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Exploring the vulnerability of frontline nurses to COVID-19 and its impact on perceived stress

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المخلص

أهداف البحث: هدفت هذه الدراسة إلى استكشاف ومقارنة مدى التعرض لمرض فيروس كورونا المستجد، والمتغيرات الديموغرافية والإجهاد الملحوظ بين الممرضات في الخطوط الأمامية.

طرق البحث: استخدم هذا البحث مقارنة كمية لمقارنة ارتباطية باستخدام تقنية أخذ عينات كرة الثلج، أجرينا هذه الدراسة على 176 ممرضة في الخطوط الأمامية من مستشفيات منطقة حائل في السعودية.

النتائج: أدركت الممرضات في الخطوط الأمامية قابلية العدوى (س = 4.36) ونفور الجراثيم (س = 5.65) كمصدر ضغط مرتفع ولكن معتدل (19.19). اختلفت سنوات الخبرة فقط بشكل كبير في النفور من الجراثيم من بين المتغيرات التي تم فحصها. لم يكن هناك فرق ذو دلالة إحصائية في العدوى والإجهاد الملموس. وبالمقارنة، كان هناك ارتباط سلبي للعدوى المدركة وكراهية الجراثيم مع الإجهاد المدرك.

الاستنتاجات: في دراستنا، أحست الممرضات في الخطوط الأمامية بالإجهاد المعتدل إلى العالي نتيجة قابلية الإصابة بمرض فيروس كورونا المستجد. وُجد أن الخبرة الطويلة تؤدي إلى اختلافات كبيرة في النفور من الجراثيم. ومن الجدير بالذكر أن قابلية الإصابة بمرض فيروس كورونا المستجد لم يكن لها تأثير على مستوى الإجهاد. يمكن أن يؤدي الاهتمام بما يقلق الممرضات إلى تحسين الممارسات الوقائية والسلوكيات الإيجابية في مكافحة الوباء.

الكلمات المفتاحية: مرض فيروس كورونا المستجد؛ التركيبة السكانية؛ الممرضات في الخطوط الأمامية؛ الضعف المدرك؛ الإجهاد المدرك

Abstract

Objectives: This study aimed at exploring and comparing the vulnerability to COVID-19, demographic variables and perceived stress of frontline nurses.

Methods: This study employed a quantitative comparative-correlational approach. Using the snowball sampling technique, we conducted this study involving 176 frontline nurses from hospitals of the Hail region, KSA.

Results: The frontline nurses showed high perceived infectability ($x = 4.36$) and germ aversion ($x = 5.65$) but were moderately stressed (19.19). Of the examined variables, only years of experience resulted in significant differences in germ aversion ($F [3] = 8.980, p < 0.01$). There was no statistically significant difference in perceived infectability and stress. Perceived infectability ($r = -0.152, p < 0.05$) and germ aversion ($r = 0.007, p > 0.05$) were negatively correlated to perceived stress.

Conclusion: In this study, frontline nurses perceived moderate to high stress vulnerability to COVID-19. There were significant differences in germ aversion based on the duration of experience. It is noteworthy that perceived vulnerability to COVID-19 did not impact stress. Paying attention to concerns of nurses can potentially improve preventive practices and positive behaviours in combating the pandemic.

Keywords: COVID-19; Demographics; Frontline nurses; Perceived stress; Perceived vulnerability

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Introduction

The COVID-19 outbreak was declared by the World Health Organization (WHO) as a public health emergency of international concern on 30 January 2020 (WHO, 2020a).¹ It was declared a pandemic on 11 March 2020 (WHO, 2020b).² While health and government authorities have been focusing on managing health problems, there has been a surge in an ‘infodemic’ of misinformation, putting the public at risk. According to the WHO (2020c),³ the emergence of a large amount of information about the outbreak has made it difficult for individuals to find reliable sources of information and direction. The result is misinformation, which adds to the confusion about which information is authentic, and which is fabricated. This misinformation has decelerated the implementation of precautionary measures, and it has increased the general population’s disease vulnerability and stress. The government-imposed quarantine without generating adequate awareness causes negative psychological effects on the public. Moreover, people feel emotionally exhausted, which causes anxiety, stress, and mental problems. According to Brooks et al. (2020),⁴ adverse effects emanate primarily from the required restrictions on liberty. Therefore, while following quarantine as far as possible is highly recommended, the measures must consider public’s tolerability.⁴ In this context, the WHO (2020c)³ has provided measures for guiding and responding to people’s inquiries, and thus helping them to cope with fear, stigma, and discrimination throughout the pandemic.

