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Prostate Cancer and Environmental Exposure to Trace Elements in Different Ethnic Groups

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Abstract

In the Wellington region of New Zealand, a stratified random sample of men were taken from a larger community prostate study group of 1405 eligible subjects from three ethnic groups in order to examine ethnic differences in cadmium, selenium, and zinc exposure, as well as possible associations of blood levels of Cd, Se, and Zn with the prevalence of elevated serum Prostate Specific Antigen (PSA), a marker of prostate cancer. Diet, profession, and smoking were found to expose Maori and Pacific Island males to more Cd than New Zealand European men. However, there was no significant difference in mean blood Cd levels between ethnic groups. Men from the Pacific Islands exhibited much higher amounts of Se in their blood than both European and Maori men from New Zealand. Maori men exhibited much higher blood Zn levels than New Zealand European men and men from the Pacific Islands. Blood Cd and total serum PSA were found to have a favourable relationship. PSA levels were not linked to selenium or zinc levels. Prostate cancer mortality rates are greater among Maori and Pacific Island men than in New Zealand European males. Variations in disease progression rates, which are impacted by trace element exposure and/or deficiency, could contribute to ethnic differences in mortality. The findings, however, did not show a consistent ethnic pattern, highlighting the intricacy of the risk/protective mechanisms given by exposure factors. To determine if the relationships found between Cd and PSA levels are biologically significant or merely things to consider, more research is needed.

Keywords: Cadmium • Selenium • Zinc • Serum prostate specific antigen • Prostate cancer • Ethnicity

Introduction

It is widely acknowledged that genetic variation alone cannot account for observed disparities in prostate cancer incidence [1]. A 120-fold disparity in prostate cancer rates between countries demonstrates that there is significant heterogeneity in the occurrence of this illness and that environmental variables have a role [2]. The relevance of suspected environmental and dietary factors (such as low soil Se) in triggering prostate cancer is still uncertain, according to the Health Research Council of New Zealand [3]. It needs to be seen whether such environmental exposures are linked to higher prostate cancer rates or progression. There is significant ethnic heterogeneity in cancer incidence and death within the New Zealand population [4]. According to WHO age-standardized prostate cancer rates from 1998 to 1999, Maori males had the lowest incidence at 86.1 per 100,000, followed by Pacific Island guys at 115.2 per 100,000, and other (mostly New Zealand European) males at 118.9 per 100,000 [5]. In contrast, in 1998-1999, the prostate cancer WHO age-standardized mortality rates for Pacific Island and Maori men (52.3 and 39.3 per 100,000, respectively) were greater than the rates for other men (22.8 per 100,000) [6]. The ethnic gap in incidence and mortality is likely due to Maori and Pacific Island men's lower health-care utilisation, as well as underreporting in ethnic health data collecting in New Zealand [7,8,9]. According to recent study, the incidence of prostate cancer in Maori and Pacific Island males is estimated to be at least as high as in New Zealand European men [10]. The increased mortality rates observed among Pacific Island and Maori men could be attributed to health-care use concerns such as delayed diagnosis and treatment, as well as ethnic disparities in disease development driven by risk factors. Environmental variables have been linked to prostate cancer in research conducted all over the world. Because many environmental factors may be changed, they have significant implications for prostate cancer prevention. Cadmium (Cd), selenium (Se), and zinc (Zn) are three environmental trace elements that have been linked to prostate illness in the literature and are major elements in the New Zealand environment. Cd can be found in abundance in New Zealand soil. Watercress, shellfish, and offal meats are among the foods high in Cd in New Zealand. Zn is a nutritional element that is abundant in the prostate gland and is required for normal prostate function. Cd and Zn compete for protein ligand binding in tissues, and Zn reduces Cd toxicity. Both Cd and Zn have the potential to impact the amount of testosterone and dihydrotestosterone (DHT) in the prostate, which are necessary for the growth of both BPH and prostate cancer. Clinical trials employing dietary supplements are being conducted around the world to investigate the role of Se as a possible anti-carcinogen for prostate cancer. Both recent and cumulative exposures are reflected in blood Cd. As a result, the greater the blood Cd level, the older the person is. It's also been proposed that as people get older, their intake of Se and Zn drops due to dietary changes. Because the risk of prostate cancer rises with age, these variations in trace element exposure may increase prostate cancer risk even more. Due to an increase in environmental and industrial contaminants, the human body burden of Cd has increased during the previous 100 years. Cd pollution in the environment occurs in New Zealand as a result of a mixture of land contamination (fertilisers and sludge application) and water contamination (irrigation and industry), and is then passed through the food chain. The search for a relationship between Cd exposure and prostate cancer has yielded mixed results. In a number of occupational and laboratory research, Cd exposure has been linked to an increased risk of prostate cancer. Environmentally exposed people to Cd have not shown an elevated relative risk of cancer, according to research. Biological investigations, on the other hand, have discovered evidence of carcinogenic qualities in prostatic cells, as well as the possibility that Cd's carcinogenic effect is hormonally driven. Se is a trace element that can be found in different amounts in soil. Meats, eggs, dairy products, and bread are the main sources of Se in the diet. Se is also abundant in kidney, liver, and shellfish. Se is typically found as organic molecules in these foods. Prostate cancer mortality is inversely related to soil Se levels, according to ecological studies. Men who used Se supplements for five years had a 65 percent lower risk of prostate cancer, according to the Nutritional Prevention of Cancer Study. During a nine-year follow-up, another big trial (the Alpha-tocopherol, Beta-Carotene Cancer Prevention Study) revealed no link between baseline Se and prostate cancer. An inverse relationship between blood Se levels and prostate cancer incidence was discovered in a case-control study of 9345 Japanese-American men. The patients in this Japanese study had a lower risk of prostate cancer if their baseline blood Se was greater than 147g/L. The link was mostly found among current or former cigarette smokers. This supports the idea that Se could help to reduce the harmful effects of cigarette chemicals like Cd. The findings of a smaller (3059 males) case/control research in the United States corroborated this conclusion, reporting a continuous reduction in prostate cancer risk with serum Se >135g/L. Intakes vary widely because Se amounts in food are dependent on local soil conditions. Some populations in places of the world where domestic food production is important consume very little Se and are at risk of Se deficiency. Soil Se levels in New Zealand are low, notably in some sections of the South Island, and this is mirrored in low Se levels in some domestically cultivated foods. Thomson and Robinson concluded in a report that New Zealanders' Se status has improved from the early 1970s surveys. The enhanced Se status was linked to the increasing

eating of fish and poultry, as well as the importation of Australian wheat and cereal due to its greater Se concentration. The dietary intakes of Se were found to be substantially below the recommended daily amounts in other nations in both the 1997/98 New Zealand Total Diet Survey and the 1997 National Nutrition Survey. Only two-thirds of the Australian recommended daily intake was estimated in the 1997 National Nutrition Survey. Recent investigations in younger New Zealand people continue to show insufficient Se intake for complete development of glutathione peroxidase (GPx), contradicting the 1996 findings. Furthermore, in the South Island, all of the wheat is grown in New Zealand, whereas in the North Island, between 50 and 100 percent of the wheat is imported. Red meat, poultry, grains, dairy, legumes, and vegetables all contain Zn, which is a homeostatically regulated necessary mineral. It's a part of a lot of metalloenzymes, and it's crucial for cell development and replication, as well as osteogenesis and immunology. In some cell types, Zn may also act as an antioxidant by stabilising membranes. Some studies have established a link between reduced Zn intake and specific malignancies in patients, while others have found no link. For the prostate, zinc is thought to be a 'cellular growth protector.' The normal human prostate stores the most zinc of any soft tissue in the body. The Zn level in prostate cancer cells, on the other hand, is significantly lower than that found in non-prostate tissues. Zn suppresses the development of human prostate cancer cells, potentially through the triggering of cell cycle arrest and death. The loss of a unique ability to retain high levels of zinc is hypothesised to play a role in the genesis and progression of malignant prostate cells. In-vitro Zn aids in the maintenance of testosterone and DHT intra-prostatic equilibrium. Zn levels would be expected to be inversely related to prostate cancer based on these cellular activities. The epidemiologic data for Zn and prostate cancer incidence and death, on the other hand, have been inconsistent. The evidence for a protective effect of zinc on prostate cancer incidence is currently in sufficient to justify randomised chemoprevention trials.

References

1. Horwich, Arthur L., and Jonathan S. Weissman. "Deadly conformations—protein misfolding in prion disease." Cell 89.4 (1997): 499-510.
2. Prusiner, S.B. 1996. Prions.In: Fields Virology. B.N. Fields D.M. Knipe, and P.M. Howley, eds. Lippincott-Raven Publishers. Philadelphia. pp. 2901-2950.
3. Weissmann, Charles. "Molecular biology of transmissible spongiform encephalopathies." FEBS letters 389.1 (1996): 3-11.
4. Bessen, Richard A., and Richard F. Marsh. "Biochemical and physical properties of the prion protein from two strains of the transmissible mink encephalopathy agent." J virol 66.4 (1992): 2096-2101.
5. Caughey, Byron, and Bruce Chesebro. "Prion protein and the transmissible spongiform encephalopathies." Trends cell biol 7.2 (1997): 56-62.
6. Bessen, Richard A., and Richard F. Marsh. "Distinct PrP properties suggest the molecular basis of strain variation in transmissible mink encephalopathy." J virol 68.12 (1994): 7859-7868.
7. Caughey, Byron W., et al. "Secondary structure analysis of the scrapie-associated protein PrP 27-30 in water by infrared spectroscopy." Biochemistry 30.31 (1991): 7672-7680.
8. Pan, Keh-Ming, et al. "Conversion of alpha-helices into beta-sheets features in the formation of the scrapie prion proteins." Proc Natl Acad Sci 90.23 (1993): 10962-10966.
9. Safar, J., et al. "Conformational transitions, dissociation, and unfolding of scrapie amyloid (prion) protein." J Biol Chem 268.27 (1993): 20276-20284.
10. Inouye, Hideyo, and Daniel A. Kirschner. "X-ray diffraction analysis of scrapie prion: intermediate and folded structures in a peptide containing two putative α-helices." J mol biol 268.2 (1997): 375-389.

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Protease-Resistant Prion Protein Formation in Cell-Free Systems

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Abstract

The endogenous protease-sensitive prion protein (PrP-sen) of the host is changed to an aberrant pathogenic version with a characteristic partial protease resistance in transmissible spongiform encephalopathies (TSE) or prion disorders (PrP-res). PrP-res can directly trigger this conversion of PrP-sen, according to studies with cellfree reactions. This PrPres-induced conversion reaction is highly specific in ways that could account for TSE species barriers, polymorphism barriers, and strains at the molecular level. This reaction has been detected in TSEinfected brain slices as well as in mainly pure PrP-sen and PrP-res reactants. The binding of PrP-sen to polymeric PrP-res and a conformational shift that results in incorporation into the PrP-res polymer appear to be involved in the conversion pathway.

Keywords: Protease • Spongiform • Transmissible encephalopathies • Insoluble protein

Introduction

In all transmissible spongiform encephalopathies, unusually protease-resistant prion protein (PrP-res) accumulates (TSE). PrPres resistance varies depending on the TSE strain and host species, but TSE-associated PrPres are far more resistant to proteinase K than the regular PrP isoform. The many aberrant TSE-associated variants of PrP-res (e.g. PrPSc, PrPCJD, and PrPBSE) form insoluble aggregates and have greater beta sheet content than PrP-sen, in addition to having increased protease resistance [1]. PrP-res generation is implicated in many forms of evidence as a crucial mechanism in TSE pathophysiology and TSE agent replication. PrP mutations appear to cause abnormal PrP-sen behaviour and spontaneous conversion to more proteaseresistant forms in the case of rare familial TSE disorders (see other chapters for review). As indicated by the 1 per million annual prevalence of sporadic CJD in humans, spontaneous conversion happens rarely, if at all, in hosts with wild type PrP-sen. The production of neurotoxic PrP-res from wild type PrP-sen after infection of hosts with TSE agents is far more common in animals. Studies using tissue culture cells and animals have revealed a great deal about the cell biology of PrP-res production and its relationship to TSE pathogenesis; these topics are covered in more detail elsewhere [2]. Studies in cell-free systems have allowed researchers to look at PrP-res production under considerably more controlled and defined conditions. In vitro studies like these have shed light on the mechanism of PrP-res generation, as well as the molecular underpinnings of TSE agent replication, strain propagation, and species barrier effects. Most notably, these investigations have demonstrated that, as previously anticipated, PrP-res can directly drive PrP-sen to PrP-res conversion via a mechanism so specific that it could theoretically account for the majority of TSE clinical symptoms.

