data was reviewed by the translators and the second author fluent in both languages to minimize meanings being lost in translation.

Conclusion

Despite a considerably high ANC coverage of 77% within Indonesia, this study highlighted several factors influencing the timely uptake of ANC. These factors primarily involve individual fears on a negative diagnosis and myths that delay ANC uptake rather than stopping attendance completely. Further, women experience shame from the community if their pregnancy is too close to previous pregnancies, again delaying ANC uptake. Additionally, overcrowded PHC services resulting in long wait time may shape return ANC visits. Finally, a factor that may influence return ANC visits concerns if the service provided is not perceived as friendly or feeling uncomfortable with the practitioners. The findings of this study suggest the need to tailor health promotion strategies around early uptake of ANC and ensuring return visits.

Abbreviations

ANC: Antenatal Care; MMR: Maternal Mortality Ratio; FGD: Focus Group Discussion; PHC: Primary Health Care; SSI: Semi-Structured

Interviews; GU: Griffith University; IDR: Indonesia Rupiah; SMS: Short Message Service.

Ethics Approval and Consent to Participate

Ethics approval was obtained from Griffith University Human Research Ethics Committee (GU ref no: 2019/424) and the Universitas Airlangga (ref no: 15494-KEPK). All participants gave informed written consent.

Competing Interest

The author declares that there are no significant competing financial, professional, or personal interests that might have affected the performance or presentation of the work described in this manuscript.

Availability of Data and Materials

The data that support the findings of this study are available from the corresponding author, LJ, upon reasonable request.

Authors' Contribution

LJ conceptualized and designed the study and research questions, assisted in data collection, data analysis, initial interpretation, and drafted the manuscript. ND carried out data collection and was a supervisor of the project. NW and NH were supervisors of the project and assisted in overall study design and research questions. ND, NW, and NH reviewed and revised the analyzed data and manuscript. All authors read and approved the final manuscript.

Acknowledgment

This project was supported by The Ministry of Research, Technology and Higher Education (MRTHE) in Indonesia, Universitas Airlangga, and Griffith University. The authors thank Ratna Wulandari and Ilham Akhsanu Ridlo for their contribution to data collection. The authors also acknowledge Hilda Izzaty, Erin Sebtiarini, Arintika Chorunnisa Islami, Dwi Ratna Paramitha, Arini Novianty, and Tita Rismayanti for their assistance in the data translation. Finally, the authors would like to express their gratitude to all participants in this study.

References

1. Haftu A, Hagos H, Mehari M, G/her B. Pregnant women adherence level to antenatal care visit and its effect on perinatal outcome among mothers in Tigray public health institutions, 2017: cohort study. *BMC Research Notes*. 2018; 11 (1).
2. World Health Organization. Trends in maternal mortality: 2000 to 2017. World Health Organization; 2019.
3. Das A. Does antenatal care reduce maternal mortality?. *Mediscope*. 2017; 4 (1): 1-3.
4. Nababan HY, Hasan M, Marthias T, Dhital R, Rahman A, Anwar I. Trends and inequities in use of maternal health care services in Indonesia, 1986-2012. *International Journal of Women's Health*. 2018; 10: 11-24.
5. The United Nations Children Fund. Antenatal care - UNICEF DATA. UNICEF DATA; 2019.
6. World Health Organization. 2018 Health SDG profile: Indonesia. *Searo.who.int*; 2018.
7. Brooks M, Thabrany H, Fox M, Wirtz V, Feeley F, Sabin L. Health facility and skilled birth deliveries among poor women with Jamkesmas

- health insurance in Indonesia: a mixed-methods study. *BMC Health Services Research*. 2017; 17 (1).
8. Yap W, Pambudi E, Marxoeki P, Jewelwayne S, Tandon A. Maternal health report: revealing the missing link. *Documents.worldbank.org*; 2017.
 9. Agus Y, Horiuchi S. Factors influencing the use of antenatal care in rural West Sumatra, Indonesia. *BMC Pregnancy and Childbirth*. 2012; 12 (1).
 10. Efendi F, Chen C, Kurniati A, Berliana S. Determinants of utilization of antenatal care services among adolescent girls and young women in Indonesia. *Women & Health*. 2016; 57 (5): 614-29.
 11. Fauk N, Cahaya I, Nerry M, Damayani A, Liana D. Exploring determinants influencing the utilisation of antenatal care in Indonesia: a narrative systematic review. *Journal of Healthcare Communications*. 2017; 02 (04).
 12. Schröders J, Wall S, Kusnanto H, Ng N. Millennium development goal four and child health inequities in Indonesia: a systematic review of the literature. *PLOS ONE*. 2015; 10 (5): e0123629.
 13. Sujana T, Barnes M, Rowe J, Reed R. Decision making towards maternal health services in Central Java, Indonesia. *Nurse Media Journal of Nursing*. 2017; 6 (2): 68.
 14. Rosales A, Sulisty S, Miko O, Hairani L, Ilyana M, Thomas J, et al. Recognition of and care-seeking for maternal and newborn complications in Jayawijaya district, Papua Province, Indonesia: a qualitative study. *Journal of Health, Population and Nutrition*. 2017; 36 (S1).
 15. Titaley C, Hunter C, Dibley M, Heywood P. Why do some women still prefer traditional birth attendants and home delivery?: a qualitative study on delivery care services in West Java Province, Indonesia. *BMC Pregnancy and Childbirth*. 2010; 10 (1).
 16. Ansariadi A, Manderson L. Antenatal care and women's birthing decisions in an Indonesian setting: does location matter?. *Rural Remote Health*. 2015; 15 (2): 2959.
 17. Titaley C, Hunter C, Heywood P, Dibley M. Why don't some women attend antenatal and postnatal care services?: a qualitative study of community members' perspectives in Garut, Sukabumi and Ciamis districts of West Java Province, Indonesia. *BMC Pregnancy and Childbirth*. 2010; 10 (1).
 18. Hennink MM, Kaiser BN, Weber MB. What influences saturation? Estimating sample sizes in focus group research. *Qualitative Health Research*. 2019; 29 (10): 1483-96.
 19. Palinkas L, Horwitz S, Green C, Wisdom J, Duan N, Hoagwood K. Purposeful sampling for qualitative data collection and analysis in mixed method implementation research. *Administration and Policy in Mental Health and Mental Health Services Research*. 2015; 42 (5): 533-44.
 20. Dilshad R, Latif M. Focus group interview as a tool for qualitative research: an analysis. *Pakistan Journal of Social Sciences*. 2015; 33 (1): 191-8.
 21. DeJonckheere M, Vaughn L. Semistructured interviewing in primary care research: a balance of relationship and rigour. *Family Medicine and Community Health*. 2019; 7 (2): e000057.
 22. Mills A, Durepos G, Wiebe E. Coding: selective coding. *Encyclopedia of Case Study Research*; 2010.
 23. Heitmann K, Svendsen H, Sporsheim I, Holst L. Nausea in pregnancy: attitudes among pregnant women and general practitioners on treatment and pregnancy care. *Scandinavian Journal of Primary Health Care*. 2016; 34 (1): 13-20.
 24. Ebonwu J, Mumbauer A, Uys M, Wainberg M, Medina-Marino A. Determinants of late antenatal care presentation in rural and peri-urban communities in South Africa: a cross-sectional study. *PLOS ONE*. 2018; 13 (3): e0191905.
 25. Ogbo F, Dhami M, Ude E, Senanayake P, Osuagwu U, Awosemo A, et al. Enablers and barriers to the utilization of antenatal care services in India. *International Journal of Environmental Research and Public Health*. 2019; 16 (17): 3152.
 26. Yasuoka J, Nanishi K, Kikuchi K, Suzuki S, Ly P, Thavrin B, et al. Barriers for pregnant women living in rural, agricultural villages to accessing antenatal care in Cambodia: a community-based cross-sectional study combined with a geographic information system. *PLOS ONE*. 2018; 13 (3): e0194103.
 27. Wulandari L, Klinken Whelan A. Beliefs, attitudes and behaviours of pregnant women in Bali. *Midwifery*. 2011; 27 (6): 867-71.
 28. Haddrill R, Jones G, Mitchell C, Anumba D. Understanding delayed access to antenatal care: a qualitative interview study. *BMC Pregnancy and Childbirth*. 2014; 14 (1).
 29. Teklesilasie W, Deressa W. Husbands' involvement in antenatal care and its association with women's utilization of skilled birth attendants in Sidama zone, Ethiopia: a prospective cohort study. *BMC Pregnancy and Childbirth*. 2018; 18 (1).
 30. Ekawati F, Claramita M, Hort K, Furler J, Licqurish S, Gunn J. Patients' experience of using primary care services in the context of Indonesian universal health coverage reforms. *Asia Pacific Family Medicine*. 2017; 16 (1).
 31. Paré G, Trudel M, Forget P. Adoption, use, and impact of e-booking in private medical practices: mixed-methods evaluation of a two-year showcase project in Canada. *JMIR Medical Informatics*. 2014; 2 (2): e24.
 32. Feroz A, Perveen S, Aftab W. Role of mHealth applications for improving antenatal and postnatal care in low and middle income countries: a systematic review. *BMC Health Services Research*. 2017; 17 (1): 704.
 33. Roberts J, Sealy D, Marshak H, Manda-Taylor L, Gleason P, Mataya R. The patient-provider relationship and antenatal care uptake at two referral hospitals in Malawi: a qualitative study. *Malawi Medical Journal*. 2015; 27 (4): 145-50.
 34. Downe S, Finlayson K, Tunçalp Ö, Gülmezoglu A. Provision and uptake of routine antenatal services: a qualitative evidence synthesis. *Cochrane Database of Systematic Reviews*; 2019.

Geographic Accessibility towards Primary Health Care in Karawang District

Nabila Ramadina*, Mulya Nurmansyah Ardisasmita, Budi Sujatmiko

Department of Public Health, Faculty of Medicine, Universitas Padjadjaran, Bandung, Indonesia

Abstract

Health accessibility refers to the availability of health care services accessible to the community as required. However, the convenience of accessing such services vary throughout regions due to geography. Hence differences in geographic accessibility can be an obstacle to accessing health care. This study characterized the influence of geographic accessibility on primary health care (PHC) in Karawang District. A cross-sectional study was conducted in November 2019 in five sub-districts of Karawang District. Respondents were interviewed using questionnaires to collect geographic (mileage and travel time from respondents' house to nearest PHC) and transportation (mode of transportation and transportation cost) data. In total, the study involved 513 randomly selected households, of which 11% had far to travel to the PHC, 22% had a long traveling time, and 23% had expensive transportation costs, with motorcycles being the most common means of transport. Therefore, PHCs in several sub-districts in Karawang District are less accessible due to geographic barriers.

Keywords: geographic accessibility, Karawang District, primary health care

Introduction

Health facilities provide health care services, including promotive, preventive, curative, or rehabilitative programs conducted by the central government, local government, and/or communities. Those that provide primary health care (PHC) are community health centers, doctor practices, dental practices, primary clinics, and primary class hospitals.¹ The PHC is the essential health service to maintain public health because they are affordable and more accessible than specialists or hospitals.²

Accessibility in the context of health is the availability of health services that can be accessed as and when required by individuals.³ Health facilities, equipment, and services should be accessible to all communities, especially the vulnerable or marginalized groups such as minorities, indigenous people, women, children, the elderly, and individuals with disabilities, including in rural areas.⁴ Access to health facilities can be classified into five dimensions: availability, accessibility, affordability, acceptability, and accommodation.⁵ The last three dimensions are unrelated to space and reflect financial regulation and cultural factors in health care, whereas the first two dimensions are related to the area. Availability refers to the number of PHC services that the patient can select, and accessibility is the travel barrier (distance or time) be-

tween the location of the patient and the health service.⁵

Geographic accessibility is the ease of residents accessing health care services measured by the distance, duration of travel, and road infrastructure.⁶ Geographic accessibility assumes that every member of the population has the potential to be a service user and the accessibility patterns depend on the location of the population and service facilities.⁷ Geographical accessibility differences in health care arise because of the distance between the population and the source of health care. Specifically, health services are provided in limited quantities to a specific location, whereas they must serve a population that comes continuously and is not distributed evenly in an area. Thus, the common obstacles to access health care are long-distance, poor transportation access, and high healthcare costs.