Healthcare providers also suffer adverse mental impacts of the pandemic. The lack of resources, such as protective gear, and the nature of their work have put them on the frontline of vulnerability to COVID-19. Such vulnerability can lead to stress and uncertainty. Reports about frontline workers being infected are rapidly increasing. In April 2020, for example, the Philippines’ Department of Health (DOH) reported that there were 252 healthcare workers who tested positive for COVID-19.⁵ Additionally, reports from Russia, dated 8 April 2020, claimed that at least 450 medical workers were infected,⁶ and at least 40 (29%) healthcare workers from 138 hospitalised patients were infected through hospital-related transmissions in Wuhan, China in January of 2020.⁷ The highest reported percentage of infected cases in April 2020 came from Spain; 14% of their confirmed cases were from the healthcare worker’s groups.⁸ A recent research finding suggests that healthcare workers who were exposed and are suspected COVID-19 positive are at a high risk of not only the viral infection, but also of developing mental health-related problems.⁹ This present situation seems true when compared to the outbreak of severe acute respiratory syndrome (SARS). Liu et al. (2003)¹⁰ noted that healthcare workers who had worked in the SARS units of hospitals suffered from depression, apprehension, fear, and frustration. To cope effectively with the impact of COVID-19 in this context, the general public and health practitioners must all be armed with proper

tools and knowledge.¹¹ Medical staff typically experience a diverse range of psychological problems because of the high level of pressure experienced in the uncertainty during a pandemic.¹² With healthcare workers, the risk of contracting the disease is assumed to drain them emotionally, mentally, and physically, which may lead to post-traumatic stress disorder (PTSD). The risk of PTSD is projected to increase because of the pandemic.¹³ Thus, it is important to implement measures to counteract the adverse psychological impact of COVID-19 on frontline healthcare professionals. Xiang and colleagues (2020) stated that it is not feasible to find the best response to the ongoing challenges of the outbreak.⁹ Exploring such interventions to manage the vulnerability and stress must be placed within the context of customising the need of keeping the frontlines safe. In fact, improvements in the disaster and pandemic management must be carried out for rapid societal recovery,¹⁴ and to meet the needs of both the frontline workers and general public.

Although this study is of paramount importance to all healthcare providers, it is particularly important to the frontline workers who require risk management and guidance regarding the outcomes of stress. Consideration of these aspects must be directed toward all frontlines that battle the challenges of this pandemic. This study contributes through customised coping strategies to address the vulnerability to COVID-19 and managing the perceived stress caused by it. It explores the perceived vulnerability to COVID-19 and the perceived stress of frontline nurses, specifically examines the demographic variables that determine perceived vulnerability and stress, and investigates the relationship between perceived vulnerability and stress.

Materials and Methods

Design

This study employed a quantitative comparative-correlational approach to explore the perceived vulnerability of frontline nurses to COVID-19 and stress.

Participants

The study participants were frontline nurses in the hospitals of the Hail region, KSA. They were the ones who were assigned to the most exposed units (e.g. triage, emergency department, acute/medical department, and critical/intensive care units) of the hospitals. The inclusion criteria were set to those frontline nurses who directly interacted with confirmed COVID-19 patients and could speak and understand English. The nurses who were quarantined during the time of this study were excluded. Thus 176 frontline nurses were part of the study. They were enrolled based on the snowball sampling technique.

Data collection

This study was conducted during the surge of the COVID-19 pandemic. Therefore, an online survey using a self-reported questionnaire on Google forms was used to collect the needed data. The online survey was in English.