PrP-res formation via self-seeding

Most protein-only TSE infectious agent models propose that the putative infectious protein, PrP-res, interacts directly with its normal, host-encoded counterpart, PrP-sen, to convert it to PrP-res. It might then propagate in the host without the need for a nucleic acid specific to the drug [3-5]. The ability of PrP-res to convert PrP-sen to PrP-res (converting activity) was first proven by combining PrP-res purified from scrapie-infected brain tissue with immune precipitated 35S-PrP-sen and seeing that 35S-PrP-sen was changed into 35S-PrP-res. In the absence of PrPres, or in the presence of another form of amyloid (Alzheimer's beta), this conversion was not detected. In addition, in the reaction with PrP-res, additional tagged proteins were not transformed to PK-resistant versions. As a result, the conversion response is PrP-res dependent and PrP-specific. Because, although partial, reversible unfolding of PrP-res boosts conversion efficiency, more complete irreversible denaturation reduces converting activity, the converting activity is dependent on the specific conformational structure of PrP-res. Further research into the influence of denaturants on PrP-res converting activity has revealed that maintaining the native folding of a Cterminal domain (16 kDa in the aglycosyl structure) is critical for refolding and converting activity recovery after denaturant dilution. Denaturation of this important C-terminal region resulted in significant decreases in both converting activity and scrapie infectivity.

Conversion vs. binding

PrP-res-induced PrP-sen to PKresistant PrP-sen conversion has now been observed in multiple laboratories [6]. However, the authors of one of the resulting papers preferred to refer to it as a binding phenomenon rather than conversion. In the conversion process, the PrP-sen precursor binds to the PrP-res aggregate, which we believe is an important aspect of the conversion mechanism. However, not all PrP-sen binding or aggregation culminates in the change to the PK-resistant state seen in PrP-res. Although PK completely digests PrP-sen, it only eliminates about 67 residues on average. The N-terminus of each monomeric unit of the PrPres aggregate forms Protease-Resistant Prion Protein in Cell-Free Systems, resulting in a 6-7 kDa downward shift in their apparent molecular weight in SDS-PAGE gels. This form of PK resistance is not attributable to nonspecific sequestration of full PrP molecules within aggregates that are not pierced by PK because virtually all of the PrP-res molecules are similarly exposed to PK and similarly truncated. When 35S-PrP-sen is incubated with high molar excesses of a synthetic PrP peptide fragment, nearly full-length PrP molecules remain following PK treatment, as has been found when 35S-PrP-sen is incubated with large molar excesses of a synthetic PrP peptide fragment [7]. The N-terminal residues of both PrP-res molecules and the 35S-PrP-res products of the conversion reaction are partially exposed, indicating that the monomers units were incorporated into highly organised polymeric structures like amyloid fibrils. PrPsen can thus not only attach to PrP-res, but also change it from a PK-sensitive to a partially PK-resistant state, as seen in TSE brain-derived PrP-res. Riesner and colleagues discovered that treating SDS-solubilized, alpha helical, and PKsensitive PrP27-30 with acetonitrile causes aggregation of PrP and an increase in its total PK-resistance and beta sheet content without restoring scrapie infectivity or fibrils [8]. This could be an example of a PrP aggregated and PK-resistant version that isn't PrPSc, as previously stated. They believe that our PrPres-induced conversion of 35S-PrP-sen to 35S-PrP-res could be explained by a similar seemingly nonspecific aggregation mechanism. However, there is a significant difference between their observation and ours.

TSE strains with self-propagating PrP-res conformations as a possible basis

Species tropism, incubation duration, clinical illness, neuropathological symptoms, and PrP-res distribution in brain tissue can all be used to differentiate TSE agent strains. TSE strains have been found in isogenic hosts in large numbers. This result presents an interesting challenge to the protein-only concept for infectious agents: it necessitates that the "inheritance" or propagation of agent strain differences be mediated by stable variations in PrP-res structure rather than mutations in an agent-specific nucleic acid. Different TSE strains have been linked to structural variations in PrP-res [9]. The various types of PrP-res associated with the

hyper (HY) and drowsy (DY) strains of hamster-adapted transmissible mink encephalopathy are particularly noteworthy (TME). PK cleaves these PrP-res forms differently, despite the fact that they are both generated from Syrian hamster PrP. This indicates that they differ in conformation rather than covalent structure, which FTIR research has validated. Furthermore, when incubated with hamster PrP-sen molecules, HY and DY PrP-res faithfully stimulate the synthesis of strain-specific PrP-res conversion products, propagating themselves in a nongenetic manner. These findings were the first to show that strain-specific PrP-res polymers with the same amino acid sequence but distinct 3-D structures or conformations can self-propagate. This is consistent with the idea that PrP-res polymer self-propagation represents a molecular underpinning for scrapie strains. A recent study found that injecting agents generated from different forms of familial CJD into mice resulted in the accumulation of PrP-res with seemingly unique conformations, supporting this theory [10].

Conclusion

At this time, it's reasonable to pose a few key questions: Is protease resistance acquired by PrP owing to conformational change, polymerization, or both? And, in terms of TSE pathogenesis and transmission, which feature of aberrant PrP is most important? Is PrP-res the agent of transmission? Is it true that the most pathogenic and neurotoxic forms of PrP are also the most transmissible (assuming that any form of PrP is transmissible in and of itself)? Finally, is the sequence of events and rate-limiting processes in the presumed spontaneous production of wild type PrP-res from mutant PrP-sen in familial TSE disorders the same as the induced formation of wild type PrP-res following TSE infection? The ultimate answers to these concerns aren't evident yet, but there are a few key aspects to consider. Although the characteristic partial PK-resistance of PrP-res appears to genuinely reflect a specific aberrant conformational and/or aggregation state that varies from PrP-sen in the majority of cases, this feature is not shared by all disease-associated variants of PrP. Because mammals lack PK, there's no reason to believe that all forms of pathogenic PrP must be PK-resistant in order to cause disease. However, PrP-res' survival as a possible transmissible agent and accumulation as a pathogenic material in the host would presumably be aided by some form of global proteolysis resistance. Even overexpression of wild type PrP-sen can cause neurological illness, implying that pathogenic (but not necessarily transmissible) PrP accumulations can be achieved without PK-resistance in some cases. Because no one has clearly documented the existence of a monomeric form of PrP that is both rich in beta sheet and PK-resistant, the only conclusion that can be drawn is that all PrP-res forms that have been adequately well characterised are both high in beta sheet and multimeric. Because conformational change and polymerization cannot be reliably separated in time, it is impossible to say which parameter is most important in TSE pathogenesis and transmission. It's important to remember that not all PrP aggregates are PK-resistant, high in beta sheet, and related with infectivity, and that not all PK-resistant, high beta sheet aggregates are the same or linked with infectivity. Although binding appears to be a requirement for PrP-induced conversion, not all binding of PrP-sen to preexisting PrP-res aggregates results in conversion to PrP-res. These observations highlight the fact that only a certain style of PrP polymerization/aggregation is associated with PrP-res' characteristic partial PK-resistance and the presence of TSE infectivity. Given that this is a correlation, it is critical to examine if the production of PrP-res (alone) results in new TSE infectivity. With so many variables and complexities, it's tempting to look for a great unifying pathogenic mechanism that would account for all conceivable illness states connected to PrP conformation, aggregation state, and sequence perturbations and accidents. However, the processes and properties of PrP that might explain TSE transmissibility differ from those that explain pathogenesis. Furthermore, the ostensibly spontaneous conversion of mutant PrP-sen molecules to PrP-res in familial TSE disorders could differ mechanistically and cell biologically from the PrP-res-induced conversion of wild type PrP-sen in infectious TSEs.

References

1. Bessen, Richard A., and Richard F. Marsh. "Biochemical and physical properties of the prion protein from two strains of the transmissible mink encephalopathy agent." *J virol* 66.4 (1992): 2096-2101.
2. Bessen, Richard A., and Richard F. Marsh. "Distinct PrP properties suggest the molecular basis of strain variation in transmissible mink encephalopathy." *J virol* 68.12 (1994): 7859-7868.
3. Caughey, Byron W., et al. "Secondary structure analysis of the scrapie-associated protein PrP 27-30 in water by infrared spectroscopy." *Biochemistry* 30.31 (1991): 7672-7680.
4. Pan, Keh-Ming, et al. "Conversion of alpha-helices into beta-sheets features in the formation of the scrapie prion proteins." *Proc Natl Acad Sci* 90.23 (1993): 10962-10966.
5. Safar, J., et al. "Conformational transitions, dissociation, and unfolding of scrapie amyloid (prion) protein." *J Biol Chem* 268.27 (1993): 20276-20284.
6. Inouye, Hideyo, and Daniel A. Kirschner. "X-ray diffraction analysis of scrapie prion: intermediate and folded structures in a peptide containing two putative α-helices." *J mol biol* 268.2 (1997): 375-389.
7. Caughey, Byron, and Bruce Chesebro. "Prion protein and the transmissible spongiform encephalopathies." *Trends cell biol* 7.2 (1997): 56-62.
8. Weissmann, Charles. "Molecular biology of transmissible spongiform encephalopathies." *FEBS letters* 389.1 (1996): 3-11.
9. Prusiner, S.B. 1996. Prions.In: Fields Virology. B.N. Fields D.M. Knipe, and P.M. Howley, eds. Lippincott-Raven Publishers. Philadelphia. pp. 2901-2950.
10. Horwich, Arthur L., and Jonathan S. Weissman. "Deadly conformations—protein misfolding in prion disease." *Cell* 89.4 (1997): 499-510.

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Treatment of Neglected Diseases with Prodrugs

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Abstract

The World Health Organization (WHO) and Médecins Sans Frontières (MSF) recently proposed a classification of diseases into three categories: global, neglected, and very neglected. The majority of pharmaceutical companies' R&D efforts are focused on global ailments such as cancer, cardiovascular disease, and mental (CNS) diseases. Millions of individuals around the world are affected by neglected diseases, but current pharmacological therapy is limited and sometimes ineffective. Furthermore, persons living in deplorable conditions with only the minimal essentials for survival are affected by extremely neglected diseases. The majority of these disorders are not included in the goals of pharmaceutical R&D projects, and hence fall outside the pharmaceutical market. Infectious diseases kill over 14 million people each year, mostly in developing nations. Only 1% of new medications licenced between 1975 and 1999 were for the treatment of neglected diseases. These figures have remained constant, indicating that new medication design and synthesis are urgently needed in those countries, and the prodrug method is a promising area in this regard. It improves the marketability of present and novel medications by enhancing activity and reducing toxicity, among other things. It's worth mentioning that saving time and money is critical in drug development, and prodrug techniques are of particular relevance in this regard.

Keywords: Prodrug design • American trypanosomisasis • African trypanosomiasis • Malaria

Introduction

Each year, billions of dollars are spent on medicine research and development for illnesses that affect wealthy individuals, such as obesity, baldness, and ageing. The world's impoverished, on the other hand, are utterly ignored. Neglected tropical infectious diseases include protozoan infections, helminth infections, and other disorders such as sickle cell disease [1]. The World Health Organization and Medicins San Frontieres recently designated these diseases as neglected and/or very neglected diseases. They have an impact on places of extreme poverty and promote poverty itself. As a result, they do not draw the attention of drug developers, who do not see this category of disorders as a profitable target [2]. Market logic dictates that if there is no profit, there will be no investment. Only 10% of global health research is focused on diseases that account for 90% of global disease burden and require new treatments urgently. Only 16 (1%) of the 1,393 novel medications introduced to the market between 1975 and 1999 were for the treatment of tropical diseases [3]. The etiologic agents that produce certain diseases have progressed in biology, molecular biology, and genetics. This knowledge, however, has not been applied to medication development, which is unacceptable.