Indonesia is an archipelago with 17,504 islands, a population of 246.9 million, and is one of the largest countries in the world with a total area of 5,193,250 km² (covering land and sea). This information places Indonesia as the 7th largest country globally after Russia, Canada, the United States, China, Brazil, and Australia. However, the vast region of Indonesia poses its problems regarding equality in health care access,⁸ with the highly diverse geographical situation posing a severe challenge

Correspondence*: Nabila Ramadina, Department of Public Health, Faculty of Medicine, Universitas Padjadjaran, Jatinangor, Bandung, West Java, Indonesia, E-mail: nabila.ramadina@gmail.com, Phone: +62 81 2218 10604

Received : October 19, 2020
Accepted : May 06, 2021
Published : August 24, 2021

regarding access to health facilities.

Based on National Basic Health Research/*Riset Kesehatan Dasar* (Riskesdas) in 2018, the knowledge of access to health facilities was measured using the Principal Component Analysis (PCA) method in three dimensions: (1) types of transportation used to reach health facilities, (2) round trip travel time from home to health facilities, and (3) round trip fees incurred for transportation to health facilities. Knowledge of access to PHC provided an index score of 39.29%, with a correlation between 0.02 and 0.14.⁹

Located in West Java, the Faculty of Medicine of Universitas Padjadjaran has the vision to improve the public health sector. The West Java Province has 27 districts with a total of 1,069 PHCs. Karawang District has a population of 2.9 million people and 50 PHCs, giving a ratio of 1.72 PHCs per 100,000 population.¹⁰ Hence, approximately 1–2 PHCs should serve 100,000 people, which is a relatively small number for a highly populated district and a growing number of sick individuals and sudden disease outbreaks. Therefore, Karawang District was chosen to conduct a detailed survey about the geographic accessibility of PHC in the area. Karawang District Health Department supported this study, the theme of which was highly relevant to the Universal Health Coverage vision in Indonesia, which included access to health facilities as one of the indicators.¹¹

Method

A cross-sectional study was conducted in November 2019 involving five sub-districts of Karawang District; Batujaya, Rengasdengklok, Tempuran, Lemahabang, and Cikampek. The respondents were interviewed using questionnaires. In addition, five villages were selected randomly from each sub-district, with a local cadre inviting the residents to be a respondent.

The questionnaire consisted of several items regarding the respondents' identity and four open questions asking about mileage, travel time, mode of transportation, and transportation cost to reach the nearest PHC from the respondents' house in one go. Of 275 enumerators across the 25 villages in five sub-districts in Karawang District conducted the interviews. This study was part of large public health study in Karawang District led by the Faculty of Medicine, Universitas Padjadjaran. These enumerators were the 2nd-grade medical students previously trained to equalize perception about the interview and questionnaire.

The interview process was conducted using a redcap application installed on the enumerator's mobile phone with available internet access. The application recorded all the data obtained by the enumerator, then transmitted to a server owned by the Faculty of Medicine, Universitas Padjadjaran, monitored online. The inclusion criteria

were invited healthy respondents who did not have any of the five diseases currently studied by the Faculty of Medicine, Universitas Padjadjaran, e.g., tuberculosis (TB), diabetes mellitus (DM), human immunodeficiency virus/acquired immunodeficiency syndrome (HIV/AIDS), leprosy, and psychiatric disorder. In comparison, the exclusion criteria were respondents who had those five diseases and those who attended health facilities not categorized as PHC. The collected data were downloaded from the redcap server, went through a cleaning process, and finally processed using Microsoft Excel software to evaluate geographic accessibility characteristics.

Results

In total, this study involved 631 questionnaires, of which 94 (14.9%) were incomplete, 12 were duplicates (1.9%), and 12 respondents (1.9%) were not included in the PHC criteria. Thus, there were total data (n) from 513 questionnaires (81.3%) used in this study after the cleaning process (Table 1).

From Table 1, the respondents from the five sub-districts in Karawang District were mainly female (83.8%), adults (46.6%), and married (91%), probably because the interviews were conducted between 9 am to 1 pm, therefore mainly housewives were available to accept the invitation to participate. Furthermore, most respondents had graduated from elementary school (52%), which may be related to the time of data collection since working residents with a higher education level were not at home. However, this data also corresponded to the data from the Ministry of Education of the Republic of Indonesia, which indicated that elementary school graduates were the largest proportion in Karawang District.¹² Most respondents came from the Batujaya Sub-district (25.9%). They had a monthly income below the Minimum Wage/*Upah Minimum Karyawan* (UMK)/ (62.6%), which might be related to the Rate of Working Participation/*Tingkat Partisipasi Angkatan Kerja* (TPAK) (63.62%) and Rate of Unemployment/*Tingkat Pengangguran Terbuka* (TPT) (9.61%) in 2019.¹³ The most visited type of health facility was PHC (49.9%).

Table 2 shows the characteristics of geographic accessibility to PHC in Karawang District. Some respondents wrote "do not know" or misperceived the questions related to the above variables when filling out the questionnaire. Hence, out of a total of 513 respondents, the response rate regarding the mileage was 82.6%, travel time was 94.3%, transportation costs were 73.1%, and the means of transportation was 97%.

The shortest distance (minimum) to a health facility was 5 m, and the furthest distance (maximum) was 50 km, giving a median value of 1 km. This was related to the diverse location of respondent's houses compared to

Table 1. Characteristics of the Respondents in Five Sub-Districts of Karawang District

Variable	Characteristic	Total (n = 515)	
		n	%
Gender	Male	85	16
	Female	430	84
Age (n = 482)	Teenager (12–25 years old)	56	12
	Adult (26–45 years old)	239	50
	Middle-aged (46–65 years old)	161	33
	Elderly (>65 years old)	26	5
Marital status (n = 512)	Single	13	2
	Married	465	91
	Divorced/widow/widower	34	7
Last education level (n = 481)	Not go to school	18	4
	Not finished elementary school	9	2
	Graduated from elementary school	251	52
	Graduated from junior high school	121	25
	Graduated from senior high school	76	16
	University	6	1
Sub-district* (n = 509)	Batujaya	133	26
	Rengasdengklok	82	16
	Tempuran	120	24
	Lemahabang	105	21
	Cikampek	69	13
Monthly income (IDR) (n = 456)	<Minimum wage (2,275,715.00)	321	71
	Minimum wage (2,275,715.01) – 2 times of minimum wage (4,551,430.00)	111	24
	>2 times of minimum wage (4,551,430.01)	24	5
	Health facilities type	Primary health care	256
	Clinic	124	24
	Midwife	95	18
	Nurse	25	5
	Others	13	3

Notes: *The following villages were selected in each sub-district: Batujaya: Baturaden, Karyabakti, Kutaampel, Kertajaya, Segarjaya; Rengasdengklok: Dewi Sari, Dukuh Karya, Kertasari, South Rengasdengklok, North Rengasdengklok; Tempuran: Ciparagejaya, Jayanegara, Purwojaya, Sumberjaya, Tempuran; Lemahabang: Karyamukti, Kedawung, Lemahabang, Pasirtanjung, Pulomulya; Cikampek: Cikampek City, South Cikampek, East Cikampek, West Dawuan, East Dawuan.

the source of healthcare in each sub-district. Travel time was determined by the distance and mode of transportation used, with individual ability considered as a contributing factor. The fastest travel time (minimum) to a health facility was 15 seconds and the longest travel time (maximum) was 120 minutes. Transportation costs were associated with public and private transportation availability, followed by individuals' preference for transportation based on their financial capacity. The median travel time to the health facility was 10 minutes. The lowest transportation cost (minimum) was IDR 0, and the highest transportation fee was IDR 50,000 (maximum), giving a median value of IDR 10,000.

The most common means of transportation used by respondents to reach PHC were motorcycles and on foot. Some respondents also used public transportation such as city transportation and motorcycle taxis or their car or bicycle, and the least used means of transportation was rickshaws.

From Table 3, 11% of health facilities were more than

Table 2. Characteristics of the Geographic Accessibility to Public Health Care in Five Sub-Districts of Karawang District

Variable	n	%	Median	Min-Max
Mileage (km)	424		1	0.005-50
Travelling time (minute)	484		10	0.25-120
Transportation cost (IDR)	375		10,000	0-50,000
Transportation (n = 496)				
Walking	96	9.3		
Bike	3	0.6		
Motorcycle	276	55.6		
Car	5	1.0		
Public transportation	15	3.0		
Taxi bike	12	2.4		
Rickshaw	2	0.4		
Others	85	17.1		

5 km from the respondent's home, with most health care facilities (95%) being close in the sub-districts, Lemahabang and Cikampek. Twenty-two percent of respondents took more than 20 minutes to reach the health facilities, with Lemahabang having the most significant

Table 3. Geographic Accessibility to Primary Health Care in Five Sub-Districts of Karawang District

Variable	Category	Total		Batujaya		Rengasdengklok		Tempuran		Lemahabang		Cikampek	
		n	%	n	%	n	%	n	%	n	%	n	%
Mileage	Near (≤5km)	376	89	94	91	55	86	84	78	87	95	54	95
	Far (>5 km)	48	11	9	9	9	14	24	22	5	5	5	5
Traveling time	Fast (≤20 minutes)	380	78	97	77	60	75	81	73	91	89	47	78
	Slow (>20 minutes)	104	22	29	23	20	25	30	27	11	11	15	22
Transportation cost	Cheap (≤IDR 10.000)	288	77	58	62	55	82	66	84	68	82	43	86
	Expensive (>IDR 10.000)	87	23	35	38	12	18	15	16	15	18	7	14

proportion of respondents (89%) with a traveling time of ≤20 minutes (fast). Transportation costs for some respondents (23%) were also considered inexpensive (≤IDR 10,000), with Cikampek having the most significant proportion (86%) of affordable transportation costs. In comparison, Batujaya had the highest proportion (38%) of expensive transportation costs >IDR 10,000.

Discussion

Recently, World Health Organization (WHO) has promoted universal health coverage programs to provide everyone with access to health care when required without financial hardship.¹⁴ Indonesian Government, through Government Regulation No. 47 of 2016 on Health Care Facilities, has set several policies related to access to health care facilities that focus on equal distribution. The distribution also takes into account the aspects of service needs, population, and accessibility to make it easier for the community to reach PHC and improve the service’s conduciveness.¹⁵

The most common respondents in this study were females. Gender further explains differences in health care access since females are independently associated with higher unmet health care needs compared to males.¹⁶ In this study, the most common age category was adults aged 26–45 years. The older a person is, the lower the immune system, hence the more significant the disease burden, therefore the more likely to access healthcare resulting in higher effort for treatment.¹⁷

One of the socioeconomic demographic factors that are statistically related to the act of health search was marital status, and most respondents were married in this study. Advice from a husband or wife could be a strong driver for a person to seek treatment.¹⁸ Most respondents graduated from elementary school with limited knowledge of health. Limited health literacy was associated with low socioeconomic status, comorbidities, and poor access to health care, suggesting that it might be an independent risk factor for health disparities.¹⁹

Most respondents came from the Batujaya Sub-district, possibly because of the availability of residents in that area to attend the interview. This study showed that

the monthly income of respondents was mainly below the UMK. Universally, most studies show that lower socioeconomic status is associated with more access barriers.²⁰ The most visited type of health facility by respondents was PHC, which is generally available in every sub-district to provide essential health services.

Geographical variation is one of the physical conditions that affect access to health care.²¹ People will use health care facilities if they are within reach. According to Notoatmodjo, the community will not use health care facilities unless they can use them. Furthermore, one reason a person does not use health care is that the health facilities are very far away.²² Wibowo stated that the further a health facility is, the more reluctant the people will visit.²³

Mileage is closely associated with the travel time to reach health care facilities, with a faster travel time making it easier to reach health services. If the distance of health care is very close, people do not need transportation. People will think twice about traveling to the health facility only for health problems or diseases they believe are ‘not that severe.’²⁴ Based on the Regulation of the Minister of Health of the Republic of Indonesia number 75 of 2014, PHC should be established in each sub-district based on the consideration of service needs, the number of residents, and accessibility, with more than one community health center established in one sub-district.²⁵ Tempuran was the sub-district with the furthest mileage and longest time travel, possibly because it covers an area of 8,849 Ha consisting of 2,051 Ha of land and 6,438 rice fields.²⁶ Tempuran also has 14 villages with 65,245 people in 2016 but only equipped with two PHC, four additional PHC (*puskesmas pembantu*), and six general practitioner clinics.²⁷

Transportation is one of the essential factors supporting access to health care. Ideally, health care facilities should be easily reached so that the community can get the health services they need.²³ The lack of transportation (or even none) to the health care facilities will affect the behavior of health care seeking in general; because the utilization of health facilities is influenced by geographical factors, scattered communities, remoteness,

difficulty, and expensive transportation costs.²² If transportation costs are too high, it can affect people's quality of life because expenses must be allocated for transportation costs.²⁴ Although health care is already accessible in several countries, spending on transportation to health care facilities is an important consideration for families to take advantage of health care. In brief, high transportation costs are likely to discourage someone from coming to the health care facility. The consequences of expensive transportation will make people consider choosing other health care facilities that are easier to access with the cheaper vehicle. However, they have to spend more to get the service, for example, the nearest nurses or midwives.²⁸ Batujaya Sub-district had the highest proportion of high transportation costs, possibly because it is the largest sub-district with an area of 9,189 Ha and geographically diverse land types.²⁹ Considering the breadth of the area, Batujaya is only equipped with limited private vehicles and three types of public transportation; pedicabs, 3-wheeled vehicles, and rowboats making transportation costs high.³⁰

These results were in line with Sparrow,³¹ and Johar's study,³² on utilizing health cards in Indonesia, which recommended that government price subsidies effectively improved access to public health services in health centers if equipped with other interventions. Health care should be easily accessible to everyone in society, and the distribution of health facilities is essential for the delivery of good health services. Health services concentrated in urban areas rather than rural areas do not provide a good service for all. If the health facility is easy to reach with available transportation, it will be widely utilized by the community.⁸ This study confirmed that physically, both geographically, regional conditions and distances, contribute to people's access to health care facilities.