The questionnaire included an informed consent statement that explained what the study was about, the study procedure, purpose, risks and benefits, and an agreement of participation. The author's contact details were included for the participants to use for clarification. Utilising the snowball sampling technique, the author began by approaching the key participants of each hospital, inviting them to answer the questionnaire on the provided link. Subsequently, after considering the inclusion criteria, the key persons were requested to share the link with their own identified colleagues. The link was shared with both the identified and the referred participants through Messenger, LinkedIn, and WhatsApp. Implied consent was obtained from the participants by completing the questionnaire on the link. This process was conducted from 1 April to 5 May 2020.

Questionnaires

The Perceived Vulnerability to Disease (PVD) scale developed by Duncan, Schaller, and Park (2009)¹⁵ and the Perceived Stress scale 10-item version by Cohen, Kamarck, and Mermelstein (1983) were used,¹⁶ with their permission. The perceived vulnerability to disease has 15 items on a 7-point scale, where 1 = strongly disagree, 2 = disagree, 3 = slightly disagree, 4 = neutral, 5 = slightly agree, 6 = agree, and 7 = strongly agree. It also has 2 subscales: subscale 1 refers to the perceived infectability with items 2, 5, 6, 8, 10, 12, and 14, and subscale 2 refers to germ aversion with items 1, 3, 4, 7, 9, 11, 13, and 15. To be appropriate in the present study's context, item 15 stating 'I avoid using public telephones because of the risk that I may catch something from the previous user' was rephrased to 'I avoid using telephone in my unit because of the risk that I may catch something from the previous user.' The responses to this 15-item survey were then averaged. Higher scores indicated higher perceived vulnerability to disease.

The Perceived Stress Scale (PSS) has 10 items. The respondents answered using a 5-point Likert scale, where 0 = never, 1 = almost never, 2 = sometimes, 3 = fairly often, and 4 = very often. Cohen, Kamarck, and Mermelstein suggested that the PSS scoring be obtained by reversing the responses (for example, 0 = 4, 1 = 3, 2 = 2, 3 = 1, and 4 = 0) to the 4 positively stated items (items 4, 5, 7, and 8) and thereafter summing all the scale items. For score interpretation, a 0–13 range was considered low stress, 1–26 was considered moderate stress, and 27–40 was considered high-perceived stress.

In this study, the Cronbach's alpha for internal consistency of perceived infectability was 0.88, and germ aversion was 0.87. The perceived stress internal consistency (Cronbach's alpha) was 0.90.

Data analysis

SPSS Version 25 was used to analyse the data. Frequency and percentages were used to determine the demographic characteristics of the nurses. The perceived infectability and germ aversion scores were averaged; the sum was used for responses to the PSS. A normality test was conducted before selecting the inferential test of significance. For Mishra and colleagues (2019), normalisation of data is a fundamental

assumption in parametric testing.¹⁷ Consequently, a *t*-test was conducted to determine the differences in sex. Age, civil status, years of experience, and number of children were tested using one-way analysis of variance (ANOVA) tests. The relationship between perceived vulnerability and perceived stress scores was analysed using the Pearson product–moment correlation. The statistical significance was set at $p < 0.05$.

Results

Most of the frontline nurses were female (females, 76.1%; males, 23.9%) and non-Saudis (70.5%). Of the 176 participants, 34.7% were aged 36 years and above, and most were married (61.4%). Most of the participants had no children (44.37%) and 6–10 (40.9%) years of experience (Table 1).

Table 2 shows that the average scores of the perceived infectability ($x = 4.36$) and germ aversion ($x = 5.65$) were high. Seven was the highest. However, the nurses on the frontlines perceived themselves as having moderate stress (19.19).

The *t*-test revealed no statistically significant difference between the female and male respondents regarding perceived infectability ($t [174] = 0.972, p > 0.05$), germ aversion ($t [174] = 1.216, p > 0.05$), and perceived stress ($t [174] = -0.845, p > 0.05$), and nationality on the perceived infectability ($t [174] = 0.826, p > 0.05$), germ aversion ($t [174] = 2.782, p > 0.05$), and perceived stress ($t [174] = -0.869, p > 0.05$). The one-way ANOVA revealed no statistically significant differences among age and perceived infectability ($F [3] = 0.472, p > 0.05$), germ aversion ($F [3] = 1.648, p > 0.05$), and perceived stress ($F [3] = 0.748, p > 0.05$); civil status and perceived infectability (F

Table 1: Demographic profile of the participants (N = 176).