Combinations of current medications, new indications for existing drugs, improvements to established pharmaceuticals and compound classes, and focused sample collections were some of the core approaches to drug development for tropical disorders.

Chagas disease

Carlos Chagas discovered American trypanosomiasis, also known as Chagas' disease, a parasitic infection caused by Trypanosoma cruzi, in 1909. The disease is predominantly seen in Latin America, where it affects 21 countries [4]. The parasite is thought to infect 16 to 18 million individuals, with 50,000 people dying each year as a result of the disease. Chagas disease is still considered to be incurable. Due to a lack of commercial incentives, the pharmaceutical industry has shown little interest in creating novel antichagasic medications. The medications available to treat this parasitosis are benznidazole and nifurtimox. Both medications, however, are hazardous nitroheterocyclic derivatives that are almost exclusively effective during the acute phase of the disease. They've been utilised for a long time as a treatment. Natural resistance of T. cruzi to nitro derivatives has been proposed as an important factor to explain the low rates of cure detected in chagasic patients, and natural resistance of T. cruzi to nitro derivatives has been suggested as an important factor to explain the low rates of cure detected in chagasic patients [5]. As a result, finding new medications to combat T. cruzi is critical and must be prioritised.

Sleeping sickness

Infection with parasitic protozoa of the Trypanosoma brucei (T. brucei) subspecies, which are introduced to the human circulation by bites of infected tsetse flies in the inter-tropical regions of Africa, causes human African trypanosomiasis (HAT), also known as sleeping sickness. In West and Central Africa, Trypanosoma brucei gambiense causes a chronic form of the disease [6]. Sleeping sickness affects more than 60 million individuals in 36 countries, with an estimated number of victims ranging from 300,000 to 500,000.

African trypanosomiasis chemotherapy is still reliant on ancient medications, some of which have deadly side effects. Before the emergence of central nervous system symptoms, suramin and pentamidine are the medications of choice for the Rhodesian and Gambian variants of the disease, respectively. Melarsoprol, a melaminophenyl arsenical medication, is used to treat late-stage illness. Eflornithine (DFMO) is also utilised in the treatment of T. b. gambiense illness. For human African trypanosomiasis, new medications are desperately needed, and drug resistance is expected to be a problem that must be addressed.

Malaria

Malaria is a life-threatening parasitic infection caused by Plasmodium falciparum, Plasmodium vivax, Plasmodium ovale, and Plasmodium malariae parasites, with P. falciparum being the only one capable of causing fatal consequences. Malaria affects about three billion people, and it is estimated that 300 to 500 million new cases of malaria are diagnosed each year, resulting in approximately two million fatalities. The poorest countries account for the majority of these cases [7]. Malaria continues to be a global epidemic due to the lack of a viable vaccine and the widespread emergence of multidrug resistance. For the majority of antimalarial medicines now in clinical use, resistant forms of malaria have been found [8]. For malaria chemotherapy, a variety of medications have been employed, including chloroquine, primaquine, mefloquine, halofantrine, artemisinin, and atovaquone. Drug or multidrug resistance, on the other hand, has been a problem for chemotherapy effectiveness. The urgent need for medications to combat tecidual forms, as well as the emergence and spread of resistance to chloroquine and other main antimalarial drugs, has prompted the development of a new generation of safe and effective antimalarial pharmaceuticals.

Schistosomiasis

Schistosoma mansoni, Schistosoma japonicum, Schistosoma haematobium, Schistosoma intercalatun, and Schistosoma mekong are the five principal Schistosoma species that infect people. Two billion people are thought to be chronically infected with soil-transmitted helminths and schistosomes, with many of them suffering from severe morbidity. According to the World Health Organization, 200 million people are affected, 600 million more are at risk of infection, and more than 200,000 people die each year from schistosomiasis. When it comes to the size of endemic areas and the number of individuals infected, it's only second to malaria. It is sold in 52 countries in South America, the Caribbean, Africa, and the East Mediterranean [9]. The parasite's intermediate host is a snail that lives in fresh water, and infection is disseminated through skin contact with the water. Schistosomiasis poses both a public health and a socioeconomic issue.

Chemotherapy has proven to be the most effective treatment for endemic disease, with therapeutic medicines such as metrifonate, oxamniquine, and praziquantel available. Only oxamniquine and praziquantel are used in some countries. The latter has been the preferred treatment since it is effective against all forms of human schistosomiasis. The development of resistance, on the other hand, is a major source of concern. Because of its negative effects, particularly those related to the central nervous system (CNS), oxyamniquine is used as a backup medicine. Because vaccine research is still years away from becoming a reality, new schitosomicide medications are urgently needed.

Tuberculosis

Similar to tropical endemic illnesses, tuberculosis (TB) looks to be a major problem for global health organisations and allied research groups. Tuberculosis (TB) is the world's most dangerous infectious lung disease and the main cause of death caused by a single infectious organism. It is found all across the world, although it is most prevalent in Africa. It is projected that two billion people are infected, and that between 2005 and 2020, one billion people will become infected, over 125 million will become sick, and 30 million will die from tuberculosis if control is not increased. Because HIV inhibits cell-mediated immunogenicity, the percentage of patients infected with M. tuberculosis who acquire active TB over a shorter period of time climbs to 50%. This, along with the advent of drug-resistant Mycobacterium tuberculosis strains, has posed enormous hurdles and necessitated the rapid development of new and better treatments.

Sickle cell disease

Sickle Cell Disease (SCD) is an inherited abnormality of haemoglobin production caused by a single point mutation in the -globin subunit that replaces valine with glutamic acid. It causes red blood cell distortion, which can lead to vaso-occlusive events, ischaemia, tissue and organ damage, and even death. This disorder is typically found in tropical areas and is most common in Africa [10]. This disease has harmed millions of individuals over the world, primarily in Sub-Saharan Africa, Latin America, the United States, Saudi Arabia, India, and Mediterranean countries such as Turkey, Greece, and Italy. The sickle gene, on the other hand, offers a genetic advantage: it protects heterozygous carriers from Plasmodium falciparum malaria infection in endemic areas. Hydroxyurea is the only medicine licenced by the US Food and Drug Administration (FDA) for the treatment of SCD. Butyric acids, aldehydes, decitabine, clotrimazole, L-arginine, and zileuton are some of the chemicals that have been explored for sickle cell treatment. The use of molecular modification methods to improve the pharmacological, pharmacokinetic, or even pharmacodinamic profile of existing medications is a recommended choice for most neglected diseases. Prodrug design is one of the most promising of these strategies. In this work, we summarise the key findings of 20 years of study into prodrug design for a number of neglected diseases.

References

1. Horwich, Arthur L., and Jonathan S. Weissman. "Deadly conformations—protein misfolding in prion disease." *Cell* 89.4 (1997): 499-510.
2. Prusiner, S.B. 1996. Prions.In: Fields Virology. B.N. Fields D.M. Knipe, and P.M. Howley, eds. Lippincott-Raven Publishers. Philadelphia. pp. 2901-2950.
3. Weissmann, Charles. "Molecular biology of transmissible spongiform encephalopathies." *FEBS letters* 389.1 (1996): 3-11.
4. Caughey, Byron, and Bruce Chesebro. "Prion protein and the transmissible spongiform encephalopathies." *Trends cell biol* 7.2 (1997): 56-62.
5. Bessen, Richard A., and Richard F. Marsh. "Biochemical and physical properties of the prion protein from two strains of the transmissible mink encephalopathy agent." *J virol* 66.4 (1992): 2096-2101.
6. Bessen, Richard A., and Richard F. Marsh. "Distinct PrP properties suggest the molecular basis of strain variation in transmissible mink encephalopathy." *J virol* 68.12 (1994): 7859-7868.
7. Caughey, Byron W., et al. "Secondary structure analysis of the scrapie-associated protein PrP 27-30 in water by infrared spectroscopy." *Biochemistry* 30.31 (1991): 7672-7680.
8. Pan, Keh-Ming, et al. "Conversion of alpha-helices into beta-sheets features in the formation of the scrapie prion proteins." *Proc Natl Acad Sci* 90.23 (1993): 10962-10966.
9. Safar, J., et al. "Conformational transitions, dissociation, and unfolding of scrapie amyloid (prion) protein." *J Biol Chem* 268.27 (1993): 20276-20284.
10. Inouye, Hideyo, and Daniel A. Kirschner. "X-ray diffraction analysis of scrapie prion: intermediate and folded structures in a peptide containing two putative α-helices." *J mol biol* 268.2 (1997): 375-389.

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Medical Virus Molecular Diagnosis

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Abstract

The development of molecular techniques, particularly the use of the polymerase chain reaction, has transformed the detection of infectious diseases (PCR). Because of the method's great sensitivity and ease of use in detecting any known DNA sequence, it has found widespread use in the biological sciences. Real-time PCR assays have lately made significant contributions, with the addition of a fluorescent probe detection system resulting in increased sensitivity over conventional PCR, the ability to confirm the amplifcation product, and the capacity to quantify the target concentration. Furthermore, nucleotide sequence analysis of the amplifcation products has aided epidemiological studies of infectious disease outbreaks and the monitoring of infection treatment outcomes, particularly for viruses that mutate often. The applications of qualitative and quantitative real-time PCR, nested and multiplex PCR, nucleotide sequence analysis of amplifed products, and quality assurance with nucleic acid testing (NAT) in diagnostic laboratories are discussed in this study.

Keywords: Virology • Probe detection • Medicine • Allergy

Introduction

The discovery of molecular tools has transformed the diagnosis of human virological disease, as it has most bioscience disciplines. While the impact of this influence has been felt for well over a decade, the change is far from complete. Although different molecular approaches have been available for decades, the technologies have only recently advanced to the point that they may be used for diagnostic purposes. The development of real-time PCR, which combines product detection and confirmation using highly sensitive hybridisation probes, as well as target quantification if needed, in a very rapid experiment, has been the most important. In addition, gene sequencing has made a significant contribution. The use of molecular systematics to directly assist patient management has been facilitated by the combination of inexpensive and rapid sequencing chemistries, computer-based phylogenetic analysis software, and electronic interrogation of Internet-accessible gene sequence databases, both for individual patients as in drug resistance testing, and within the community as in epidemiological analysis of infectious outbreaks. The scope of this study precludes a thorough examination of all molecular approaches available or in use for the detection of all medically significant viruses. However, it is critical to first focus on the general issue of ensuring result correctness, as any test would be pointless without it. Following that, specific typical examples of the application of molecular methods for the diagnosis and management of human virological disorders will be shown.

Assurance of the quality of the outcome

The quality of the results is critical, and it can only be achieved if all parts of the test technique are thoroughly understood [1]. The design, development, and validation of the test for the range of specimen types, collection conditions, and sample quality for which the test is expected to function begins with the design, development, and validation of the test for the range of specimen types, collection conditions, and sample quality for which the test is expected to function. These performance standards are typically specified for commercial test kits, however before in-house tests can be used, each aspect must be thoroughly evaluated and validation analyses documented. Regardless of the source of the test, the ongoing performance must be closely checked and problems reported to ensure that the test's result quality is maintained. Laboratory design and personnel competency are other important considerations. Quality assurance issues are usually outlined in national standards and guidelines, which must be followed in order to achieve good laboratory practise and are frequently mandated in order to obtain statutory certification [2-3].