Geographical barriers are one of the most dominant factors affecting Indonesia's accessibility of health services due to it being an island nation. The government even specifically released a policy about geographical barriers. Through the Decree of the Director-General of Health Management Efforts Number HK.03.05/II/2485/2012, a policy was issued on Guidelines for Improving Access to Health Services in Disadvantaged Areas, Borders and Islands/*Daerah Tertinggal, Perbatasan dan Kepulauan Terluar* (DTPK) to ensure the accessibility of health services to vulnerable areas in terms of service availability.³³ The Ministry of Health also issued a policy of Nusantara Sehat to improve access and quality of essential health services in DTPK and Health Troubled Areas/*Daerah Bermasalah Kesehatan* (DBK), aiming to maintain the continuity of services, community empowerment, provide integrated health services, as well as improve the retention of health workers who work in DTPK.³⁴

Understanding access to healthcare from the community perspective as a consumer can provide valuable input to the planning process. Policymakers can use data on health care access issues to identify and support priorities regarding funding for improvement.³⁵ Public involvement in the stewardship of the system is also critical to achieving a high-quality system based on evidence and equity values.³⁶

This study was the first study that discussed geographic accessibility in Karawang District and was supported by Karawang District Health Office, which would use the study results as evaluation material for local governments to access health services to achieve equal access area. The limitation of this research was the minimum time to prepare the enumerators to perform the interview. Adequate preparation and briefing were the essential steps to avoid miscommunication and anticipate the diversity of education and knowledge levels when researching with interview methods, thereby obtaining optimal answers.

Conclusion

This study shows that PHC in several sub-districts of Karawang District is still less accessible due to geographic barriers such as distance, long travel times, and expensive transportation costs. Both private and public transportation are available to support the mobilization of the community to PHC in Karawang District. However, the transportation costs incurred by some respondents are relatively expensive due to the distance from health facilities. The participation of the government and the community is urgently needed to address the barriers that complicate access to improve the geographic accessibility of PHC in Karawang District.

Abbreviations

PHC: Primary Health Care; Risesdas: *Riset Kesehatan Dasar* (National Basic Health Research); PCA: Principal Component Analysis; TB: Tuberculosis; DM: Diabetes Mellitus; HIV/AIDS: Human Immunodeficiency Virus/Acquired Immunodeficiency Syndrome; UMK: *Upah Minimum Karyawan* (Minimum Wage); TPAK: *Tingkat Partisipasi Angkatan Kerja* (Rate of Working Participation); TPT: *Tingkat Pengangguran Terbuka* (Rate of Unemployment); WHO: World Health Organization; DTPK: *Daerah Tertinggal, Perbatasan, dan Kepulauan Terluar* (Daerah Tertinggal, Perbatasan dan Kepulauan Terluar); DBK: *Daerah Bermasalah Kesehatan* (Health Troubled Areas).

Ethics Approval and Consent to Participate

Ethical approval was obtained from the Faculty of Medicine Ethics Committee, Universitas Padjadjaran No: 1359/UN6.KEP/EC/2019. Subjects were explained the study's aims, risks, and procedures and signed informed consent as an agreement before the research was conducted

Competing Interest

The author declares that there are no significant competing financial, professional, or personal interests that might have affected the performance or presentation of the work described in this manuscript.

Availability of Data and Materials

Data are not available due to the ethical restrictions of the research. Participants of this study disagreed for their data to be shared publicly.

Authors' Contribution

NR: concept and design, data collection, literature research, data processing, and interpretation; MNA: concept and design, final approval of the article; BS: data collection, statistical expertise, final approval of the manuscript.

Acknowledgment

The authors would like to thank all the respondents of this research in Karawang District, especially the Health Department of Karawang District, for supporting this research. The author(s) fully thank Universitas Padjadjaran for the financial support for this study by the name of community service activities of Universitas Padjadjaran under the theme of "The Revitalization of Bumi Walagri in Karawang District."

References

1. Badan Penyelenggaraan Jaminan Sosial Kesehatan. Panduan praktis pelayanan kesehatan. BPJS Kesehatan Website; 2014.
2. Ursulica TE. The relationship between health care needs and accessibility to health care services in Botosani County-Romania. *Procedia Environmental Science*. 2016; 32: 300-10.
3. Evans DB, Boerma T. *Bulletin of the World Health Organization*. World Health Organization; 2015: 10-11.
4. Meier BM, Onzivu W. The evolution of human rights in World Health Organization policy and the future of human rights through global health governance. *Pubmed.gov*. 2014; 128 (2): 179-87.
5. Levesque J-F, Harris MF, Russell G. Patient-centred access to health care: conceptualising access at the interface of health systems and populations. *International Journal for Equity in Health*. 2015; 12 (1): 18.
6. Megatsari H, Laksono AD, Ridlo IA, Yoto M, Azizah AN. Perspektif masyarakat tentang akses pelayanan kesehatan. *Buletin Penelitian Sistem Kesehatan*. 2019; 21(4): 247-53.
7. Apparicio P, Gelb J, Dubé A-S, Kingham S, Gauvin L, Robitaille É. The approaches to measuring the potential spatial access to urban health services revisited: distance types and aggregation-error issues. *International Journal of Health Geographics*. 2017; 16 (1): 32.
8. Nainggolan O, Hapsari D, Indrawati L. Pengaruh akses ke fasilitas kesehatan terhadap kelengkapan imunisasi baduta (analisis Risesdas 2013). *Media Penelitian dan Pengembangan Kesehatan*. 2016; 26 (1): 15-28.
9. Kementerian Kesehatan Republik Indonesia. Laporan Risesdas 2018. Laporan Nasional Risesdas 2018. 2018; 53 (9): 181-222.
10. Kementerian Kesehatan Republik Indonesia. Data dasar puskesmas. Kemkes RI Website; 2019.
11. Kementerian Kesehatan Republik Indonesia. 16 Indikator universal health coverage (UHS). Kemkes RI Website; 2018.
12. Kementerian Pendidikan Republik Indonesia. Jumlah data peserta didik per Kabupaten/Kota: Kab. Karawang, Kemdikbud RI Website; 2020.
13. Badan Pusat Statistik Kabupaten Karawang. TPAK dan TPT (Persen) 2018-2020. BPS Kab Karawang; 2018-2020.
14. World Health Organization. Universal health coverage. World Health Organization; 2020.
15. Presiden Republik Indonesia. Peraturan Pemerintah Republik Indonesia nomor 47 tahun 2016 tentang fasilitas pelayanan kesehatan. Jaringan Dokumentasi dan Informasi Hukum BPK RI; 2016.
16. Socias ME, Koehoorn M, Shoveller J. Gender Inequalities in Access to health care among adults living in British Columbia, Canada. *Women's Health Issues*. 2016; 26 (1): 74-9.
17. Anggraini MT, Rohmani A. Hubungan kepuasan pasien dengan minat pasien. Lembaga Penelitian dan Pengabdian Kepada Masyarakat Universitas Muhammadiyah Semarang; 2012.
18. Widayati A. Health seeking behavior di kalangan masyarakat urban di Kota Yogyakarta. *Jurnal Farmasi Sains dan Komunitas*. 2012; 9 (2): 59-65.
19. Savitz ST, Bailey SC, Dusetzina SB, Jones WS, Trogdon JG, Stearns SC. Treatment selection and medication adherence for stable angina: the role of area-based health literacy. *Journal of Evaluation in Clinical Practice*. 2020; 26 (6): 1711-21.
20. McMaughan DJ, Oloruntoba O, Smith ML. Socio-economic status and access to healthcare: interrelated drivers for healthy aging. *Frontiers in Public Health*. 2020; 8: 231.
21. Mohanty SK, Kim R, Khan PK, Subramanian SV. Geographic variation in household and catastrophic health spending in India: assessing the relative importance of villages, districts, and states, 2011-2012. *The Milbank Quarterly*. 2018; 96 (1): 167-206.
22. Verdina MA. Faktor-faktor yang berhubungan dengan pemanfaatan pelayanan kesehatan imunisasi dasar di Kabupaten Ketapang, Sanggau, dan Sintang Tahun 2007 [Tesis]. Fakultas Kesehatan Masyarakat Universitas Indonesia; 2012: 1.
23. Azwar H. Analisis kepuasan masyarakat terhadap pelayanan publik. *Sosio e-Kons*. 2020; 11: 259.
24. Ridzkyanto RP. Pemanfaatan posyandu lansia berdasarkan karakteristik individu di Indonesia (analisis data indonesia family life survey 2014). *Jurnal Ilmu Kesehatan Masyarakat*. 2020; 16 (2): 60-6.
25. Menteri Kesehatan Republik Indonesia. Peraturan Menteri Kesehatan Republik Indonesia Nomor 75 tahun 2014 tentang pusat kesehatan masyarakat. Pelayananjakarta.go.id; 2014.
26. Pemerintah Kabupaten Karawang. Profil Kecamatan Tempuran 1. Published online; 2016.
27. Pemerintah Kabupaten Karawang. Data monografi Kecamatan Tempuran. Published Karawang Kab Website; 2012.
28. Zavras D. Studying healthcare affordability during an economic recession: the case of greece. *International Journal of Environmental Research and Public Health*. 2020; 17 (21): 1-21.
29. Pemerintah Kabupaten Karawang. Profil Kabupaten Karawang. Karawang Kab Website. 2017; 1-26.
30. Pemerintah Kabupaten Karawang. Data monografi Kecamatan

- Batujaya. Karawang Kab Website; 2012.
31. Sparrow R, Suryahadi A, Widyanti W. Social health insurance for the poor: targeting and impact of Indonesia's askeskin programme. *Social Science & Medicine*. 2013; 96: 264-271.
 32. Ly C. Essays on universal health coverage in Indonesia. ProQuest Diss Theses. Durham University Library and Heritage Collections. 2018: 149.
 33. Direktorat Jenderal Bina Upaya Kesehatan Kementerian Kesehatan Republik Indonesia. Pedoman peningkatan akses pelayanan kesehatan dasar di DTPK. Direktorat BUK Dasar, Dirjen BUK, Kemenkes RI; 2012.
 34. Kementerian Kesehatan Republik Indonesia. Sekilas nusantara sehat. Kemkes RI Website; 2015.
 35. Mohammed K, Nolan MB, Rajjo T, Shah ND, Prokop LJ, Varkey P, et al. Creating a patient-centered health care delivery system: a systematic review of health care quality from the patient perspective. *American Journal of Medical Quality* 2016; 31 (1): 12-21.
 36. Martin D, Miller AP, Quesnel-Vallée A, Caron NR, Vissandjée B, Marchildon GP. Canada's universal healthcare system: achieving its potential. *Lancet*. 2018; 391 (10131): 1718-35.

King Bhumibol Adulyadej's Sufficiency Economy Philosophy and Post-Traumatic Stress Disorder among Higher-Education Students from the Armed Conflict Region of Thailand

Chonnakarn Jatchavala*, Arnont Vittayanont

Department of Psychiatry, Faculty of Medicine, Prince of Songkla University, Songkhla, Thailand

Abstract

This cross-sectional survey assessed the association between post-traumatic stress disorder symptoms and perceived self-sufficiency, reflecting the Sufficiency Economy Philosophy (SEP), conceived by H.M. King Bhumibol Adulyadej (King Rama IX). It was conducted among university students on one campus located within the area affected by the Southern Thailand insurgency and another campus located in a nearby province outside of the restive area. All self-administered questionnaires consisted of questions related to personal information, the Thai version of the PTSD checklist, and a questionnaire aimed at measuring the perceived self-sufficiency according to H.M. King Bhumibol Adulyadej's SEP. The study found that most university students in the restive area affected by the Southern Thailand insurgency perceived to live sufficiently according to H.M. King Bhumibol Adulyadej's SEP. The rate of perceived self-sufficiency was also higher than reported by the students from the other campus in a nearby province. Moreover, self-sufficiency exhibited a significant inverse association with PTSD symptoms.