Indicator	Frequency	Percent
Sex		
Female	134	76.1
Male	42	23.9
Nationality		
Saudi	52	29.5
Non-Saudi	124	70.5
Age (in years)		
20-25	18	10.2
26-30	51	29.0
31-35	46	26.1
36 and above	61	34.7
Civil Status		
Married	108	61.4
Unmarried	64	36.4
Divorced/Separated	4	2.3
Number of Children		
None	78	44.3
1	36	20.5
2	26	14.8
3 or more	36	20.5
Years of Experience		
1-5	68	38.6
6-10	72	40.9
11-15	24	13.6
16 and above	12	6.8

Table 2: Perceived vulnerability to disease and stress in frontline nurses.

Indicator	Mean	Std. Dev.
Perceived vulnerability to disease		
Perceived infectability	4.36	0.84426
Germ aversion	5.65	0.73864
Perceived stress	19.19	—

Std. Dev = Standard Deviation.

[2] = 1.779, $p > 0.05$), germ aversion ($F [2] = 1.364, p > 0.05$), and perceived stress ($F [2] = 2.914, p > 0.05$); and number of children and perceived infectability ($F (3) = 0.967, p > 0.05$), germ aversion ($F (3) = 1.155, p > 0.05$), and perceived stress ($F [3] = 0.653, p > 0.05$). There were no significant differences in perceived infectability ($F [3] = 1.570, p > 0.05$) and perceived stress ($F [3] = 0.766, p > 0.05$). However, significant differences resulted due to the same in case of germ aversion ($F [3] = 8.980, p < 0.01$). The Bonferroni test showed that there were significant differences in germ aversion based on years of experience, with the 16 years and above group having the highest mean rating of 6.32

Table 3: Differences in perceived vulnerability and perceived stress based on sex, age, civil status, number of children, and years of experience.

Indicator	Group	Mean t	df	p (2-tailed)	
Sex					
Perceived infectability	Female	4.39	0.972	174	0.333
	Male	4.25			
Germ aversion	Female	5.69	1.216	174	0.225
	Male	5.53			
Perceived stress	Female	19.03	-0.845	174	0.399
	Male	19.69			
Nationality					
Perceived infectability	Non-Saudi	4.39	0.826	174	0.410
	Saudi	4.28			
Germ aversion	Non-Saudi	5.75	2.782	174	0.321
	Saudi	5.42			
Perceived stress	Non-Saudi	19.00	-0.869	174	0.386
	Saudi				
Indicator	F	df	p (2-tailed)		
Age					
Perceived infectability	0.472	3	0.734		
Germ aversion	1.648	3	0.180		
Perceived stress	0.748	3	0.525		
Civil Status					
Perceived infectability	1.779	2	0.172		
Germ aversion	1.364	2	0.258		
Perceived stress	2.914	2	0.863		
Number of Children					
Perceived infectability	0.967	3	0.410		
Germ aversion	1.155	3	0.329		
Perceived stress	0.653	3	0.582		
Years of Experience					
Perceived infectability	1.570	3	0.199		
Germ aversion	8.980	3	0.000		
Perceived stress	0.766	3	0.515		

df – degrees of freedom.

Table 4: Relationship between perceived vulnerability to disease and stress of frontline nurses.

		Perceived Stress
Perceived infectability	Pearson coefficient	-0.152
	p (2-tailed)	0.044
Germ aversion	Pearson coefficient	0.007
	p (2-tailed)	0.928

compared to those who had 1–5 years of experience ($x = 5.35$), 6–10 years of experience ($x = 5.76$), and 11–15 years of experience ($x = 5.81$) (Table 3).

The Pearson product–moment correlation revealed a significant negative correlation between perceived infectability and perceived stress ($r = -0.152, p < 0.05$). However, germ aversion did not have a significant relationship with perceived stress ($r = 0.007, p > 0.05$) (Table 4).