The causes of false results

To ensure test performance, each assay batch must include sufficient positive and negative controls. They must be chosen to assure the validity of each step: nucleic acid extraction, reagent master-mix preparation, nucleic acid aliquoting, amplifcation, and detection. The use of weakly positive control material, with nucleic acid concentrations just beyond the limit of detection, should be used to evaluate the performance of the entire test procedure, including extraction, to ensure test sensitivity is maintained for each batch. A negative patient sample is also necessary, and it should be processed last at each step, after any positive controls, to avoid sample contamination. Negative controls should be strewn throughout large batches of assays [4-5]. A negative water control in the mastermix, not opened during the aliquoting of nucleic acid, is also recommended to ensure that the mastermix is uncontaminated. Even if the controls are performing well, clusters of positive results, particularly after a substantially positive sample, should be treated with caution until the suspect samples can be re-extracted and retested to confirm the result.

Contamination

Understanding the sources of misleading results is necessary for their eradication. The possibility of contamination of new tests with amplifed product (amplicon) from prior amplifcations of the same target sequence offers by far the biggest risk, and is the most prevalent source of false positive results with PCR-based testing, because the same techniques are run repeatedly [6-7]. To avoid contamination, it is critical that the functions of (a) PCR reagent storage and master mix preparation, (b) nucleic acid extraction, (c) nucleic acid addition to PCR mixes, and (d) PCR amplifcation and post-PCR manipulation, such as running gels, sequencing, or cloning of products, are physically separated, with independent airfows. Each should, ideally, be carried out in different rooms. To avoid contamination of set-up regions with previously amplifed product, a unidirectional workfow from one function to the next is required. Each department needs its own pipettors, equipment, consumables, and personal protective equipment for the workers, such as lab coats and gloves. Staff must be well-trained and adhere to strict sterile procedures. If racks must be returned to the unidirectional workfow, they must first be disinfected for 4 hours in 2 percent sodium hypochlorite or the equivalent. At all stages, PCR-certified fltered tips should be used, and reagent, sample, and PCR tubes should be kept covered, only opening when absolutely necessary. Because the latter criteria cannot be met, the usage of ganged cap strips should be avoided. Wiping down work locations and pipettes with 2 percent sodium hypochlorite disinfectants after each use, as well as irradiating work areas with UV light, is also recommended [8-10]. For stages 1–3, a biohazard hood is recommended, both to shield the operator from potentially infectious agents and to limit the possibility of sample contamination. Smaller particles, such as viruses and nucleic acid molecules, are expected to be efficiently retained by the HEPA filters in such cabinets, which are normally rated to 0.3Mm. Viruses are frequently aggregated, linked to, or confined within larger particles such as cells, and molecular interactions such as electrostatic attraction and Brownian motion, rather than size exclusion, are more likely to maintain nucleic acid molecules efficiently.

However, cabinets used to manipulate post-amplifcation products, such as during two-tube nested amplifcation, should be externally vented to avoid recirculation of any amplicons that pass through the filters into the exhaust. The use of dUTP instead of dTTP in the PCR master mix, as well as the use of Uracil-DNA Glycosylase (UNG) to degrade previously amplifed uracil-containing contaminating amplicons, a method commonly included in commercial kits, should be considered to eliminate contamination, though it is only effective when the level of contamination is low. If quick examination of the result is not practicable, PCR samples should be kept at -20°C. Furthermore, using dUTP and UNG for one-step RT-PCR is troublesome, necessitating the use of a heatstable reverse transcriptase active above 60°C to prevent cDNA degradation before PCR. Assay sensitivity may be reduced as a result of such RT-PCR needs and circumstances. Multiple tests are routinely performed on samples sent to a diagnostic laboratory. Before the specimen is sent for virological testing, it is usually subjected to biochemical or haematological tests conducted by auto-analysers. During injection sampling, such auto-analysers can cross-contaminate specimens. Setting aside an aliquot specifically for molecular testing eliminates the problem, but it also adds the potential of transcribing and aliquoting errors, as well as the possibility of specimens being too small to split properly. The presence of amplifcation reaction inhibitors in the sample, such as haemoglobin, lactoferrin, and bile salts, is the most common cause of erroneous negative results. Because the nucleic acid contained in the silicagel membrane can be cleaned very well before elution, most commercial nucleic acid extraction techniques incorporating a spin or vacuum column allow for efficient removal of inhibitors. Similarly, approaches that use magnetic beads to trap and keep nucleic acid produce high rates of recovery and purity. Some samples, however, will remain inhibitory, and these samples must be identified using effective inhibition controls. To offer a meaningful assessment of the presence of inhibitors, such control nucleic acid should be present only at levels close to the assay's limit. We prefer to run a duplicate inhibition control for each sample spiked with the low positive control since integrating both a separate inhibition control target and the test target in a multiplex reaction can reduce amplifcation sensitivity. However, if maximal sensitivity is not required, such multiplex, simultaneous testing of test and inhibitory control targets may be appropriate. If the rate of inhibition has been determined to be very low, inhibition controls in specific specimen types can be skipped. Samples containing inhibitors can be further treated with chelating agents, such as Chelex 100 chelating resin (Bio-Rad Laboratories, Hercules, CA, USA), to remove divalent metal cations, or diluted until the inhibition is no longer detectable, but keep in mind that these steps will reduce the test sensitivity. If inhibition is a concern during the development phase due to the nature of the materials being tested, such as faeces, amplifcation facilitators such as bovine serum albumin and betaine could be investigated to reduce inhibition problems. Furthermore, some polymerases may be more resistant to inhibitors than others.

Target homology

Primer and probe target sites should ideally come from areas of the genome that are conserved throughout the viral strains to be detected. To ensure broad responsiveness of the test for all wild strains of the virus, this is frequently done to functionally limited areas within protein-encoding non-structural genes. This isn't always doable, though.

RNA viruses come in a wide variety of strains in the wild. Although known strain diversity at the target location is accommodated in the primer and probe design, the genetic diversity of some viruses, such as caliciviruses and HIV, exceeds the test's ability to detect all strains without sacrificing sensitivity.

Conclusion

As molecular approaches have progressed and made a significant contribution to the diagnosis of human viral disease, there has been a growing recognition of the importance of quality assurance in order to generate clinically useful results. Furthermore, the targeted nature of PCR has some inherent constraints that are difficult to regulate, particularly in virology, where the diverse composition of the viral genome can make test design and performance difficult. Nonetheless, being aware of these limitations will lead to a better knowledge of this new technology and enable the full potential of these current diagnostic tools to be realised.

References

1. Inouye, Hideyo, and Daniel A. Kirschner. "X-ray diffraction analysis of scrapie prion: intermediate and folded structures in a peptide containing two putative α-helices." *J mol biol* 268.2 (1997): 375-389.
2. Caughey, Byron, and Bruce Chesebro. "Prion protein and the transmissible spongiform encephalopathies." *Trends cell biol* 7.2 (1997): 56-62.
3. Prusiner, S.B. 1996. Prions.In: Fields Virology. B.N. Fields D.M. Knipe, and P.M. Howley, eds. Lippincott-Raven Publishers. Philadelphia. pp. 2901-2950.
4. Weissmann, Charles. "Molecular biology of transmissible spongiform encephalopathies." *FEBS letters* 389.1 (1996): 3-11.
5. Bessen, Richard A., and Richard F. Marsh. "Biochemical and physical properties of the prion protein from two strains of the transmissible mink encephalopathy agent." *J virol* 66.4 (1992): 2096-2101.
6. Caughey, Byron W., et al. "Secondary structure analysis of the scrapie-associated protein PrP 27-30 in water by infrared spectroscopy." *Biochemistry* 30.31 (1991): 7672-7680.
7. Pan, Keh-Ming, et al. "Conversion of alpha-helices into beta-sheets features in the formation of the scrapie prion proteins." *Proc Natl Acad Sci* 90.23 (1993): 10962-10966.
8. Horwich, Arthur L., and Jonathan S. Weissman. "Deadly conformations—protein misfolding in prion disease." *Cell* 89.4 (1997): 499-510.
9. Bessen, Richard A., and Richard F. Marsh. "Distinct PrP properties suggest the molecular basis of strain variation in transmissible mink encephalopathy." *J virol* 68.12 (1994): 7859-7868.
10. Safar, J., et al. "Conformational transitions, dissociation, and unfolding of scrapie amyloid (prion) protein." *J Biol Chem* 268.27 (1993): 20276-20284.

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Patient Safety Culture among Nurses in Hafar Al-Batin

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Abstract

Background: Patient safety is a critical component of healthcare quality, and it is one of the most closely evaluated metrics by all healthcare institutions throughout the world. Because of the nature of their profession, nurses play a critical role in ensuring and promoting patient safety.

Objective: This study was aimed for identifying the nurse's perception of patient safety culture and assesses the impact of nurse's demographic data on the perception of patient safety culture in Hafar Al-batin, Saudi Arabia.

Methods: The study used a descriptive and cross-sectional design. The Hospital Survey on Patient Safety Culture was used to study the patient safety culture of 367 registered nurses working in four governmental hospitals in Hafar Al-batin. General linear regression and Descriptive statistics were used to examine the relationship between demographic variables and patient safety culture.

Result: From 12 domination of the HOSPC, the highest positive response was teamwork with unit following organizational learning–continuous improvement on another hand area that require improvement of No punitive Response to Errors followed by staffing then Communication Openness. From the perspective of nurses, regression analysis revealed that factors such as age, gender, and language influenced patients' safety culture in Saudi hospitals.

Keywords: Patient safety • Culture nurses • Hospitals

Introduction

This chapter reviewed the introduction and background for this research including the background of nurses' patient safety culture perception, research questions, research aims and significance of the study.

Nurses perception of patients safety culture

Patient safety is the ability of a patient to be free from harm and other risks that may be deemed unnecessary associated with health care [1]. Therefore, when a health facility set values and guidelines commonly shared in enhancing the safety of the patients, the facility is said to have a patient's safety culture. Patient safety is critical to health care quality as it can directly or indirectly threaten patients. Patient safety can be influenced by many factors, including cultural background. One of the common reasons for medical errors was the diversity of cultural perception of patient safety. Culture is widely used by all service providers in ensuring that the patients feel safe and protected from harm; hence, boots their confidence in the operation of the organization. The patients' image and attitude to the facility is a determinant of the adoption of the safety standards as part of the facility's culture.

The effectiveness of organizational culture was reliant on the acceptance of the culture. Therefore, a patient's safety culture should be embraced and accepted by the nurses to impact. If the nurses were not in agreement with the policy, the patients' safety would be compromised. The nurses were the lead implementers of some of the cultural practices in ensuring the patients' safety. For example, team training and inter-disciplinary rounding were the interventions that help in promoting the safety of the patients. Nurses have a vital role in monitoring patients' progress, for any deterioration was detected. The nurses were required to monitor the patients and ensure their recovery closely. The safety of the patients was reliant on the workload of the nurses. Studies suggested that nurses can effectively perform their tasks with an adequate number of functions. If the institution's values were not central to the patients' safety, the nurses would have a considerable workload; hence, reducing the time in monitoring patients. Therefore, in any emergency, the patients would be vulnerable and exposed to various risks. Thus, the institutions needed to promote the efficiency of the nurses in caring for their patients, hence improving the effectiveness of the adopted patient's safety cultures.

According to Ibrahim et al., there was an increasing pressure to progress the safety of the patients in the kingdom of Saudi Arabia (KSA) due to increased stress amongst patients on their safety [2]. There were numerous complaints about the issues surrounding a patient's safety with the nurses in Saudi Arabia. Hence, research suggested that nurses' job satisfaction may be related to the nurses' low services. In collaboration, many organizations had no clear policies on personal and patient safety amongst the nurses. There was ignorance amongst institutions that have seen the risk of increased exposure of the patients to the various risks. Enhancing the collaboration of the organization's commitment to setting put the policies accompanied by other personal initiatives to follow the set procedures would help in solving the problem. The patients were also required to identify the barriers related to executing the safety measures to the patients. Some of the obstacles include lack of job satisfaction amongst the nurses as well as poor attitudes to follow the set policies.

Despite that, there was research in a country like Saudi Arabia regarding the nurse's perception of patient safety culture [3]. This research mostly was conducted in big cities in the central area of) KSA) such as Riyadh city. However, there was no study investigating nurses' perception of patient safety culture in Hafar Al-batin city) (KSA). Given that the popularity of the nursing workforce was expatriate nurses had cultural diversity [4]. This study employed a quantitative approach to investigate this area. The paper main aim was to perform quantitative research on the area and establish the adoption of patient's safety cultures and the impact it had on the patients. Hence, establishing clear statistics and knowledge on the policies adoption was necessary for the institutions in enhancing their services to the patients.