Keywords: armed conflict, economy, philosophy, post-traumatic stress disorder, student

Introduction

Over the 16 years—January 1, 2004, to April 14, 2019—of the armed conflict affecting some parts of the Southern Region of Thailand, 20,588 violent incidents have been officially reported; they have been responsible for 7,123 deaths and another 13,308 people injured.¹ This insurgency has primarily affected the Southern Border Provinces (SBP) of Pattani, Yala, and Narathiwat.¹ Consequently, local civilians, especially young people, have been at risk of many psychiatric disorders such as substance-related disorders and post-traumatic stress disorder (PTSD). Such cases have also been found to present more complicated symptoms than usual.²

According to DSM-5 and several other studies, post-traumatic stress disorder (PTSD) negatively impacts many dimensions of well-being—physical, mental, social, and economical.²⁻⁶ Moreover, Hoeltherhoff and Chung,⁴ maintain that “self-efficacy” is a mediator in controlling PTSD symptoms after the patient experienced life-threatening events. Higher education, being employed, and being “never married” were found to be protective factors among survivors of the 2001 World Trade Center attack.⁵ Most prior studies on PTSD in Thailand have ex-

plored its prevalence and the symptoms predictive factors among survivors of natural disasters.⁶ However, Sonpaveerawong, *et al.*,⁷ reported that a critical protective factor from mental health problems related to natural disasters in Thailand, including PTSD symptoms, is the high social support that characterizes the Thai society. Together with cognitive behavioral therapy, the high social support has been supported by many studies to be effective in PTSD treatment among people residing in the insurgent areas of Southern Thailand.⁸ So far, no previous study has attempted to elucidate a protective paradigm related to PTSD symptoms in the armed-conflict areas of Southern Thailand, which have markedly distinct contexts compared with the other parts of Thailand.

The Sufficiency Economy Philosophy (SEP) was introduced to the Thai people by the late H.M. King Bhumibol Adulyadej (King Rama IX) of Thailand over 40 years ago. Its core concepts were partly derived from Buddhist Economics, which focused on the “middle path” (*majjhimā paṭipadā*) and “self-actualization” (*vijā*) to handle the economy's supply chain. However, the late King Rama IX also engaged “sustainability” into his expanded philosophy to make it more practical.⁹ The late

Correspondence*: Chonnakarn Jatchavala, Department of Psychiatry, Faculty of Medicine, Prince of Songkla University, Songkhla, Thailand, Email: jchonnak@medicine.psu.ac.th, Phone: +66 7445 1351-2

Received : January 27, 2021

Accepted : June 11, 2021

Published : August 24, 2021

King's SEP was endorsed by the Thai government as a national policy in 1997, during the Asian financial crisis, to cope with both the mental and economic situations that were pervasive at the time nationwide. The SEP model targets enhancing appropriate deliberation (moderation) based on rationality (reasonableness) and developing the risk-management skills (self-immunity) of Thai people. Moreover, this philosophy focuses on people's morality and pursuit of knowledge. Owing to its efficacy in yielding positive outcomes, the SEP has been enshrined in Thailand's constitutions from 2006 onwards.¹⁰

Besides economic outcomes, evidence of psychological benefit related to SEP has also been reported. In 2011, Jatchavala and Pitanupong surveyed lifestyle adaptations and attitudes toward H.M. King Bhumibol Adulyadej's SEP in a district of Songkhla Province, a nearby province to the restive areas of the South.¹¹ The survey found that people who perceived living sufficiently were 2.2 times happier than those who did not. Moreover, the participants who did not perceive living sufficiently had 1.6 times more health problems overall compared to those that perceived they were living sufficiently.¹¹ Another study on SEP among Thai farmers also reported that SEP had a strong positive effect on their subjective happiness.¹²

Thus, the main objective of this study was to examine the association between the perception of self-efficiency according to H.M. King Rama IX's SEP and PTSD symptoms among university students from the restive areas of Southern Thailand. Another aim was to discover a paradigm and associate factors that could help prevent psychological illness and improve mental health in populations, especially the young people who live in war zones or armed conflict areas.

Method

Of 960 university students of Prince of Songkla University were approached for recruitment using convenient and straightforward randomization, following classification into three types of faculty: social sciences, health sciences, and pure/applied sciences. Of 480 participants were approached at the Pattani Campus, which is located within the area affected by the armed conflict of Southern Thailand. In contrast, another 480 participants were surveyed at the Hat Yai Campus located in the biggest city of a nearby province outside of the area directly affected by the insurgent violence. This study was part of more extensive research approved by the Ethics Committee of Faculty of Medicine, Prince of Songkla University (REC number: 61-071-3-1). Some data related to the participant's personal information, PTSD symptoms, and sense of self-sufficiency had been described in other reports.

The questionnaire was self-reported, and it consisted of three parts: (1) Personal and socioeconomic information such as age, gender, domicile, financial debt, physical health, history of mental diseases, perception of stress, and so forth; (2) The 17-item Thai version of the Post-Traumatic Stress Disorder Checklist (Thai PCL) employed a self-reported rating scale examining PTSD symptoms during three months. Its internal consistency had been reported to have a Cronbach's alpha coefficient of 0.961. In contrast, the cut-off point was reported to be at 30,¹³ with 82% sensitivity and 76% specificity; and (3) The 35-item questionnaire of perceived self-sufficiency according to the philosophy of H.M. King Bhumibol Adulyadej, which had five domains consisting of 30 items related to self-perceived moderation, reasonableness, and self-immunity adaptation in one's daily life, and another five items involving one's attitude toward the knowledge-seeking behavior in respect to morality. This questionnaire was developed by the corresponding author and approved by three experts in 2011. Its cut-off point was determined to be 40 by a pilot study in another area of Songkhla Province, and its internal consistency was validated by a Cronbach's alpha coefficient of 0.67.¹¹

This study used a cross-sectional design. The participants were approached by study assistants, psychiatrists/psychologists, and educators in their lecture rooms. The participants completed the self-administered questionnaires on a single occasion between August 8, 2018, and October 8, 2018, at the Prince of Songkla University campuses of Pattani, located in Southern Thailand's armed conflict area, and Hat Yai, located in a nearby province to the restive area.

All statistical procedures were completed using the R software package. The descriptive statistics such as those related to demographic characteristics (e.g., age, gender, and hometown) were categorized into two groups according to the campus the students were registered; the participants were represented in terms of frequency, percentage, median (interquartile range/IQR), and articulate mean. Univariate analyses were performed using the chi-square test, Wilcoxon rank sum test, and Kruskal-Wallis test for factors associated with PTSD symptoms. Moreover, a comparison of self-sufficiency perception between participants studying in the restive area and nearby provinces was conducted. Variables with a p-value less than 0.2 were included in the initial model of the multivariate analysis. The multivariate analyses were performed via logistic regressions, using the backward stepwise elimination method to examine the association between the perception of self-efficiency and PTSD symptoms. Any association which resulted in a p-value less than 0.05 was considered statistically significant.

Results

The overall response rate was 93.4% (Table 1). Most participants were Thai-ethnic female university students (94.1% and 80.3% vs. 99.6% and 81.5% at the Pattani and Hat Yai Campuses, respectively), who lived in university dormitories (72.9% and 87.9%, respectively) and perceived their economic status to be “middle class” (89.7% and 89.2%, respectively). Most of them reported having financial debt, mostly formal debt (93.3% and 73.8%, respectively), but not feeling any burden (46.0% and 47.5%, respectively). However, 28.5% of the Hat Yai-Campus students reported having taken an informal or “shark loan” compared to 10.4% of the participants from the Pattani Campus. In addition, the majority of the participants from both groups reported being healthy both physically (91.2% and 92.1%, respectively) and mentally (99.8% and 99.3%, respectively). They also tended to deny any history of domestic violence (98.4% and 97.5%, respectively), but their perception of stress related to insurgent violence was well-recognized (64.7%

and 65.1%, respectively). Religious affiliation and domicile were different between the two groups. The majority of the students from the Pattani Campus were Muslim (76.3%) and lived in the SBP areas (55.7%). In comparison, most participants from the Hat Yai Campus were Buddhist (76.8%) and domiciled in other provinces of Thailand outside of the areas afflicted by the unrest (46.8%).

Only 31.3% of the students studying at the Pattani Campus perceived living insufficiently compared to 40.6% of those who studied at the Hat Yai Campus. Although the majority in both groups reported being moderately self-sufficient (65.5% and 53.9% at the Pattani and Hat Yai Campuses, respectively), the students from Pattani, which is located in the armed-conflict area, perceived a significantly higher rate of self-sufficiency than those from Hat Yai, which does not lie in the area affected by the insurgency but in a nearby province (p-value = 0.001) (Table 2).

After univariate analysis (Table 3), the perception of

Table 1. Participants' Demographic Information

Demographic	Category	Total		Hat Yai Campus (n = 454)		Pattani Campus (n = 443)	
		n	%	n	%	n	%
Gender	Male	171	19.1	84	18.5	87	19.7
	Female	724	80.9	370	81.5	354	80.3
Age (years)	Median (IQR)	20	19, 21	20	19, 21	20	19, 21
Ethnicity	Thai	864	96.9	450	99.6	414	94.1
	Malay/Chinese	28	3.1	2	0.4	26	5.9
Religion	Buddhist	450	50.6	347	76.8	103	23.5
	Muslim	435	48.9	101	22.3	334	76.3
	Other	5	0.6	4	0.9	1	0.2
Domicile	Songkhla Province	196	22.2	132	29.1	64	14.8
	Southern border provinces	353	37.7	93	20.5	240	55.7
	Other provinces in Southern Thailand	329	37.2	212	46.8	117	27.1
	Other provinces in Thailand	26	2.9	16	3.5	10	2.3
Residence	Dormitory	711	80.4	391	87.9	320	72.9
	Other	173	19.6	54	12.1	119	27.1
Perception of economic status	Low income	45	5.0	24	5.3	21	4.8
	Middle income	798	89.5	404	89.2	394	89.7
	High income	49	5.5	25	5.5	24	5.5
Debt	No	348	39.0	181	40.0	167	38.0
	Yes, but no perception of it being a burden	417	46.7	215	47.5	202	46.0
	Yes, and perceived it to be a burden	127	14.2	57	12.6	70	15.9
Source of loan	Formal loan						
	No	87	16.3	69	26.2	18	6.7
	Yes	446	83.7	194	73.8	252	93.3
	Informal loan						
	No	430	80.7	188	71.5	242	89.6
	Yes	103	19.3	75	28.5	28	10.4
History of physical diseases	No	821	91.6	418	92.1	403	91.2
	Yes	75	8.4	36	7.9	39	8.8
History of mental illness	No	882	99.5	448	99.5	434	99.8
	Yes	4	0.5	3	0.7	1	0.2
History of domestic violence	No	856	97.9	431	97.5	425	98.4
	Yes	18	2.1	11	2.5	7	1.6
Perception of stress due to insurgent violence	Yes	307	35.1	154	34.9	153	35.3
	No	568	64.9	287	65.1	281	64.7

Notes: There were missing values for some variables, IQR: Interquartile Range. n: Sample of Participants

self-sufficiency among students studying at the Pattani campus was found to be negatively associated with PTSD symptoms (p-value <0.001). The same statistically significant association was also detected regarding the participants studying at the Hat Yai Campus (p-value =

0.007). When analyzing the 897 participants in total (all students from both campuses), a higher perception level of self-sufficiency according to the late King Rama IX's SEP was also associated with significantly fewer PTSD symptoms (p-value <0.001).

Table 2. Comparison of Self-Sufficiency Perception among Students at the Hat Yai and Pattani Campuses

	Total		Hat Yai Campus (n = 454)		Pattani Campus (n = 443)		p-value
	n	%	n	%	n	%	
Perception of self-sufficiency							0.001*
Insufficiency (score <40)	321	36.0	184	40.6	137	31.3	
Moderate sufficiency (score 40-49)	531	59.6	244	53.9	287	65.5	
Rigorous sufficiency (score ≥50)	39	4.4	25	5.5	14	3.2	
Median (IQR)	42 (38-45)		41 (37-45)		42 (39-45)		0.040 ^{a*}

Notes: ^{a*}: p-value from the Wilcoxon rank sum test, IQR: Interquartile Range

Table 3. Association between the Perception of Self-Sufficiency and Post-Traumatic Stress Disorder Symptoms among Students at the Hat Yai and Pattani Campuses

PTSD Symptoms	Perception of Self-sufficiency (Score)						p-value
	<40		40-49		≥50		
	n	%	n	%	n	%	
Hat Yai campus (n = 454)	184	100	244	100	25	100	0.007*
Negative (score 1-29)	139	75.5	213	87.3	21	84.0	
Positive (score ≥30)	45	24.5	31	12.7	4	16.0	
Pattani campus (n = 443)	137	100	287	100	14	100	<0.001*
Negative (score 1-29)	71	51.8	221	77.0	11	78.6	
Positive (score ≥30)	66	48.2	66	23.0	3	21.4	
Both groups in total	321	100	531	100	39	100	<0.001*
Negative (score 1-29)	210	65.4	434	81.7	32	82.1	
Positive (score ≥30)	111	34.6	97	18.3	7	17.9	
Median (IQR)	22 (17-35)		20 (17-26)		20 (17-25.5)		0.001 ^{a*}

Notes: ^{a*}: p-value from the Wilcoxon rank sum test, PTSD: Post-Traumatic Stress Disorder, IQR: Interquartile Range

Table 4. Factors Associated with Post-Traumatic Stress Disorder Symptoms among University Students at Pattani Campus

Demographic	PTSD among University Students		p-value (LR test)
	Crude OR (95% CI)	Adjusted OR (95% CI)	
Age	0.79 (0.66-0.93)	0.78 (0.65-0.95)	0.006
Ethnicity			0.034
Thai	1		
Malay/Chinese	2.81 (1.11-7.11)	3.08 (1.09-8.72)	
Domicile			0.004
Other provinces in Southern Thailand	1	1	
Southern border provinces	2.04 (1.21-3.42)	1.92 (1.15-3.27)	
Songkhla Province	0.98 (0.46-2.10)	0.88 (0.4-1.95)	
Other provinces in Thailand	0 (0-Inf.)	0 (0-Inf.)	
Perception of stress due to insurgent violence			0.019
No	1	1	
Yes	1.73 (1.12-2.68)	1.76 (1.10-2.82)	
Perception of self-sufficiency			<0.001
Sufficiency (>40 points)	1	1	
Insufficiency (<40 points)	3.19 (2.03-5.00)	3.35 (2.09-5.39)	

Notes: PTSD: Post-Traumatic Stress Disorder, LR: Likelihood Ratio, OR: Odds Ratio, CI: Confidence Interval

In the multivariate analysis (Table 4), age, ethnicity, domicile, perception of stress, and perceived self-sufficiency were found to be significantly associated with PTSD symptoms among the participants who studied in the restive area. Older students were at 0.78-times higher risk for experiencing PTSD symptoms for every year they were older than their younger counterparts (95% CI = 0.65, 0.93). Meanwhile, the Malay/Chinese ethnic students and those whose domicile was in the SBP of Thailand were at 3.08- and 1.92-times increased risk for suffering from PTSD symptoms compared with those who were Thai ethnics and domiciled in provinces not affected by the insurgency (95% CI = 1.09, 8.72, and 1.13, 3.27 respectively). Furthermore, students who reported self-perceived stress related to the insurgency were found to face a 1.76-times higher risk of experiencing PTSD symptoms than those who did not (95% CI = 1.10, 2.82). In addition, a 3.35-times higher risk for developing PTSD symptoms was reported among participants who perceived they did not live sufficiently compared with those who did (95% CI = 2.09, 5.39).

Discussion

This study was the first study to explore associations between the late King Rama IX of Thailand's Sufficiency Economy Philosophy and mental disorder symptoms. This survey identified young people and ethnic minorities as susceptible populations for post-traumatic stress disorder symptoms like many prior studies.¹⁴ The majority of this study's participants residing in the armed-conflict areas of Thailand were Muslim, while most of the surveyed university students in a nearby province to the restive areas were Buddhist. The latter seemed to understand and apply the late king's philosophy more efficiently, most likely because it was derived from the Buddhist Economics concept. However, the authors found that participants from the restive areas, predominantly Muslim, reported living self-sufficiently at a higher proportion than those who were domiciled in non-restive provinces.

Nevertheless, Buddhists and Muslims share the same goal of living/having a "good life." The extinction of the "three fires," greed, aversion, and ignorance, could be interpreted in light of the concept of "nibbāna" as the ultimate spiritual purpose in traditional Buddhism. In contrast, the "*hayatan tayyibah*" concept represents the pursuit of a good wholesome life in Islamic philosophy, which entails contentment in the present life and the hereafter in paradise.^{15,16} In Islam, the attainment of a good life, known as "*Qana'ah*" or "self-contentment," is believed to lead to a reassured soul (*Nafs-ul-Mutmainnah*) in one's pursuit of the "good wholesome life".¹⁷ Therefore, the overlap of some SEP concepts with those of Islamic philosophy, which are beneficial for both men-

tal health promotion as well as toward the eradication of poverty in the armed-conflict areas of Southern Thailand.¹⁸ The application of this philosophy could prove instrumental in helping improve the campus ethos as well as the community's capacity to ensure resilience. In regards to this, a study that was a part of this project reported a significant association between better resilience and a lifestyle in line with the late King Rama IX's SEP.¹⁹

However, since most of the university students studying within the armed-conflict zone and an area not directly affected by insurgent violence perceived self-sufficiency, it may be concluded that religion might not be a limitation for applying the late King's SEP in practice. Sufficiency Economy Philosophy may help achieve sustainable growth by improving health care for developing countries, especially those in South-East Asia.^{18,20} Regarding the association of PTSD symptoms with a perceived self-sufficient lifestyle, it needs to be pointed out that not all participants who reported positive results via the screening test would have been necessarily diagnosed with post-traumatic stress disorder. Since a psychiatrist's diagnosis is the gold standard for diagnosing a mental illness, other mental disorders like generalized anxiety disorder and major depressive disorder could have been diagnosed in such cases, as they share some of the PTSD symptoms.²¹

However, since cognitive-behavioral therapy (CBT) has been reported to be efficient psychotherapy not only for PTSD but also for many other psychological diseases such as anxiety and depression, it could be said that it would be feasible to incorporate the core concept of the late king's SEP into the CBT techniques.²² In other words, adjusting one's attitudes and actions following the concept of the "middle way" (moderation) using logic (reasonableness) could enhance "reality testing," a CBT technique, leading to cognitive changes. Meanwhile, risk management (self-immunity) could be applied along the lines of "behavioral experiments" through the process of trial and error.²³ However, since the evidence supporting the use of the late King Rama IX's SEP as a protective strategy for mental disorders is still insufficient, further studies are needed on this topic.

Conclusion

In the armed-conflict areas of Southern Thailand, people who belong to the Malay ethnic minority are young, a student in the university, and reside in the Southern Border Provinces of Thailand. They have an elevated risk for PTSD symptoms; the same is true for those experiencing stress related to the insurgent violence and who lead a self-insufficient life. However, the students from areas affected by the armed conflict were statistically more self-sufficient than those who studied in a nearby

province outside of the restive area. According to H.M. King Bhumibol Adulyadej's SEP, living self-sufficiently was statistically associated with fewer PTSD symptoms in both groups.

However, this study was designed as a cross-sectional survey; thus, even though factor association could be examined, no cause and effect could be established. Cohort studies are suggested for further study in the future. Moreover, since any philosophy can be interpreted in several ways, both qualitative and multi-level analytic studies could assist in furthering the knowledge and practical application related to this topic.

Abbreviations

SBP: Southern Border Provinces of Thailand, PTSD: Post-Traumatic Stress Disorder, SEP: Sufficiency Economy Philosophy; IQR: Interquartile Range; CBT: Cognitive-Behavioral Therapy.

Ethics Approval and Consent to Participate

This study was approved by the Ethics Committee, Faculty of Medicine, Prince of Songkla University (REC number: 61-071-3-1). Participants were provided with an informed consent form to sign by the research assistants. The consent form contained detailed information regarding the study's objectives, risks, and benefits.

Competing Interest

The author declares that there are no significant competing financial, professional, or personal interests that might have affected the performance or presentation of the work described in this manuscript.

Availability of Data and Materials

The data of this study's findings are available upon reasonable request to the corresponding author and the Department of Psychiatry, Faculty of Medicine, Prince of Songkla University, Thailand. However, the data are not available to the public regarding the participants' privacy and security.

Authors' Contribution

CJ designed the study, reviewed the literature, and analyzed and interpreted the data. AV supervised and edited the manuscript contents. Both authors discussed the findings and contributed to the manuscript preparation.

Acknowledgment

The corresponding author presented this study orally and was awarded the "Outstanding Psychiatrist for Excellence in Research" prize at the Annual Congress of the Psychiatric Association of Thailand, in Bangkok, Thailand, on November 7-8, 2019. Concerning the same study, the author was also honored with the annual "Pride of PSU (Prince of Songkla University)" award on March 13, 2020, by the Prince of Songkla University's Chancellor for her distinction in research contribution and presentation. The authors sincerely appreciate Ms. Kruewan Jongborwanwivat, Mrs. Nisan Werachattawan, and the other local research assistants for their invaluable help in data collection and

statistical analysis. Moreover, both authors would like to express our gratitude to Dr. Mohammad Manzoor Malik for his mentorship on Islamic philosophy. This article was edited by Mr. Edmond Subashi and Mr. Andrew Tait from the International Affairs Office of the Faculty of Medicine, Prince of Songkla University.

References

1. Deep South Watch. Summary of incidents in Southern Thailand, March 2020; 2020.
2. Jatchavala C, Vittayanont A, Ngamkajornviwat A. Post-traumatic stress disorder and resilience in substance-related disorders for patients in the South Thailand insurgency. *ASEAN Journal of Psychiatry*. 2018; 19 (2): 2251-7805.
3. American Psychiatric Association. *Diagnostic and Statistical Manual of Mental Disorders*. 5th ed. Arlington: American Psychiatric Association; 2013.
4. Hoelterhoff M, Chung MC. Self-efficacy as an agentic protective factor against death anxiety in PTSD and psychiatric co-morbidity. *The Psychiatric Quarterly*. 2020; 91 (1): 165-81.
5. Kung WW, Liu X, Huang D, Kim P, Wang X, Yang LH. Factors related to the probable PTSD after the 9/11 world trade center attack among Asian Americans. *Journal of Urban Health: Bulletin of the New York Academy of Medicine*. 2018; 95 (2): 255-66.
6. Jatchavala C, Vittayanont A. Post-traumatic stress disorder symptoms among patients with substance-related disorders in the restive areas of south Thailand insurgency. *Songklanagarind Medical Journal*. 2017; 35 (2): 121-32.
7. Sonpaveerawong J, Limmun W, Chuwichian N. Prevalence of psychological distress and mental health problems among the survivors in the flash floods and landslide in Southern Thailand. *Walailak Journal of Science and Technology*. 2019; 16 (4): 255-64.
8. Prohmpetch W, Songwathana P. Research synthesis of mental remedies for people affected by the civil unrest in the southernmost provinces. *Journal of Liberal Arts, Prince of Songkla University*. 2018; 10 (1): 352-80.
9. Agard A, Roberts R. A re-envisioned agricultural system in Thailand: the growth in human capital experienced by agriculturalists after adoption of the sufficiency economic philosophy. *Advancements in Agricultural Development*. 2020; 1 (3): 14-26.
10. Schaffar W. Alternative development concepts and their political embedding: the case of sufficiency economy in Thailand. *Forum for Development Studies*. 2018; 45 (11): 1-27.
11. Jatchavala C, Pitanupong J. The study on the relationship between the lifestyle according to His Majesty the King's Philosophy of sufficiency economy and mental health status: the case study at Bangklam District, Songkhla Province. *Songklanagarind Medical Journal*. 2015; 33 (1): 1-8.
12. Leerattanakorn M, Wiboonpongse A. Sufficiency economy philosophy and happiness of farmers in Thailand. In: *Proceedings of the 9th ASAE international conference: Transformation in agricultural and food economy in Asia [conference proceedings on the Internet]*; 2017 January 11-15; Bangkok, Thailand: Asian Society of Agricultural Economists; 2017.
13. Chawanakrasaesin P, Rukskul I, Ratanawilai A. Validity and reliability