Research questions

The previous literature review guided us to formulate the research questions as following:-

- What is the nurses' patient safety culture perception in Hafar Al-batin city, Saudi Arabia?
- What is the influence of the personal demographical variables of nurses on patients' safety culture perception?

Research objectives

Objectives of this study were as the following:-

- To identify nurses' perception about patient safety culture in Hafar Al-batin city, Saudi Arabia.
- To measure the influence of nurse's demographical data on the perception of patients' safety culture.

Null hypothesis

No significant relationship between the demographical data of the nurses to their patient safety culture views.

Significance of study

The following benefits resulted from this study

Patients: The patients would be the direct beneficiary of the results of the study since they were the recipient of the care provided by staff nurses.

Sufficient staffing had been demonstrated to prevent untoward outcomes. Recommendations from this study would be inputted to quality improvement and patient safety.

Staff nurses: Nurses could also benefit from this study. Nurses would be refrained from committing errors. They would also be prevented from the omission of nursing care provisions. They would have refrained from potential legal concerns and burnout. Furthermore, they would have more time to provide health teachings and nurse-patient interactions. This would lead to better nursing assessment, and thus able to distinguish concerns promptly, plan appropriately, and provide swift nursing interventions.

Nurse managers: The results of this study indicated the great utility to nurse managers since it was a good input in determining the correct staffing process. The results may become part of the specification in determining the staff size per shift per unit. When the input was based on evidence, then the current process would be potentially corrected that eventually resulting in a positive outcome (quality and patient safety). Using the DMAIC process, this study may be considered as part of the Define, Measure and Analyse phases, which eventually be the basis for the Improvement and Control phases.

Hospital: Unfortunate outcomes result in harm to the patient which would then be translated into inconvenient hospital costs [5]. When the correct staffing stratagem was deployed, recommendations would be made to the hospitals for consideration. This would eventually defer potential cost from potential legal concerns, and other miscellaneous or wastage costs brought about by inadequate staffing.

Regulatory bodies: The Ministry of Health) MOH), Saudi Patient Safety Centre (SPSC), Saudi Central Board for Accreditation of Healthcare Institutions (CBAHI) Saudi Patient Safety Centre, and Saudi Commission for Health Specialties may benefit from the recommendations of this study. Guidelines may be provided by (MOH) and (SPSC) after recommendations of the study were considered. Audits from (CBAHI) may consider the inputs of recommendations of this study as part of the clauses under the Human Resource and Nurse-Patient Ratio.

Researchers and future researcher: The researcher benefited from the partial completion of the requirement for the graduate program. Future researchers may use the result of this study as mother literature, or part of the review of related literature.

Study variables

The demographical data like age, marital status, gender, education, experience, nationality, place of work and language were used as independent variables. Patient safety cultures were used as the dependent variable. In addition, the study investigated patient safety culture 12 dimensions (variables) collaboration between each other.

Definitions of terms

Patient safety: It is referred to the ability of a patient to be free from harm and other risks that may be deemed unnecessary associated with health care.

Safety culture: It is defined as the outcome of people or group values, attitudes, perceptions, competencies, and behaviour that controlled the commitment to, style and proficiency of the health and safety management organization.

Patient safety culture: It is referred to the belief, norms, values proper action, and appropriate attitudes in a workgroup environment [7].

The number of events reported: It is defined as the self-reporting of error events that the healthcare provider was filling out and submitting in 12 months [8].

Non-punitive response to the error: It is referred to the healthcare provider's perception of action taken by the management of the healthcare system on reported error occurrence.

Feedback and communication about errors: It is the healthcare provider perception of how much information was shared regarding occurrence and follow-up process in the healthcare system.

Organizational learning: It is referred to the healthcare worker perception of organizational effort to productively check, evaluate, engage in quality and safety improvement based upon error events in the healthcare system.

Teamwork across hospital units: It is referred to the healthcare worker perception of the capability of the institution to cooperate while delivering care to the patient.

Literature review

This chapter provided the related literature that has been conducted about nurse's perception of patient safety. In addition, this chapter included a rich description of the results of previous research (related studies) which have been conducted in different countries as well as Saudi Arabia. Finally, an explanation of the research gap was provided at the end of the chapter.

For decades, healthcare providers and consumers have seen a demand for excellence increase. When excellence was not achieved, provider's competence leads to debates, complaints, and root cause investigations [9-10]. In European countries and several countries in the Middle East, healthcare has advanced. Still, it results in adverse events in hospitals, such as medical errors and hospital-acquired infections. For instance, in Australia, approximately 12 per cent of hospitalized patients suffered from adverse events. Patient safety called for organizational and multidisciplinary strategy, where nursing was fundamental. As Graban reported, providers had a value that enhanced them to work better. In nursing, values were critical in developing a culture of patient safety. Thus, this literature focused on nurse's perception of patient safety culture.

Existing evidence proposed that nurses could develop a patient safety culture that eventually helped them to prevent avoidable adverse events. However, in a study conducted by, the researchers reported that this could only happen in health systems that promote, generate, and preserve a culture of patient safety [12]. This primary issued that presented itself of how nurses perceive a principle of patient safety. In their review, reported that the culture of patient safety in hospitals was not a coherent vision among healthcare professionals, because they all had different perspectives. In a review of 11 articles, the authors discovered that nurses had poor awareness of patient safety culture [13]. Similarly, Farokhzadian et al, in their research, indicated that nursing has a long way to go regarding their perception of patient culture because of poor leadership, organizational substructure, and insufficient efforts to keep up with national and global values on patient safety [14].

Furthermore, nurses helped to enforce a culture of safety, especially with a support system in place [15]. Empirical evidence indicated that nurses need an open line of communication with other healthcare teams to enable them to assess their peers' personal and professional work habits and behaviours that fostered patient safety in the clinical area of practice. In their research, Rigobello et al. investigated nursing perceptions towards patient safety culture [16]. The subjects reported that they were satisfied with their jobs but dissatisfied with how management addressed safety issues within different facilities. The same was reported in different studies by Eiras, Wami, Okuyama et al., which all reported that despite nurses embracing a culture of patient safety, the general climate of the issue was hostile [17-19].

Notably, nurses' perception regarding patient safety climate, especially in primary care and emergency care, aids in assessing safety culture, contributed to enhanced healthcare and minimizes adverse events. Thus, organizations directed their efforts towards improving the quality of care. In Saudi Arabia, existing evidence indicated that nurses consider patient safety culture to be a critical component of care. However, their focus was on teamwork within units and organizational learning [20-22]. Evidence from the country indicated that a strong safety culture of leadership committed to learning from mistakes, storing and enhancing patient safety, and encouraging teamwork among nurses was critical. Alonzi et al. reported that nurses get a more positive perception of patient safety than other providers inside the country. Thus, through leadership, health systems identified potential hazards and incorporated nurses and other staff to develop a culture of patient safety.

Related studies

Globally, Patient safety culture was critical because it directly affected patient health and wellbeing. Despite that, research was limited in some countries and therefore, the responses of countries regarding this issue were different based on how big their problem was.

In Turkey, a study within a sample of 554 Registered nurses who have been requested to complete (HSOPSC) survey in four hospitals. The result showed that patient safety culture highest score on teamwork within units, followed by organizational learning/continuous improvement whereas the lowest score was on non-punitive response to an error with an overall negative perception of Turkish nurses on patient safety culture. This issue may be because nurses who work in Turkish hospitals were lacking effective leadership. Managers of nurse's requirement created a positive safety culture through effective communication [23].

Another study was carried out in the Philippines for a sample of 292

registered nurses from three governmental hospitals across all hospitals departments. The study also showed a positive response for the teamwork within units and organizational learning/continuous improvement as an important aspect of patient safety culture. The non-punitive response to error was an area that requires improvements [24].

In Iran, the study showed slightly different responses in some categories. Although it showed the same strong response at first part such as organizational learning/continuous as well as teamwork within units, it showed different in weak response for communication concerning errors and non-punitive response to error. Thinking differently believed to be due to cultural and linguistic diversity of nurses. In particular, some cultural background did not report some mistakes because they fear disciplinary action from hospital management [25]. One important feature was missing here regarding effective leadership which can build a patient safety culture.

In KSA, a study in the same year by Alharbi et al. was conducted in one facility oncology centre in Riyadh. The study was conducted for different healthcare providers including nurses and found that the majority of nurses who responded to the questionnaire in all departments reported negative responses in some dimensions including communication. Feedback and communication about errors and teamwork in units were significant predictor's factors to patient safety culture. Therefore, more research may be needed to ascertain these findings in different cities in Saudi Arabia as well as more than one healthcare facility.

In addition, Alquwez et al. conducted a study at three hospitals in Riyadh city (KSA) to measure the influence of demographical characteristics on patient safety perception [26]. The study found that the nurse's length of service, nationality, education and work area were significant predictors to patient safety culture perception. The study also found that teamwork with the unit, organization learning continuous, communication and frequency and event report was significantly related to patient safety culture. Specifically, two areas identified strengths of teamwork within the unit as well as organizational continuous learning whereas the rest factors were identified as a weakness.

Alquwez et al. also stated that communication and active responsiveness amongst the staff would progress the patient's safety culture. The study indicated that direct and frequent patient contact with the care provider enhanced the quality of care given as well as the execution of the organizational culture towards patient's safety. Hence, the patient's safety in Saudi Arabia was still under development, and many of the loops were covered through further studies and culture adoption.

The literature review suggested that there were communication issues that impact patient safety culture. In addition, different culture had a different perception of safety. The literature review also suggested that effective leadership and management supported patient safety. All studies that have been conducted in Saudi Arabia were focused on Riyadh city only. Based on the literature, the focus of future study should be on the patient safety culture perception of nurses in other Saudi cities Future studies should concentrate on the patient safety perception of nurses in more than three healthcare facilities and all hospitals departments.

Related Studies that used the instrument

Table 1 illustrated the studies that used the HSOPSC questionnaire among different healthcare settings in the world including year and author, design, sample and settings, instrument, key findings and limitations.

Theoretical Framework

Social system theory: Social system theory can be defined as "an organized boundaries system of social roles, behaviours, and practices developed to maintain values and the mechanisms to regulate the practice and rules". This theory has a robust effect on people as they grew from childhood to adulthood. The social system theory covered six concepts: organization, power, authority, decision-making, status and control, as well as concepts from interpersonal systems and personal (King, 1981). In this research, the social systems theory or concepts of power, organization, and status would be used as abstracted by the support of leadership for error reporting, patient safety, and nursing staffing.

Organization was defined as "human beings with prescribed roles and positions who used resources to accomplish personal and organizational goals". King suggested four components for organization: human value, behaviour pattern, needs, and goal and expectation; natural environments in which materials and human resources were always essential when achieving the goal; employer and employee, or parent and child, who initiated groups that cooperatively interact to attain the goal; and technologies which enable goal accomplishment. Operational leadership support referred to the activity accomplished by the healthcare organization administrator to assist nurses to keep safe practice for patients that they care on. According to King, status can be defined as "the position individual in a group or a group concerning other groups in an organization" as well as "it was related to who you are, what you do, who you know, what you have achieved". The operational for nursing staff was defined as how work was arranged, how staffing was organised, and who played what role in the patients care dynamic.

King has defined Power in a variety of ways

First, power was defined as the capability to use resources in organizations to attain targets or goals. Another definition was that it was the process that one or more humans influenced other humans in a situation. Another definition was that it was the capability or capacity of a people or group of people to attain the goal that occurs in any aspect of life and each person has possible power determined by individual resources as well as the environmental force encountered. Power, on the other hand, was a social force that arranged and kept or maintained society. Power meant the ability to employ and activate resources to reach targets. The operational definition for the error reported the real action occupied by organizations when the error occurred. While every of King's thoughts were designated as application of a specific system, King suggested that the concept was arbitrarily placed in any of the three systems and can be employed inter-changeably through systems (King, 1992). Figure 1 showed the conceptual framework for patient safety culture based on King's social system theory.