- of Thai version of the post-traumatic stress disorder checklist. *Journal of the Psychiatric Association of Thailand*. 2011; 56 (4): 395-402.
14. Roberts AL, Gilman SE, Breslau J, Breslau N, Koenen KC. Race/ethnic differences in exposure to traumatic events, development of post-traumatic stress disorder, and treatment-seeking for post-traumatic stress disorder in the United States. *Psychological Medicine*. 2011; 41 (1): 71-83.
 15. Patgiri R. A brief analysis of God, self, karma and rebirth in context of Buddhism and Jainism. *Psychology and Education Journal*. 2020; 57 (8): 985-87.
 16. Ali M. Contentment (qanācah) and its role in curbing social and environmental problems. *Islam and Civilisational Renewal*. 2014; 5 (3): 430-45.
 17. Ali M. The good-wholesome life (ḥayātan ṭayyibah) as an Islamic lifestyle standard. *Islam and Civilisational Renewal*. 2014; 5 (4): 591-4.
 18. Khamken P, Klomkul L, Khaw-ngern C, Khaw-ngern K. Sufficiency economy philosophy towards poverty eradication in Thailand. *Psychology and Education Journal*. 2021; 58 (1): 1406-11.
 19. Jatchavala, C., Vittayanont, A. Higher education in armed conflict region of Southern Thailand: association between H.M King Bhumibol Adulyadej's sufficiency economy philosophy and resilience. *Journal of Health And Translational Medicine*. 2020; 23 (2): 49-54.
 20. Jitsuchon S. Thailand's sufficiency economy philosophy as an alternative path to sustainable development. *European Journal of Sustainable Development*. 2019; 8 (2): 191.
 21. Jaguga F, Mwangi A, Mahugu M, Songole R, Gakinya B, Ayuku D. Post-traumatic stress disorder, major depressive disorder and generalized anxiety disorder, among university students following a terrorist attack in Kenya. *East African Medical Journal*. 2018; 95 (7): 1767-75.
 22. Leder, G. Know thyself? Questioning the theoretical foundations of cognitive behavioral therapy. *Review of Philosophy and Psychology*. 2017; 8: 391-410.
 23. Widnall E, Price A, Trompeter H, Dunn B. Routine cognitive behavioural therapy for anxiety and depression is more effective at repairing symptoms of psychopathology than enhancing well-being. *Cognitive Therapy and Research*. 2019; 44: 28-39.

COVID-19 Preparedness and the Anxiety of Thai Citizens

Afifi Lateh^{1*}, Prasopchai Pasunon², Kiflan Dolah³, Panida Kongjam⁴, Saminee Chema⁵, Phanupong Panomwan⁶, Alawee Lateh⁷

¹Faculty of Education, Prince of Songkla University Pattani Campus, Pattani, Thailand, ²Faculty of Management Sciences, Silpakorn University Petchaburi IT Campus, Petchaburi, Thailand, ³Naradhiwas Rajanagarindra Hospital, Narathiwat, Thailand, ⁴WHO/TDR Collaborating Project, Thammasat University Rangsit Center, Pathum Thani, Thailand, ⁵Pattani Hospital, Pattani, Thailand, ⁶Office of the Education Council, Bangkok, Thailand, ⁷Faculty of Management Sciences, Prince of Songkla University Hatyai Campus, Songkhla, Thailand

Abstract

The outbreak of COVID-19 has brought sickness and fatality to Thai citizens. In addition, it left a tremendous psychological impact on mental health as they experienced panic and anxiety about controlling situations and preserving their physical and mental well-being. This study aimed to analyze the factors influencing COVID-19 preparedness and anxiety based on groups of Thai citizens. Online questionnaires were employed to collect data from 2,768 respondents selected through convenience sampling and snowball sampling on Facebook, having shared questionnaires with 190 other users. Data were collected from March 29 to April 3, 2020. The acquired data were analyzed using percentage and logistic regression analyses. It found that the influencing factors of preparedness included citizens' sex, residing province, and work or off-house conditions. In contrast, the influencing factors of anxiety included their sex, age, residing province, and income adequacy. The results conveyed that Thai citizens were anxious about the pandemic and had been attempting to cope. In addition, issued policies should respond to the public promptly to prevent unnecessary panic and to maximize public cooperation against future situations put forth by the pandemic.

Keywords: anxiety, COVID-19, mental healthcare, preparedness, Thai citizens

Introduction

Coronavirus disease 2019 (COVID-19) has rapidly spread in many countries worldwide, causing notable deaths. As a result, the World Health Organization (WHO) declared the situation as a public health emergency of international concern (PHEIC) on January 30, 2020.¹ The Thai Minister of Public Health congruently said COVID-19 is a dangerous communicable disease following the Communicable Disease Act BE 2558 (2015) on February 29, 2020.² The origin of this disease was in Wuhan, Hubei, China, and was first identified at the end of December 2019. This strand of large ribonucleic acid (RNA) enveloped viruses can be found in mammals and poultry. It can infect humans via the respiratory system through droplet transmission (e.g., through coughing and sneezing), similar to the spread of influenza and contact transmission (e.g., by initially touching objects contaminated by secretions and subsequently touching the nose, mouth, or eye).³

As of June 14, 2020, Thailand had 3,135 confirmed cases, 58 deaths, and 2,987 recovered cases. The top five provinces with confirmed cases include Bangkok, Phuket

(Southern Thailand), Yala (three southern border provinces), Songkhla (Southern Thailand), and Nonthaburi (metropolitan region) with 1,542, 226, 133, 128, and 116 confirmed cases, respectively.⁴ Currently, there are no specific vaccines or antiretroviral treatments available for COVID-19. Hence, infected patients are treated as necessary based on symptoms and complications, whereas those in severe conditions are closely monitored and treated in hospitals. Most patients can self-recover from infection through symptomatic treatment. Through the coordination of the WHO, global efforts and clinical trials have been invested in to develop vaccines and cures for COVID-19.⁵ The outbreak of this disease has brought sickness and fatality and left tremendous psychological impacts on mental health. Citizens experience anxiety about coping with grave situations and maintaining their physical and mental well-being. Moreover, social stigmas might overly pressure the infected to conceal their conditions to avoid discrimination, or they might not receive the immediate treatment they need, thus feeling discouraged to afford behavioral changes to preserve their good health.⁶ When

Correspondence*: Afifi Lateh, Faculty of Education, Prince of Songkla University Pattani Campus, Pattani, 94000 Thailand, Email: afifi.l@psu.ac.th, Phone: +66-73 357 381

Received : October 29, 2020
Accepted : April 27, 2021
Published : August 24, 2021

considering psychological preparedness as an ability to manage and cope with one’s emotional response during a disaster, to better one’s cognitive and behavioral response, the widely employed classification of disaster preparedness has three categories: 1) Material Preparedness, 2) Planning Activities, and 3) Knowledge and Skills.⁷ Anxiety, on the other hand, is one of the emotions that serve the positive function of alerting us to things we might need to worry about: potentially harmful things. More importantly, these emotions help evaluate potential threats and respond to them appropriately, perhaps by quickening our reflexes or focusing our attention.⁸ COVID-19 is a global pandemic that requires meticulous mitigation preparation and coordination. Thailand is inevitably another affected nation. Hence, it needs to be ready to support its citizens with necessary health care, mental health care, food supplies, environmental facilitation, and livelihood adaptation.

Past studies on 2003 SARS preparedness, psychological preparedness, and anxiety are worth investigating in terms of social factors. First, Peng, *et al.*,⁹ reported that older adults in Taiwan who were over 50 years old with high school education were the group with more increased preparedness and more personal experiences with the epidemic than others. Hence, they suffered more damage to their mental health. Second, Hauksdottir, *et al.*,¹⁰ examined the impact of a widower’s preparedness before his wife’s death from cancer on his risk of long-term morbidity. The results found that men aged 38-61 years with a low degree of preparedness at the time of their spouse’s death had an increased risk of psychological morbidity and other symptoms; such as anxiety, a heightened startle response, emotional numbness, little or no grief resolution, and sleep disorders, even 4-5 years after the loss. For older widowers (aged 62-80 years), a low degree of preparedness increased the risk of repeated painful memories and a heightened startle response at follow-up. Finally, Cagle and Kovacs,¹¹ discovered the perceptions of preparedness and support provided by informal caregivers among hospice oncology patients, who interpreted preparedness broadly and identified multiple sources of support, including hospice personnel, family, friends, neighbors, and spiritual beliefs. Additionally, informational support, such as education and enhanced communication, is essential for preparing and supporting caregivers.

Although public agencies in Thailand are reasonably prepared to handle the COVID-19 pandemic, many Thai people remain anxious about the situation. More specifically, the general public is concerned about the issued public measures to counteract the outbreak, the levels of awareness of others, and future living adjustments. Therefore, the results were projected to reflect the outbreak preparedness and anxiety management in

conjunction with various factors based on Thai demographics. Furthermore, although this devastating humanitarian crisis is far from its ending, the results would systematically offer a better understanding of the situation and help stakeholders with future strategic reviews and formulations. Therefore, this research aimed to investigate the factors influencing preparedness and anxiety among Thai citizens.

Method

This study was a web-based cross-sectional survey. The population in this study was Thai citizens, with a total population of 66,558,935 in 77 provinces,¹² and 37,805,475 internet users (56.8% of the entire population) who were expected to complete the constructed online questionnaires.¹³ The sample size was 2,500 Thai citizens in 77 provinces who were projected to have access to the constructed online questionnaires based on Yamane’s formula with an error margin of 2% (Formula 1). The sample with returned and complete questionnaires included 2,768 respondents selected using convenience sampling and a snowball sampling method. The author shared the questionnaire via their personal Facebook wall, with the shared questionnaires reaching 190 other users. The survey was conducted through the URL: <https://forms.gle/MwzsHJiCRePF7fvZ8> from March 29 to April 3, 2020.

The instrument used was a three-section online questionnaire. Section 1 included response items on demographic data, such as sex, age, education level, occupation, residing province, characteristics of family members, income adequacy, and conditions of regular work or off-house errands. Section 2 comprised 24 response items on COVID-19 preparedness using a 5-point Likert scale where 5 represented “most important” and 1 represented “least important.” Section 3 comprised nine response items on COVID-19 anxiety using a 10-point Likert scale where 10 represented “most anxious” and 1 represented “least anxious.” This section of the instrument was developed based on the guidelines for the self-assessment of patients, other relevant medical examples, and psychological principles extracted from expert suggestions by Cao, *et al.*,¹⁵ and Hu, *et al.*¹⁶ Three experts validated the instrument to demonstrate an Item-

$$(n = \frac{N}{1+Ne^2} = \frac{37,805,475}{1+37,805,475(0.02^2)} = 2,499.83)$$

Notes:
 n = Sample size
 N = Population size
 e = Acceptable sampling error

Formula 1. Yamane’s Formula,¹⁴

Objective Congruence (IOC) range of 0.67-1.00. Section 2 pertaining to COVID-19 preparedness and section 3 examining COVID-19 anxiety were pilot-tested with 30 respondents to indicate a Cronbach's alpha of 0.84 and 0.81.

Based on the preparedness of COVID-19, the citizens were classified into three groups, wherein one was omitted: Group 1 with low outbreak preparedness (<50% total scores), Group 2 with moderate preparedness (50-79% total scores), and Group 3 with high preparedness (80% total scores or higher). However, since Group 1 only contained 128 respondents (4.62%), it was omitted from the analyses. Hence, the remaining two groups included 2,640 respondents.

Statistical analysis was assessed using the R program. Percentages were used to exhibit demographic insights, and univariate logistic regression (one dependent variable and one independent variable by taking just one independent variable at a time) and multivariate logistic regression analyses (one dependent variable and more than one independent variables by taking all the independent variable at a time) were performed to explore potential influencing factors of the Thai citizens' levels for outbreak preparedness and anxiety. Odds ratios (ORs), adjusted odds ratios (AORs), and 95% confidence intervals (95% CIs) were obtained from the logistic regression analysis. Additionally, the significance level was accepted as p-value <0.05 in all statistical analyses.

Results

The majority of the sample was female (74.13%), aged between 26 and 45 years (48.53%), and 27.50% were under 26 years of age. Mainly, the sample was graduated with a bachelor's degree (40.07%), and 31.86% had graduated with a master's degree or higher. In terms of occupation, 35.98% were teachers, lecturers, and academic employees, whereas 38.18% had other fields, such as corporate employees, homemakers, business owners, or retirees. Of 25.4% resided in the provinces of Southern Thailand, 22.06% were in the three southern border provinces, and 17.77% were in the Bangkok Metropolitan Region. In terms of family members, 27.61% of the respondents were in households with children and older adults, whereas 31.74% were not. Forty-two point six percent of respondents received adequate income to cover expenses but without savings, whereas 23.14% received adequate income with excess savings. The respondents mainly worked from home or did weekly off-house errands (45.69%), whereas 32.34% were obligated to leave their houses for work every day. However, some respondents (32.34%) were obligated to leave their houses for work every day. Based on the levels of COVID-19 preparedness and anxiety, the respondents were classified into two groups. Group 1 comprised

1,032 (39.09%) and 812 (30.76%) respondents who had moderate preparedness and anxiety, respectively, and scored between 50% and 79%. Group 2 comprised 1,608 (60.91%) and 1,828 (69.24%) respondents with high preparedness and anxiety, scoring higher than 80%, as shown in Table 1.

Table 2 shows the following data: the top five results of COVID-19 preparedness (with a maximum score of five) and anxiety (with a maximum score of ten). For COVID-19 preparedness, the respondents prioritized preliminary health check-ups (77.92%) and research on outbreak-related knowledge (68.22%). For COVID-19 anxiety, the respondents reported their concerns over public measures against the pandemic (54.70%), followed by delays and corruption within the public sector in remediating and reversing grave situations (53.94%).

Table 3 reports data based on the univariate logistic regression analysis. The influencing factors of Thai citizens' levels of outbreak preparedness with statistical significance were sex, age, education level, occupation, province of residence, and conditions of work or off-house errands. More specifically, female respondents were 1.37 times more prepared than males (95% CI = 1.14-1.63). The respondents aged between 26-45 years and over 46 years were, respectively, 1.21 and 1.39 times more prepared than those under 26 (95% CI = 1.01-1.46, 1.12-1.73). Respondents with a master's degree or higher were 1.43 times more prepared than those with lower education (95% CI = 1.16-1.75). The respondents who

Table 1. Preparedness and Anxiety Groups among Thai Citizens (n = 2,640)

Variable	Category	n	%
Preparedness	Group 1 Moderate	1,032	39.09
	Group 2 High	1,608	60.91
Anxiety	Group 1 Moderate	812	30.76
	Group 2 High	1,828	69.24

Table 2. Top Five Results of COVID-19 Preparedness and Anxiety (n = 2,640)

Variable	Category	n	%
Preparedness	Prioritized preliminary health check-ups	2,057	77.92
	Study for outbreak-related knowledge	1,801	68.22
	Monitoring of public announcements of epidemiological news	1,698	64.32
	Social distancing cooperation	1,684	63.79
	Preservation of mental health for themselves and family members	1,660	62.88
Anxiety	Public measures against the pandemic	1,444	54.70
	Delays and corruption within the public sector in remediating and reversing situations	1,424	53.94
	Increased consumption costs and crimes	1,384	52.42
	Poor public responsibility	1,311	49.66
	Unemployment and income inadequacy	1,267	47.99

Table 3. The Influencing Factors of Thai Citizens' Levels of Outbreak Preparedness and Anxiety Based on Univariate and Multivariate Logistic Regression Analyses

Variable	Category	Preparedness		Anxiety	
		OR (95% CI)	AOR (95% CI)	OR (95% CI)	AOR (95% CI)
Sex	Male	1.00	1.00	1.00	1.00
	Female	1.37 (1.14-1.63)**	1.35 (1.13-1.62)**	1.36 (1.13-1.64)**	1.42 (1.18-1.72)**
Age	<26 years	1.00	1.00	1.00	1.00
	26-45 years	1.21 (1.01-1.46)*	1.24 (0.88-1.75)	0.93 (0.75-1.14)	0.74 (0.49-1.11)
	>46 years	1.39 (1.12-1.73)**	1.28 (0.88-1.86)	0.47 (0.38-0.60)**	0.42 (0.27-0.64)**
Education	Lower education	1.00	1.00	1.00	1.00
	Bachelor degree	1.02 (0.85-1.24)	1.02 (0.74-1.40)	0.95 (0.77-1.17)	1.13 (0.80-1.61)
	Master degree or higher	1.43 (1.16-1.75)**	1.31 (0.93-1.86)	0.70 (0.57-0.87)**	0.98 (0.67-1.42)
Occupation	Students	1.00	1.00	1.00	1.00
	Healthcare profession	1.10 (0.71-1.72)	0.99 (0.54-1.85)	0.48 (0.31-0.75)**	0.76 (0.39-1.47)
	Academic profession	1.24 (1.01-1.53)*	0.95 (0.60-1.52)	0.83 (0.66-1.04)	1.40 (0.83-2.36)
	Others	1.10 (0.90-1.36)	0.93 (0.61-1.44)	0.82 (0.65-1.02)	1.18 (0.72-1.91)
Residing province	Bangkok and metropolitan	1.00	1.00	1.00	1.00
	North	1.12 (0.75-1.66)	1.13 (0.75-1.69)	0.86 (0.58-1.29)	0.77 (0.51-1.18)
	Central	0.98 (0.70-1.37)	1.04 (0.74-1.45)	0.85 (0.60-1.20)	0.75 (0.52-1.06)
	East	1.27 (0.77-2.08)	1.34 (0.81-2.21)	1.03 (0.62-1.70)	0.95 (0.56-1.61)
	North-eastern	0.94 (0.71-1.25)	0.97 (0.73-1.29)	0.91 (0.69-1.21)	0.69 (0.51-0.93)*
	West	0.58 (0.35-0.99)*	0.59 (0.35-1.01)	0.98 (0.56-1.72)	0.81 (0.45-1.46)
	Southern border provinces	0.70 (0.55-0.90)**	0.76 (0.58-1.00)*	1.09 (0.83-1.42)	0.76 (0.57-1.03)
Family members	Without children or older adult	1.00	1.00	1.00	1.00
	With children but without older adult	0.88 (0.69-1.13)	0.96 (0.74-1.23)	1.31 (1.01-1.71)*	1.12 (0.85-1.47)
	With older adult but without children	1.07 (0.87-1.31)	1.04 (0.84-1.29)	0.87 (0.70-1.08)	0.83 (0.66-1.03)
	With children and older adult	0.98 (0.80-1.20)	1.05 (0.85-1.30)	1.36 (1.09-1.70)**	1.16 (0.92-1.46)
Adequate income	Adequate income with excess for savings	1.00	1.00	1.00	1.00
	Cover expenses but without excess for savings	0.86 (0.70-1.06)	0.89 (0.72-1.10)	1.58 (1.29-1.94)**	1.47 (1.19-1.82)**
	Unstable	0.84 (0.67-1.06)	0.96 (0.74-1.23)	2.03 (1.59-2.60)**	1.84 (1.41-2.40)**
	Inadequate income to cover debts	0.88 (0.67-1.16)	0.90 (0.67-1.20)	2.44 (1.80-3.32)**	2.37 (1.72-3.27)**
Conditions of work or off-house errands	Leave house for work every day	1.00	1.00	1.00	1.00
	On shift or 2-3 times a week	1.02 (0.83-1.26)	0.97 (0.78-1.21)	0.89 (0.71-1.12)	0.85 (0.67-1.08)
	Worked from home or left home weekly	1.43 (1.20-1.72)**	1.40 (1.16-1.69)**	1.06 (0.88-1.29)	0.99 (0.81-1.22)

Notes: OR = Odds Ratio, AOR = Adjusted Odds Ratio, CI = Confidence Interval. *p-value < 0.05 **p-value < 0.01

worked as teachers, lecturers, and academic employees were 1.24 times more prepared than the students (95% CI = 1.01-1.53). The respondents who resided in the West and the three southern border provinces were, respectively, 42% and 30% less prepared than those in the Bangkok Metropolitan Region (95% CI = 0.35-0.99, 0.55-0.90). The respondents who worked from home or left home weekly were 1.43 times more prepared than those who still left home for work or left home regularly/every day (95% CI = 1.20-1.72).

Table 3 further reports the univariate logistic regression results on the influencing factors of anxiety with statistical significance and included sex, age, education level, occupation, family members, and income adequacy. More specifically, the female respondents were 1.36 times more anxious than the males (95% CI = 1.13-1.64). Respondents aged over 46 were 50% less anxious than those under 26 years (95% CI = 0.38-0.60). Respondents with a master's degree or higher were 30% less anxious than those with lower than undergraduate education (95% CI = 0.57-0.87). Respondents who worked as physicians, nurses, or other medical

professionals were 50% less anxious (95% CI = 0.31-0.75). Respondents who were in a household with children and/or older adults were 1.31 and 1.36 times less anxious than those living without children and older adults, respectively (95% CI = 1.01-1.71, 1.09-1.70). Finally, respondents with adequate income to cover expenses, unstable income, and inadequate income with debts were, respectively, 1.58, 2.03, and 2.44 times more anxious than those with adequate income with excess for savings (95% CI = 1.29-1.94, 1.59-2.60, 1.80-3.32).

In addition, the multivariate logistic regression analysis in Table 3 indicated that the only influencing factors of COVID-19 preparedness that were statistically significant among Thai citizens included sex, residing province, and conditions of work or off-house errands. The number of factors was less than that of the univariate logistic regression and with lower AORs. Specifically, female respondents were 1.35 times more prepared than males (95% CI = 1.13-1.62). The respondents in the three southern border provinces were 24% less prepared than those in the Bangkok Metropolitan Region (95% CI = 0.58-1.00). The respondents who worked from home

or left home weekly were 1.40 times more prepared than those who still worked or left home regularly every day (95% CI = 1.16-1.69).

Similar insights from Table 3, based on the multivariate logistic regression analysis, demonstrated that the only influencing factors of anxiety with statistical significance were sex, age, and income adequacy. In addition, the number of factors was less than that in the univariate logistic regression and had lower AORs (except for the sex factor). However, the residing province factor was included as a variable. More specifically, the respondents in the northeast and south (excluding the three southern border provinces) were 31% and 26% less anxious than those in the Bangkok Metropolitan Region (95% CI = 0.51-0.93, 0.56-0.98), respectively. The female respondents were 1.42 times more anxious than the males (95% CI = 1.18-1.72). Respondents aged over 46 years were 40% less anxious than those aged <26 years (95% CI = 0.27-0.64). The respondents with adequate income to cover expenses but without excess for savings, unstable income, and inadequate income with debts were, respectively, 1.47, 1.84, and 2.37 times more anxious than those with adequate income and savings (95% CI = 1.19-1.82, 1.41-2.40, 1.72-3.27).

Discussion

The majority of the respondents had high outbreak preparedness (60.91%) as they paid attention to personal health check-ups, maintained healthy mental conditions, sought knowledge on the pandemic, monitored governmental news on the situation, and cooperate in asserting social distance. However, most of them also had high anxiety (69.24%), as they were concerned about public measures, delayed remediations and restoration, increased consumption costs, unemployment, income inadequacy, crimes, and inadequate public responsibility. The results indicated that the influencing factors based on the univariate logistic regression analysis of the Thai citizens' levels of outbreak preparedness with statistical significance were sex, age, education level, occupation, province of residence, and conditions of work or off-house errands. In contrast, the influencing factors of outbreak anxiety were sex, age, education level, occupation, family member, and income adequacy. The multivariate logistic regression analysis indicated that the only influencing factors of COVID-19 preparedness that were statistically significant among Thai citizens included sex, residing province, and conditions of work or off-house errands. While, the influencing factors of outbreak anxiety were sex, age, and income adequacy.

The results were consistent with those of Roy, *et al.*,¹⁷ discovered; Indian citizens were committed to following governmental guidelines on quarantines and social

distancing and possessed high levels of anxiety. Furthermore, over 80% of these citizens were preoccupied with the COVID-19 outbreak. Wang, *et al.*,¹⁸ found that 84.7% of Chinese citizens spent 20-24 hours per day at home during the outbreak. Many reported moderate to severe psychological effects (53.8%) and developed symptoms of moderate to severe depression (16.5%) as well as moderate to severe levels of anxiety (28.8%) and stress (8.1%). The univariate logistic regression and multivariate logistic regression analyses revealed that female respondents had higher preparedness and anxiety than male respondents.

Similarly, the older or more educated the respondents were, the higher their tendency to have higher preparedness and lower anxiety. These notions were congruent with study done by Guo, *et al.*,¹⁹ wherein an academic synthesis on the prevalence of anxiety disorders in China from 2000-2015 stated that female informants had higher anxiety than males regarding general anxiety disorders, panic disorder, and social anxiety disorder. In addition, Lai, *et al.*,²⁰ indicated that female medical practitioners in China experienced more intense depression and anxiety than males regarding COVID-19.