Research methods

Research design

This chapter reviewed the research methods which would be conducted in Hafar Al-batin, Saudi Arabia including research methods, sampling and sample size, settings, data collection, analysis, recruitment, and ethical considerations.

The study used a quantitative approach to explore the Patient safety

Table 1. Summary of studies that used the HSOPSC instrument

Year/author	Design	Sampling / Setting	Instrument	Key findings	Limitation
(Güneş et al., 2016)	Cross-sectional	Convivence Four hospitals	HSOPSC	Positive teamwork within units and organizational learning/continuous	The instrument was not tested in Turkey.
(Ramos & Calidgid, 2018)	Cross-sectional	Convivence (One hospital)	HSOPSC	Positive teamwork within units and organizational learning/continuous.	· . One hospital only and small sample size.
(Raeissi et al., 2018)	Cross-sectional	Convivence	HSOPSC	Some nurses reported positive perception.	· The instrument was not tested in Iran.
		One hospital		Lowest score was communication.	· One hospital only and small sample size.
(Alquwez et al., 2018)	Cross-sectional	Convivence (Three hospitals)	HSOPSC	Teamwork within the unit and organizational continuous learning identified as strengths.	· 90% of participants are female.
(Alharbi et al., 2018)	Cross-sectional	Convivence	HSOPSC	Area of weakness were reporting of events, non-punitive response to error and communication.	· Small sample size (127)
		One facility			· One hospital and one department (Oncology).

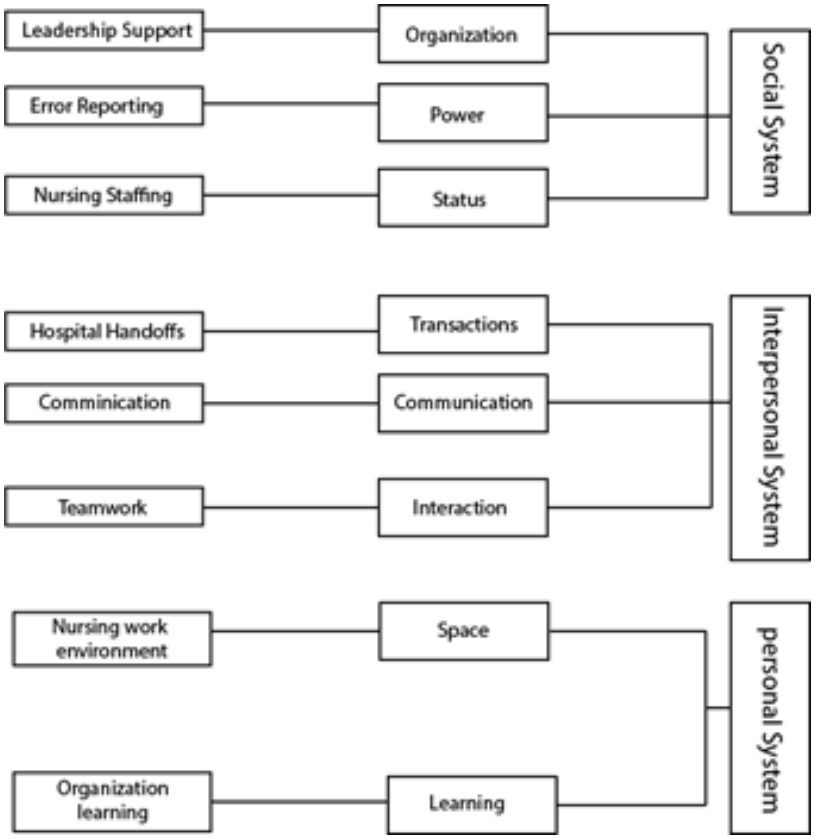

Figure 1. Patient Safety Culture conceptual framework based on King's Conceptual System.

culture perception among registered nurses in Hafar Al-batin, Saudi Arabia. Similarly, a quantitative approach to measure the influence of demographical factors of nurses working in different hospitals in Hafar Al-batin, Saudi Arabia. In particular, research aimed at measuring the influence of demographical factors of nurses working in different hospitals whereas research aim two explored patient safety culture perception in Hafar Al-batin, Saudi Arabia. The study also used a cross-sectional design using Google Survey Platforms and used for both aims in this study. This design was chosen to help researchers to understand the influence of personal demographical characteristics on Patient safety culture perception as well as exploring the Patient safety culture awareness among registered nurses [27]. The demographic questions in this research included socio-cultural, demographic characteristics. In particular, the participant's demographic data included questions about age, gender, marital status, level of education, years of experience, nationality, working department and language/s that participants speak. In addition, the study explored nurses' perceptions of patient safety culture in Hafar Al-batin.

Study participants and setting

The eligible participants participated in this research according to inclusion and exclusion criteria. The inclusion and exclusion criteria of the participants were described below:-

Inclusion Criteria

- Male or female.
- Nurse practitioner.
- Currently working in any of Hafar Al-batin targeting facilities.
- 18 years old and above.

Exclusion Criteria

- Other healthcare providers.
- Working in a different city.
- Working in different hospitals than targeting hospitals.
- Less than 18 years old.

The study was conducted at four healthcare facilities at the secondary level. In particular, the study was conducted at four hospitals in Hafar Al-batin including Central Hospital, King Khalid General Hospital Maternity Hospital, Hafar Al-batin Mental Hospital. These four hospitals were selected from general hospitals that provided different services for several conditions and they are rich in registered nurses working in different departments.

Sampling

367 nurses among 700 nurses were participated in this study from four hospitals in Hafer Albatin region. Sample size calculation illustrated that to have approximately 5% error and around 90% confidence level the total sample size, 249 registered nurses were calculated as the minimum sample size of this study. Sample size was calculated by Thompson's equation as seen in Table 2. [28]. A convenience sample was used to perform inferential analysis of the quantitative data. The demographic data questions and HSOPSC instrument were sent to the eligible participants via electronic email using the google survey platform. A strategy to enhance the response rate was utilized during data collection.

$$n = \frac{N \times p(1-p)}{\left[\{N-1 \times (\mathrm{d}^2 \div z^2)\} + p(1-p)\right]}$$

Data collection

Data gathering procedure: The data collection process was held at the four nominated in Hafar Al-batin. Data collection was expected to last for approximately one to two months. After obtaining ethical approval from the Ministry of Health (MoH), Saudi Arabia conducted the study; the researchers explained the study details including the eligibility criteria to the administration of the targeting healthcare facilities. The researcher also discussed the study details with the nursing educator. Following that, an e-mail or WhatsApp message was sent to the eligible participants asking them to respond to the questions. The e-mail or WhatsApp message included the participants' information statement (PIS) which was an explanation of all the study aim, nature and the potential risk. Then, there was a question at the end of the first page asking participants about their consent to participate. After that, the participants started part A and Part B of the questionnaire. This exercise was repeated in all the health facilities until the sample size was attained.

Instrument: The study used the Hospital Survey on Patient Safety Culture (HSOPSC) questionnaire which was developed in the United States. This questionnaire was validated and was widely used across many health settings. The reliability score in these studies showed a Cronbach alpha of a value higher than 0.7 which was accepted [29]. In addition, it had been psychometrical tested in Saudi culture which was a valid and reliable

Table 2: Sample size calculation of this study.

	Input Values		Output Values
N	Population size = 700		
z	Confidence level at 95% = 1.96	**n**	**sample size** = 249
d	Error proportion = 0.05		
p	Probability value = 0.50		

*The minimum recommended sample size of this study.

instrument to be used in Saudi Arabia with a Cronbach alpha of 0.88. The questionnaire consisted of 42 items asking nurses regarding their perception of patient safety. Most of these items had several five responses ranging from strongly disagree to strongly agree as well as never to always. A higher number indicated a positive response whereas a lower number indicated a negative response. The questionnaire had two main parts with a total of 50 items. The first part consisted of eight items regarding demographical data. The second part consisted of 42 HSOPSC items about patient safety culture perception among registered nurses. Filling the questionnaire may approximately take up to 15 to 20 minutes to complete. The study used the Statistical Analysis program Statistical Package for Social Sciences (SPSS).

Data analysis

To achieve the study aims represented in measuring the influence of demographical factors of nurses working in different hospitals in Hafar Al-batin, Saudi Arabia on patient safety culture which explored their perception; the researchers used a descriptive and inferential analysis. The descriptive statistics summarized the demographic characteristics of the survey respondents. The statistics involved frequency distribution, mean, standard deviations and median [30]. The inferential analysis used the linear regression model to identify the most predictive factors to patient safety culture perception among registered nurses. In particular, research aim one aimed at measuring the demographical factors that correlated with patient safety culture perception on nurses. The second aim aimed at measuring the most predictor factors from patient safety culture instrument dimensions. As shown in Appendix 1, the study aims, method, data collection instrument, sample and data analysis were provided.

Calculate item and composite percent positive scores

It can be useful to calculate an overall score for items within a composite. To calculate hospital's score on a particular safety culture composite, average the per cent positive responses on all items included in the composite.

To calculate percent positive scores, need to reverse code negatively worded items. Disagreeing or responding Never to a negatively worded item indicated a positive response. Negatively worded items were identified in the document Hospital Survey on Patient Safety Culture: Composites and Items.

Use the following guidelines for reverse coding negatively worded items:

- If respondents answered "strongly disagree" or "never" to a negatively worded item, answers should be recorded from 1 to 5?
- If respondents answered "Disagree or rarely" to a negatively worded item, answers should be recorded from 2 to 4.
- The neutral response categories neither agree nor disagree and sometimes were not affected by negatively worded items and would always be coded as 3.
- If respondents answered "Most of the time or Agree" to a negatively worded item, answers should be recorded from 4 to 2.
- If respondents answered "Always or strongly agree" to a negatively worded item, answers should be recorded from 5 to 1.

Then items were dichotomised/classified into "positive" and "negative", so 5 and 4 were classified as positive and coded 1, and 3,2 and 1 were classified as negative and coded as zero, then the targeted positive score (percentage) as the achieved score divided by the total responses*100 excluded the missing values.

Ethical considerations

The study utilized instrument (HSOPSC) which is common used. Furthermore, the study obtained ethical approval from the Ethical Committee of the directorate of health affairs in Hafer Albatin city, numbered H-05-FT-083 and dated 25/3/2021. Then the researcher obtained approval from the administration of each healthcare facility. The researcher ensured that there was no harm to participating in this project. Assurance of autonomy participating was provided in the email and WhatsApp. For the anonymous questionnaire, consent was implied if the email was completed and submitted. The researcher maintained the confidentiality of the data. After ethical approval from both facilities, the researcher went to each hospital and met the management of nursing as well as nursing education staff. The researcher explained to them all the study details. The researcher provided participants with an information statement that contained all details about study participation, the aim of the study, potential risks of participation and who participated in this study. Following that the researcher ensured that every participant agreed to participate by answering a confirmation question after reading the participant's information statement. The participant's information statement confirmed that the participant can withdraw at any time before completing and submitting the questionnaire. Then the eligible participant responded to the questions of the survey. Participants who want more clarification, /can contact the researcher at any time to clarify an unclear point as a researcher was providing his contact details at the participant's information statement.

Results

The data was collected using Google forms service, coded inspected and processed using Microsoft Excel and then exported to the Software Statistical Package for the Social Science (SPSS) version 23 for analysis. The internal consistency method was used to test the validation of the scale. Descriptive statistics including frequencies, percentages were used to describe the items and the study variables. Linear regression was conducted to test the influence of demographic factors on Patient safety culture. The p values at 0.05 were considered statistically significant.