This study also illustrated that sampled citizens in the west, and the three southern border provinces of Thailand had lower preparedness than those in other regions. Nonetheless, the northeast and south samples, except for those in the three southern border provinces, were found to have lower anxiety than those in other regions. In addition, the citizens who worked from home or left home weekly tended to demonstrate higher preparedness than those in the other two groups. Citizens in households with children and/or older adults tended to have higher anxiety than those in the other two groups.

For citizens who lived in a household with children and older adults, it was not unexpected for them to be anxious, as they had to pay special attention to caring for the vulnerable. Likewise, it was also inevitable for those with poor economic conditions to feel anxious about this pandemic. The results are partially consistent with the survey conducted by Prince of Songkla University, Pattani Campus,²¹ which stated that 91% of the respondents were worried about an information overload. However, in contrast to this study, the survey suggested that those with lower income suffered lower anxiety or mental impacts than those with a higher income. Likewise, McGreal,²² described this coronavirus as the "inequality virus". Ali, *et al.*,²³ also reported social inequality arising from COVID-19, highlighting that professionals in some occupation groups were unable to work from home, and many jobs were on hold or terminated as businesses in several industries were forced to shut down. Consequently, this economic hardship immediately posed financial risks. Furthermore, those in

ethnic minorities and marginalized groups were more prone to infections due to the long-standing structural problems of social inequality, health inequality, and genetic immunity among the vulnerable.

Moreover, the results regarding anxiety were also consistent with Egunjobi's study,²⁴ which conducted an online survey on COVID-19 fear by involving participants in 11 countries, most of whom were Nigerians. The results showed that the participants perceived COVID-19 as a biological weapon (29.2%) and divine punishment (19.8%). As many as 77% of the participants were moderately or highly frightened by the disease. Similarly, Presti, *et al.*,²⁵ classified the dynamics of fear into three courses: 1) anxiety-derived fear, especially towards COVID-19, as discussed here during this period which could pressure people to escape from affected areas; 2) disruption to the sense of self, for example, spending time finding detailed information, discussing in search for clarifications, as well as repeated thinking and reviewing on what is correct or incorrect; and 3) prejudices and discrimination, for example, in cases such as Corona Beer, with a name resembling coronavirus, receiving backlash, or Asians being reportedly prejudiced in media, as this virus originated in China.

The results conveyed that Thai citizens were anxious about the pandemic and attempted to cope with it autonomously. For example, by producing their masks and alcohol gel,²⁶ donating consumer items, artists and celebrities donating money to hospitals, groups of volunteers giving away free food, and groups of volunteers giving up their accommodations such as hotels to establish field hospitals.²⁷ The survey results from the Office of the National Economic and Social Development Council,²⁸ revealed that 67% of the sample were aware of state measures but did not have access to such aids. It was suggested that measures should be extended to cover all groups or that eligibility should be reduced to enhance outreach.

The results of this study demonstrated that over 2,600 sampled respondents had high levels of COVID-19 preparedness and anxiety. Hence, it is not surprising that the number of confirmed cases admitted to hospitals tended to decrease. The data provided were relevant as of June 14, 2020, when there were only nine confirmed cases, 90 active cases, 2,987 (89.01%) recovered cases, and 3,135 accumulated confirmed cases.⁴ However, there were still other factors at play, for example, the promulgation of the Emergency Decree, news reports on the intensity of COVID-19 in the United States and European countries, the outbreak in Singapore, and the influences of news and knowledge through social media sharing. Nevertheless, stakeholders should be aware that significant restoration and adjustment among various

dimensions, such as economic, social, cultural, and livelihood, in Thailand will take place after COVID-19 is under control. Hence, the phenomenon known as the "new normal" is a future challenge for everyone.

Although only sex and residing provinces influenced both preparedness and anxiety, it seemed that Thai citizens with the most important preparedness for COVID-19 congruently demonstrated the most anxiety. It was seen wherein the number of respondents who had high preparedness and anxiety (scored higher than 80%) was equal to 60.91% and 69.24%, respectively. However, Thai citizens were aware that self-reliance was the most crucial component during this outbreak. They understood that this outbreak is not based on factors such as social class, status, or wealth. Instead, it spreads through the air, which is a public commodity. In addition, the disease generally took longer before the infection showed symptoms (approximately 5-21 days), causing the course of this situation to be longer than other crises that the global community has ever encountered.

The limitations of this study are as follows: 1) The data were collected from an online questionnaire, which was not equally distributed across all regions due to the selected sampling techniques. Furthermore, those without access to the Internet were not included in this study. During the data collection period, the outbreak was only severe in Bangkok and the three southern border provinces. 2) The results of this study were only projected to reflect the situation from January to March 2020 adequately. After the data were collected, the government promulgated the Emergency Decree, and the epicenter of the COVID-19 pandemic shifted from China to Italy, Spain, and the United States. Hence, various data began to fluctuate rapidly and might also have, to some extent, impacted the outbreak preparedness and anxiety. However, this study should help understand the COVID-19 situation among several aspects, including public health, sociology, and economic problems, thereby helping stakeholders with future strategic reviews, managing the public, and mitigating the problem based on demographic distinctions.

Conclusion

Sex, age, education level, and occupation were the main factors influencing COVID-19 preparedness and anxiety. While residing provinces and work or off-house conditions only influenced preparedness, family members and income adequacy mainly affected anxiety. The following strategies are suggested for utilizing this study's results for future outbreak mitigation. First, the government should identify, classify, and manage the public in groups based on demographic distinctions. Second, issued policies should respond promptly to the

public's needs to prevent unnecessary panic and maximize public cooperation against future pandemic situations. Third, future studies should consider collecting more in-depth data through interviews and focus group discussions on obtaining practical data that match specific needs. In-depth insights are highly beneficial, as they can more effectively optimize outbreak preparedness and mitigate public anxiety during the pandemic.

Abbreviations

COVID-19: Coronavirus. Disease 2019; WHO: World Health Organization; PHEIC: Public Health Emergency of International Concern; RNA: Ribonucleic Acid; IOC: Item-Objective Congruence; OR: Odds Ratio; AOR: Adjusted Odds Ratio; CI: Confidence Interval.

Ethics Approval and Consent to Participate

Electronic informed consent was obtained from all respondents prior to starting the investigation. Therefore, respondents could withdraw from the survey at any moment without providing any justification.

Competing Interest

The author declares that there are no significant competing financial, professional, or personal interests that might have affected the performance or presentation of the work described in this manuscript.

Availability of Data and Materials

The data that support the findings of this study are available from the corresponding author upon reasonable request. However, the data are not publicly available because they contain information that could compromise research participant privacy and consent.

Authors' Contribution

As the principal investigator, AL conceived the idea, designed, analyzed, interpreted the study results, and drafted the manuscript. PP gave his expert opinion in sampling design and data collection and critically analyzed the data for important intellectual content. KD gave his input in the manuscript drafting and submission. PK and SC helped find the literature review and provided feedback and academic information during the study design. Finally, PhP and AIL conceived the study and co-drafted the manuscript; all authors read and approved the manuscript as submitted.

Acknowledgment

The authors thanked all of the respondents.

References

- World Health Organization. Current novel coronavirus (2019-nCoV) outbreak; 2020.
- Government Gazette. Ministry of Public Health on names and important symptoms of dangerous communicable diseases; 2020.
- World Health Organization. Modes of transmission of virus causing COVID-19: Implications for IPC precaution recommendations; 2020.
- Department of Disease Control. COVID-19 situation report; 2020.
- World Health Organization Thailand. Handbook of COVID-19 prevention and treatment. WHO; 2020.
- World Health Organization Thailand. Social stigma about COVID-19. WHO; 2020.
- Malkina-Pykh IG. An integrated model of psychological preparedness for threat and impacts of climate change disasters. The III International Conference on Disaster Management and Human Health: Reducing Risk, Improving Outcomes. C.A. Brebbia (Ed.), WIT Press, Southampto. 2013; 121-33.
- Swift P, Cyhlarova E, Goldie I, O'Sullivan, C. Living with anxiety: understanding the role and impact of anxiety in our lives. London: Mental Health Foundation; 2014.
- Peng EYC, Lee MB, Tsai ST, Yang CC, Morisky DE, Tsai LT, et al. Population-based post-crisis psychological distress: an example from the SARS outbreak in Taiwan. *Journal of the Formosan Medical Association*. 2010; 109 (7): 524-32.
- Hauksdottir A, Steineck G, Furst CJ, Valdimarsdottir U. Long term harm of low preparedness for a wife's death from cancer: a population-based study of widowers 4-5 years after the loss. *American Journal of Epidemiology*. 2010; 175 (4): 389-96.
- Cagle JG, Kovacs PJ. Informal caregivers of cancer patients: perceptions about preparedness and support during hospice care. *Journal of Gerontological Social Work*. 2011; 54 (1): 92-115.
- Department of Provincial Administration. Announcement of the Central Registration Office regarding the number of citizens throughout the Kingdom; 2020.
- National Statistical Office. Information and communication technology survey of households. NSO; 2020.
- Yamane, T. *Statistics: An introductory analysis*. 2nd Ed. New York: Harper and Row; 1967.
- Cao X, Yumul R, Elvir Lazo OL, Friedman J, Durra O, Zhang X, White PF. A novel visual facial anxiety scale for assessing preoperative anxiety. *PLoS ONE*. 2017; 12 (2): 1-7.
- Hu YH, Tsai A, Ou-Yang LW, Chuang LC, Chang PC. Postoperative dental morbidity in children following dental treatment under general anesthesia. *BMC Oral Health*. 2018; 18 (84): 1-7.
- Roy D, Tripathy S, Kar SK, Sharma N, Verma SK, Kaushal V. Study of knowledge, attitude, anxiety & perceived mental healthcare need in Indian population during COVID-19 pandemic. *Asian Journal of Psychiatry*. 2020; 51: 1-7.
- Wang C, Pan R, Wan X, Tan Y, Xu L, Ho CS, et al. Immediate psychological responses and associated factors during the initial stage of the 2019 Coronavirus Disease (COVID-19) epidemic among the general population in China. *International Journal of Environmental Research and Public Health*. 2020; 17 (5): 1-25.
- Guo X, Meng Z, Huang G, Fan J, Zhou W, Ling W, et al. Meta-analysis of the prevalence of anxiety disorders in mainland China from 2000 to 2015. *Scientific Reports*. 2016; 6: 28033.
- Lai J, Ma S, Wang Y, Cai Z, Hu J, Wei N, et al. Factors associated with mental health outcomes among health care workers exposed to Coronavirus Disease 2019. *JAMA Network Open*. 2020; e203976.
- Prince of Songkla University Pattani Campus. Survey results on measures and cooperation in surveillance of the COVID-19; 2020.
- Ali S, Asaria M, Stranges S. COVID-19 and inequality: are we all this

- together?. Canadian Journal of Public Health. 2020; 111: 415-6.
25. McGreal C. The inequality virus: how the pandemic hit America's poorest. The Guardian; 2020.
24. Egunjobi JP. The perception of COVID-19 as a fear factor in the preparation for the pandemic aftermath; 2020.
25. Presti G, McHugh L, Gloster A, Karekla M, Hayes SC. The dynamics of fear at the time of COVID-19: a contextual behavioral science perspective. Clinical Neuropsychiatry. 2020; 17 (2): 65-71.
26. Daily News. Do it yourself easily! Hand wash gel anti-virus helper "Covid 2019". Daily News; 2020.
27. Bangkok Business. Volunteer spirit "Thai people do not leave each other" in the crisis of COVID-19, we must survive. Bangkokbiznews; 2020.
28. Office of the National Economic and Social Development Council. Survey of business problems and needs; 2020.

SUBSCRIPTION FORM

The undersigned:

Name :
Address :
.....
.....
Phone Number :
E-mail :
Edition :

is willing to be Kesmas: Jurnal Kesehatan Masyarakat Nasional (National Public Health Journal) customer paying the cost amount Rp. 400,000,-/year/4 edition (exclude delivery cost).

.....,
(.....)

Please make a bank transfer payment to:
UNIVERSITAS INDONESIA BHPP
BANK BNI UI DEPOK
ACCOUNT NO. 1273000568
SWIFT CODE: BNINIDJA

Then please send the proof of payment to:
Secretariat of Kesmas: Jurnal Kesehatan Masyarakat Nasional (National Public Health Journal)
G301 Building G 3rd Floor
Faculty of Public Health Universitas Indonesia
Kampus Baru UI Depok 16424
Mobile Phone: +62815-1141-6600
or email: jurnalkm@ui.ac.id or jurnalkesmas.ui@gmail.com