Demographic factors

As shown in Table 1, a total of 367 nursing staff participated in the study including 28.1% male and 71.9% female, just above a half aged 31-40 years old, and more than two-thirds were married. 64.3% were Saudi and 35.7% were non-Saudi. 45.25 held bachelor degrees while 33% got a diploma. A half spoke the Arabic language while 44.36% spoke English. 34.6% had experienced 5 to 10 years, 43.7% worked in King Khalid Hospital, and worked in more than 6 departments with an advantage for emergency (34.3%).

Que. 1) what is the nurse's patient safety culture perception in Hafar Al-Batin?

Patient Safety Culture description: As shown in Table 3 the perception of Patient Safety Culture was presented. The overall average score of the nurse's patient safety culture perception in Hafar Al-Batin was moderate (44.17%). Teamwork had the highest positive score across the dimensions with 64.31%, followed by Organizational Learning—Continuous Improvement with 63.03% then Frequency of Events Reported (51.95%) then Management Support for Patient Safety (47.23%). While the lowest score was Nonpunitive Response to Errors (20.35%), followed by staffing (23.43%) then Communication Openness (37.42%), the rest dimensions were in the 40s.

Work area/unit in the hospital and overall: As shown in Table 3 participants were asked about their perception of their work area/unit in this hospital and overall, they score M=3.74, SD=0.99 with a very good level.

Background information: As shown in Table 4, the background information was presented, more than a half were Registered Nurses, and 88.9% typically had direct interaction or contact with patients, 47.1% had no event reports while 28.1% had 1 to 2 event reports, 43.6% had worked in this hospital for 1 to 10 years and half of the nurses worked in the current hospital work area/unit, 67.3% had worked 40 to 59 hours per week in the hospital.

As shown in Table 5 the linear regression was conducted to test the relationship/prediction of personal demographical variables of nurses on patient safety culture perception in Hafar Al-Batin, the significant value of path estimation (β) was examined based on the *t* value ($p<0.05$), ($F=4.47$, $p<0.05$), R^2 is a function of the influence of independent variables on the dependent variable, so R^2 of independent variables (predictors variables) = 0.11. This value meant that only 11% of the influence was made by independent variables (demographical variables) on the dependent variable (nurses on patient safety culture perception). Gender had a relationship with patient safety culture perception with advantage for females ($\beta=-0.59$, $t=-2.35$, $p<0.05$). Age had a relationship with patient safety culture perception with advantage for older nurses ($\beta=2.89$, $t=3.34$, $p<0.05$), the spoken language had an influence on patient safety culture perception with advantage for spoken less number of language ($\beta=-1.88$, $t=-2.58$, $p<0.05$).

Null hypothesis

There was no significant relationship between the personal demographical variables of nurses to patient safety culture perception.

Table 3. Demographic factors (N=367)

Factor		N	%
Gender	Male	103	28.10%
	Female	264	71.90%
Age	20-30	151	41.10%
	31-40	189	51.50%
	41-50	23	6.30%
	51-60	4	1.10%
Marital statue	Single	80	21.80%
	Married	273	74.40%
	Divorced	13	3.50%
	Widow	1	0.30%
Nationality	Saudi	236	64.30%
	Non-Saudi	131	35.70%
Education	Diploma	121	33.00%
	Bachelor	166	45.20%
	Graduate Certificate	58	15.80%
	Masters	22	6.00%
Spoken language	Arabic	258	50.19%
	English	228	44.36%
	Other	28	5.45%
Experience	Less than 2 years	43	11.70%
	2 to 5 years	86	23.40%
	5 to 10 years	127	34.60%
	10 to 15 year	83	22.60%
	More than 15 years	28	7.60%
Hospital	King Khalid Hospital	145	43.70%
	Mental	46	13.90%
	Central Hospital	95	28.60%
	Maternity and Children	46	13.90%
Department	Medical	29	7.90%
	Surgical	45	12.30%
	Emergency	126	34.30%
	Intensive care	10	2.70%
	Critical Care	4	1.10%
	Other	153	41.70%

Table 4. Patient Safety Culture description (N=367)

Statement	N/%	SDS/ Never	DA/ rarely	N/ sometimes	A/often	SD/Always	Achieved score	Positive %
People support one another in this unit	N	17	24	84	172	70	242	65.94%
	%	4.6	6.5	22.9	46.9	19.1		
When a lot of work needs to be done quickly, we work together as a team together the work done	N	23	28	89	156	71	227	61.85%
	%	6.3	7.6	24.3	42.5	19.3		
In this unit, people treat each other with respect	N	12	32	77	172	74	246	67.03%
	%	3.3	8.7	21	46.9	20.2		
When one area in this unit gets really busy, others help out	N	25	34	79	168	61	229	62.40%
	%	6.8	9.3	21.5	45.8	16.6		
Teamwork Within Units								**64.31%**
My supervisor/manager says a good word when he/she sees a job done according to established patient safety procedures	N	34	45	82	150	56	206	56.13%
	%	9.3	12.3	22.3	40.9	15.3		
My supervisor/manager seriously considers staff suggestions for improving patient safety	N	39	50	91	134	53	187	50.95%
	%	10.6	13.6	24.8	36.5	14.4		

Whenever pressure builds up, my supervisor/manager wants us to work faster, even if it means taking shortcuts (R)	N	47	77	120	96	27	124	33.79%
	%	12.8	21	32.7	26.2	7.4		
My supervisor/manager overlooks patient safety problems that happen over and over (R)	N	28	48	104	133	54	76	20.71%
	%	7.6	13.1	28.3	36.2	14.7		
Supervisor/Manager Expectations & Actions Promoting Patient Safety								**40.40%**
We are actively doing things to improve patient safety	N	12	22	53	186	94	280	76.29%
	%	3.3	6	14.4	50.7	25.6		
Mistakes have led to positive changes here	N	31	35	113	152	36	188	51.23%
	%	8.4	9.5	30.8	41.4	9.8		
After we make changes to improve patient safety, we evaluate their effectiveness	N	18	23	100	182	44	226	61.58%
	%	4.9	6.3	27.2	49.6	12		
Organizational Learning—Continuous Improvement								**63.03%**
Hospital management provides a work climate that promotes patient safety.	N	20	46	117	142	42	184	50.14%
	%	5.4	12.5	31.9	38.7	11.4		
The actions of hospital management show that patient safety is a top priority	N	16	40	93	151	67	218	59.40%
	%	4.4	10.9	25.3	41.1	18.3		
Hospital management seems interested in patient safety only after an adverse event happens (R)	N	44	74	106	106	37	118	32.15%
	%	12	20.2	28.9	28.9	10.1		
Management Support for Patient Safety								**47.23%**
Patient safety is never sacrificed to get more work done	N	40	49	88	124	66	190	51.77%
	%	10.9	13.4	24	33.8	18		
Our procedures and systems are good at preventing errors from happening	N	18	29	92	171	57	228	62.13%
	%	4.9	7.9	25.1	46.6	15.5		
It is just by chance that more serious mistakes don't happen around here (R)	N	27	43	120	136	41	70	19.07%
	%	7.4	11.7	32.7	37.1	11.2		
We have patient safety problems in this unit (R)	N	50	90	98	93	36	140	38.15%
	%	13.6	24.5	26.7	25.3	9.8		
Overall Perceptions of Patient Safety								**42.78%**
We are given feedback about changes put into place based on event reports	N	25	58	149	108	27	135	36.78%
	%	6.8	15.8	40.6	29.4	7.4		
We are informed about errors that happen in this unit	N	15	45	114	130	63	193	52.59%
	%	4.1	12.3	31.1	35.4	17.2		
In this unit, we discuss ways to prevent errors from happening again	N	16	35	104	130	82	212	57.77%
	%	4.4	9.5	28.3	35.4	22.3		
Feedback & Communication About Error								**49.05%**
Staff will freely speak up if they see something that may negatively affect patient care	N	27	56	115	121	48	169	46.05%
	%	7.4	15.3	31.3	33	13.1		
Staff feel free to question the decisions or actions of those with more authority	N	59	66	101	107	34	141	38.42%
	%	16.1	18	27.5	29.2	9.3		
Staff are afraid to ask questions when something does not seem right (R)	N	46	56	128	108	29	102	27.79%
	%	12.5	15.3	34.9	29.4	7.9		
Communication Openness								**37.42%**
When a mistake is made, but is caught and corrected before affecting the patient,how often is this reported? .	N	26	57	84	120	80	200	54.50%
	%	7.1	15.5	22.9	32.7	21.8		
When a mistake is made, but has no potential to harm the patient, how often is this reported?	N	30	62	96	113	66	179	48.77%
	%	8.2	16.9	26.2	30.8	18		
When a mistake is made that could harm the patient, but does not, how often is this reported?	N	33	53	88	116	77	193	52.59%
	%	9	14.4	24	31.6	21		
Frequency of Events Reported								**51.95%**
There is good cooperation among hospital units that need to work together	N	19	54	93	150	51	201	54.77%
	%	5.2	14.7	25.3	40.9	13.9		
Hospital units work well together to provide the best care for patients	N	17	45	103	154	48	202	55.04%
	%	4.6	12.3	28.1	42	13.1		

Hospital units do not coordinate well with each other (R)	N	35	88	122	97	25	123	33.51%
	%	9.5	24	33.2	26.4	6.8		
It is often unpleasant to work with staff from other hospital units(R)	N	34	114	122	82	15	148	40.33%
	%	9.3	31.1	33.2	22.3	4.1		
Feedback & Communication About Error								**45.91%**
We have enough staff to handle the workload	N	19	54	93	150	51	123	33.51%
	%	5.2	14.7	25.3	40.9	13.9		
Staff in this unit work longer hours than is best for patient care(R)	N	17	45	103	154	48	48	13.08%
	%	4.6	12.3	28.1	42	13.1		
We use more agency/temporary staff than is best for patient care(R)	N	35	88	122	97	25	119	32.43%
	%	9.5	24	33.2	26.4	6.8		
We work in "crisis mode" trying to do too much, too quickly (R)	N	34	114	122	82	15	54	14.71%
	%	9.3	31.1	33.2	22.3	4.1		
Staffing								**23.43%**
Things “fall between the cracks” when transferring patients from one unit to another (R)	N	49	119	98	84	17	168	45.78%
	%	13.4	32.4	26.7	22.9	4.6		
Important patient care information is often lost during shift changes (R)	N	66	124	89	74	14	190	51.77%
	%	18	33.8	24.3	20.2	3.8		
Problems often occur in the exchange of information across hospital units(R)	N	31	112	129	78	17	143	38.96%
	%	8.4	30.5	35.1	21.3	4.6		
Shift changes are problematic for patients in this hospital(R)	N	50	101	113	81	22	151	41.14%
	%	13.6	27.5	30.8	22.1	6		
Handoffs & Transitions								**44.41%**
Staff feel like their mistakes are held against them (R)	N	24	51	136	106	50	75	20.44%
	%	6.5	13.9	37.1	28.9	13.6		
When an event is reported, it feels like the person is being written up, not the problem(R)	N	27	56	120	122	42	83	22.62%
	%	7.4	15.3	32.7	33.2	11.4		
Staff worry that mistakes they make are kept in their personnel file (R)	N	19	47	99	136	66	66	17.98%
	%	5.2	12.8	27	37.1	18		
No punitive Response to Errors								**20.35%**
Overall Patient Safety Culture								**44.19%**

(R) = Reverse question

Table 5. Work area/unit in this hospital an overall (N=367)

	Failing	Poor	Acceptable	Very good	Excellent	Mean	SD	Level
N	9	26	110	130	92	3.74	0.99	Very good
%	2.5	7.1	30	35.4	25.1			

Table 6. Back ground information (N=367)

Factor		N	%
Staff position	Registered Nurse	198	54.00%
	Physician Assistant/Nurse Practitioner	81	22.10%
	LVN/LPN	29	7.90%
	Patient Care Asst/Hospital Aide/Care Partner	29	7.90%
	Nurse	30	8.20%
In your staff position, do you typically have direct interaction or contact with patients?	YES, I typically have direct interaction or contact with patients.	319	88.90%
	NO, I typically do NOT have direct interaction or contact with patients.	40	11.10%
In the past 12 months, how many event reports have you filled out and submitted?	No event reports	173	47.10%
	1 to 2 event reports	103	28.10%
	3 to 5 event reports	47	12.80%
	6 to 10 event reports	23	6.30%
	11 to 20 event reports	8	2.20%
	21 event reports 21	13	3.50%

How long have you worked in this hospital?	Less than1year	48	13.10%
	1 to5 years	160	43.60%
	6 to10years	92	25.10%
	11 to 15years	51	13.90%
	16 to 20 years	12	3.30%
	21 years or more	4	1.10%
How long have you worked in your current hospital work area/unit?	Less than 1year	68	18.50%
	1 to5 years	182	49.60%
	6 to10years	85	23.20%
	11 to 15years	24	6.50%
	16 to 20years	7	1.90%
	21 years or more	1	0.30%
Typically, how many hours per week do you work in this hospital?	Less than 20 hours per week	29	7.90%
	20 to 39 hours per week	46	12.50%
	40 to 59 hours per week	249	67.80%
	60 to 79 hours per week	34	9.30%
	80 to 99 hours per week	6	1.60%
	100 hours per week or more 100	3	0.80%

Table 7. The prediction of demographical variables of nurses on patient safety culture perception (N=367)

Predictor variables	ß	SE-*b*	Beta	*t*	*p*	95% CI	
						Lower	Upper
(Constant	**23.72**	**3.38**		**7.01**	**0.00***	**17.06**	**30.38**
Age	**2.89**	**0.86**	**0.24**	**3.34**	**0.00***	**1.19**	**4.59**
Gender	**-0.59**	**0.25**	**-0.14**	**-2.35**	**0.02***	**-1.08**	**-0.1**
Marital statue	0.23	0.93	0.01	0.25	0.81	-1.61	2.06
Education	-0.11	0.5	-0.01	-0.22	0.83	-1.08	0.87
Nationality	-1.63	1.09	-0.1	-1.49	0.14	-3.78	0.52
Language	**-1.88**	**0.73**	**-0.14**	**-2.58**	**0.01***	**-3.32**	**-0.45**
Experience	0.14	0.52	0.02	0.27	0.79	-0.88	1.16
Hospital	-0.09	0.38	-0.01	-0.24	0.81	-0.83	0.65
Department	-1.86	1.08	-0.11	-1.71	0.09	-3.99	0.27

Note: patient safety culture perception was the dependent variable. ß is the unstandardized coefficients; SE-b is the Standard error.

R2 =0.33; Adjusted R2 =0.11.
F=4.47**

**Significant at0 .05 level

So, the above hypothesis was not supported for gender, age and spooked language on nurse's perception of patient safety culture Table 6, 7.

Discussion

The result of this research, which was shown at four hospitals in (KSA) , explored the perception of patient safety among nurses and showed that the strength of high denomination was teamwork with in-unit followed by organization learning continue improvement and, on the other hand, weakness of lower dimension was nonpunitive response to errors, staffing and communication openness.

In the teamwork with unit dimension, it was found that staff nurses in departments had self-esteem and confidence, due to the presence of respect, unity, support, cooperation and collaboration among the nurses in the unit to attain safe, efficient, and excellent quality of urgent care within four hospitals (2018). On the other hand, in the organization learning, it was since governmental hospitals had their continuous education department that support and values the educational learning of staff [31].

The Ministry of Health Hospitals in Saudi Arabia with its mission and vision values a Continuous education of their staff updated the knowledge with the new trend, and were able to adapt to the sophisticated level of health care.

Similar recent research was carried out in Turkey and Philippines indicated that the highest positive dimension was teamwork with units across the dimension between 78.5% and 91.50 % followed by organizational learning continued improvement between 67.6% and 86.89% which was considered a close result to my research finding. Also, numerous local studies in which we share similar culture-proven the teamwork within units and organizational learning continues improvement area as strengths [32].

In the weakness dimensions the lowest denomination score non punitive response to errors, Because of the severe fines and consequences, nurses may be afraid to report such incidents., which were led to get low score following hand Staffing factor showed that the shortage of staffing was a universal concern that harmed nurses because long hours of a heavy workload, which was an evident in the high score gotten by nurses working between 40 to 59 h per week in this study. Then Communication openness might be related to the nurses who continued work in the hospitals of the country they had a different culture. Communication and openness, that compromised by differences in religion, language, and cultural beliefs.

And by reviewing the previous studies which was done on nurses working in hospitals only and utilized Hospital of patient safety culture survey instrument (HOPSC) in Turkey, Jordan and in Saudi Arabia study the participant which was found the lowest dimension was in Nonpunitive Response to Errors followed by staffing then Communication Openness. That was similar to my result.

The current study indicated that there was no significant relationship between demographic variables on nurses to patient safety culture perception except on gender, age and speaking language.

Female staff provided a higher score to the patient safety culture than men, It might be related to the fact that females were associated with caring actions in our culture [33-35]. Older nurses' age evaluated more positively patient safety culture than young nurses' age. This may be associated to those who had more working experiences than a young nurse in hospitals. Non-Arabic-speaking nurses were more positive about the patient safety culture better than Arabic-speaking staff. The result was expected and similar to two studies conducted in Saudi Arabia.

Conclusion

This study results reviewed three demographic factors that affected how patient safety was perceived among nurses in Saudi Arabia. The majority of the participant were females who were more aware of patient safety than males, older nurses were conscious than young ones, and who speak less language were more observant than who didn't speak. These studies utilized (HSOPS) instrument to find two strength areas as teamwork with the unit and followed by orientation learning continue improvement. On the other hand, three weak areas were required Initiatives to improve staffing, communication and non-punitive response. Our study appeared to suggest that a culture of safety has yet to be created and developed in Saudi Arabia. Hospital administrators and nurse's managers made policies and initiatives that aimed at enhancing hospital patient safety culture.

Limitations and recommendations

Only four hospitals were studied, so to better include all hospitals to give more perception in Hafer Al Batin. Additionally, the study's sample was limited to nursing staff only in secondary care and not for all health care providers.

In light of study findings, The researcher recommended leaders in the health field in general to adopt initiatives that aim to improve the culture of patient safety, in addition to conduct further studies that include all health workers at all levels of health care in Hafer Al-batin. Furthermore, the researchers required to conduct a further research to cover all levels of health care and all health specialties

References

1. Pourshareiati, F., and Mohammad Amrollahi. "Patient safety culture from Rahnemon hospital nurses' perspective." Occup Hyg Health Promot J 1.1 (2017): 52-61.
2. Ibrahim, MA., et al. "Assessment of patient safety measures in governmental hospitals in Al-Baha, Saudi Arabia." AIMS Public Health 6.4 (2019): 396.
3. Alharbi, W., et al. "Assessment of patient safety culture in an adult oncology department in Saudi Arabia." Oman Med J 33.3 (2018): 200.
4. Alshammari, M., et al. "Barriers to nurse–patient communication in Saudi Arabia: an integrative review." BMC Nurs 18.1 (2019): 1-10.
5. Alsakkak, MA., et al. "Outcome of the first Saudi Central Board for Accreditation of Healthcare Institutions (CBAHI) primary health care accreditation cycle in Saudi Arabia." Saudi Med J. 38.11 (2017): 1132.
6. Marsden, E. "Safety Culture a Contentious and Confused Notion" Risk Engineering, 18 Jan. 2021.
7. Cooper, D. (1998). Improving safety culture: A practical guide. Wiley.
8. AHRQ. (2021). Hospital Survey 1.0: 2021 User Database Report
9. Lannon, K., & Vanni, C. (2020). 5 projects, 5 hospitals: Using DMAIC for rapid quality improvement.
10. Kelly, P., et al. Introduction to Quality and Safety Education for Nurses: Core Competencies for Nursing Leadership and Management. Springer Publishing Company, 2018.
11. Graban, Mark, and John Toussaint. Lean hospitals: improving quality, patient safety, and employee engagement. Productivity Press, 2018.
12. Koushal, Vipin K., and Vineet Goyal. "Patient safety is the need of the hour: A study in nursing department of a tertiary care teaching hospital." Int. J. Res. Found. Hosp. Healthc. Adm. 5.2 (2017): 55-59.
13. Willmott, Julie, and Jon Mould. "Health professionals' perception of patient safety culture in acute hospitals: an integrative review." Aust Health Rev. 42.4 (2017): 387-394.
14. Farokhzadian, Nahid Dehghan Nayeri, and Fariba Borhani. "The long way ahead to achieve an effective patient safety culture: challenges perceived by nurses." BMC health Serv Res. 18.1 (2018): 1-13.
15. Sherwood, Gwen, and Jane Barnsteiner. "Quality and safety in nursing: a competency approach to improving outcomes." J Nurs Regul. 3.4 (2013): 64.
16. Rigobello, Mayara Carvalho Godinho, et al. "The perception of the patient safety climate by professionals of the emergency department." Int Emerg Nurs. 33 (2017): 1-6.
17. Eiras, M., et al. "The hospital survey on patient safety culture in Portuguese hospitals: instrument validity and reliability." Int J Health Care Qual Assur. (2014).
18. Sintayehu W.D., et al. "Patient safety culture and associated factors: A quantitative and qualitative study of healthcare workers' view in Jimma zone Hospitals, Southwest Ethiopia." BMC health Serv Res. 16.1 (2016): 1-10.
19. Okuyama JH, Galvao TF, Silva MT. "Healthcare professional's perception of patient safety measured by the hospital survey on patient safety culture: a systematic review and meta-analysis." Sci World J. 19; (2018).
20. Andri LP, Soewondo P. "Nurses' perception of patient safety culture in the hospital accreditation era: a literature review." KnE Life Sciences (2018): 60-75.
21. Andri, L., and Soewondo P. "Nurses' perception of patient safety culture in the hospital accreditation era: a literature review." KnE Life Sciences (2018): 60-75.
22. Alshammari F., Pasay-an E, Alboliteeh M., et al. " Google Scholar Crossref
23. Güneş ÜY, Gürlek Ö, Sönmez M. "A survey of the patient safety culture of hospital nurses in Turkey." Collegian 23.2 (2016): 225-232.
24. Ramos RR and Calidgid CC. "Patient safety culture among nurses at a tertiary government hospital in the Philippines." Appl Nurs Res. 44 (2018): 67-75.
25. Raeissi P, Reisi N, Nasiripour AA. "Assessment of patient safety culture in Iranian academic hospitals: strengths and weaknesses." J. Patient Saf. 14.4 (2018): 213-226.
26. Alquwez N, Cruz JP, Almoghairi AM, et al. "Nurses' perceptions of patient safety culture in three hospitals in Saudi Arabia." J Nurs Scholarsh. 50.4 (2018): 422-431.
27. Creswell, John W., and J. David Creswell. "Research design: Qualitative, quantitative, and mixed methods approaches". Sage Publ. 2017.
28. Thompson, Steven K. Sampling. Vol. 755. John Wiley & Sons, 2012.
29. Zijlmans, Eva AO, et al. "Item-score reliability in empirical-data sets and its relationship with other item indices." Educ. Psychol. Meas. 78.6 (2018): 998-1020.
30. Tariq, S., and J. Woodman. "Using mixed methods in health research. JRSM Short Reports, 4 (6), 204253331347919." (2013).
31. Alkhazim, Mohammad A., et al. "Delivering effective continuous medical education in Saudi Arabia: some critical issues." Health Prof. Educ. 1.1 (2015): 43-49.
32. Ammouri, Ali A., et al. "Patient safety culture among nurses." Int. nurs. rev. 62.1 (2015): 102-110.
33. Aboshaiqah, Ahmad E., and Omar Ghazi Baker. "Assessment of nurses' perceptions of patient safety culture in a Saudi Arabia hospital." J. nurs. care qual. 28.3 (2013): 272-280.
34. Alotaibi, et al. "Saudi Nurses Perception regarding Patient Safety in a Major Tertiary Hospital." Open J. Nurs. 10.7 (2020): 657-664.
35. Khater, W. A., et al. "Nurses' perceptions of patient safety culture in J ordanian hospitals." Int. Nurs. Rev. 62.1 (2015): 82-91.

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