Discussion

This study explored the perceived vulnerability to COVID-19 and the perceived stress of frontline nurses. It examined the demographic variables affecting perceived vulnerability and perceived stress and the relationship between perceived vulnerability and perceived stress. Frontline nurses' highly perceived infectability and germ aversion put them in a moderately stressful situation. This suggests their need for precautionary measures, positive health behaviour, and positive reinforcement to avoid stress. Precautionary techniques also need to be in place to safeguard these nurses and other healthcare workers to protect them from illness because of the exposure at work. Certainty in infection-control procedures may alleviate an adaptive stress response.¹⁸ Support from colleagues and supervisors and clear communication of directives and precautionary measures are recommended to help reduce stress and/or other psychiatric symptoms.¹⁹ Consequently, it is imperative to protect the self-esteem and mental health of the nurses because it might affect the quality of delivering healthcare services.²⁰ This finding contributes toward maintaining wellness on the frontline wherein a supportive work culture is vital to preserving the resilience of nurses during the COVID-19 pandemic. It is crucial to recognise the frontlines that have perceived vulnerability to disease and psychological distress to enable timely intervention.

The age and sex of frontline nurses were not determinants of perceived infectability, germ aversion or stress. While the females in this study had slightly higher scores in perceived infectability and germ aversion than the males, there were no statistically significant differences. A study²¹ on perceived vulnerability to disease provided support to the notion that the women had a higher score than the men. Moreover, previous reports have shown that sex-based differences exist concerning the ability to cope with stress. Verma et al. (2011),²² for example, posit that males and females have been shown to have variable patterns for particular incidence rates of different disorders (e.g. psychological and physical) and that they respond to stress differently. Similarly, civil status, nationality, number of children, and years of experience (but not in germ aversion) are not attributes of

perceived infectability, aversion, or stress. This indicates that, regardless of these variables, the frontline nurses recognised the possible sources of contracting the disease, fostered avoidance behaviour, and reduced the possibility of contracting infection, thus perceiving less stress. However, an earlier study predicted that people with increased levels of viral avoidance were associated with less stress.²³ These findings contribute to eliminating the factors that could influence helping frontline nurses with their vulnerability to COVID-19 disease and stress. Considerations of these factors could help identify other variables that may need attention to improve the preventive practices and behaviours of nurses during the pandemic.

A greater number of years of nursing experience resulted in higher germ aversion compared to fewer years of experience. This indicates that more experienced frontline nurses felt discomfort and were more susceptible to infection. One possible reason for this is that their known competencies owing to their work experience deemed them to be exposed in the area during the pandemic. Hospital authorities viewed these experienced nurses to have better control in the workplace and a stronger control of the situation. According to Shanafelt et al. (2015),²⁴ those with more years of experience may have felt closer to key decision makers and have access to well-timed and specific data. This indicates that psychological support for those on the frontlines and affected by COVID-19 should be prioritised and made more promptly accessible. The results of this study contribute toward the awareness of policy makers regarding the possibility of potentially injurious exposure events of these experienced nurses. Hospital authorities may help to advance physical, emotional, and psychological preparedness, allowing the staff to comprehend some unavoidable symptoms because of the high probability of pathogen transmission.

There was no significant correlation between the perceived vulnerability to disease and the perceived stress by frontline nurses. This suggests that perceived vulnerability does not translate into stress. However, previous findings suggest that individuals with higher perceived vulnerability scores are also vulnerable to stress.^{15,25} One valid explanation based on the current study is that the frontline nurses manage to stay away from contracting those pathogens because of their long-term experience in dealing with the situation. Moreover, policies and protocols for these nurses have been in place for protecting themselves from susceptibility to disease and stress. This current finding could contribute toward good practices of frontline nurses during pandemics. Despite their vulnerability to the disease, their composure on the frontline could lead them to less stress, thereby carrying out their roles with confidence.

Limitations of the study

This study has limitations. Regarding the use of snowball sampling, for example, the sample is not considered representative of the population. Therefore, probability sampling (e.g. random sampling) is recommended in further investigations. Additionally, since the small sample size affects the generalisability of the study, additional research that

includes other healthcare professionals who directly interact with patients diagnosed with COVID-19 is worthy of investigation.

Conclusion

Frontline nurses perceived moderate to high stress vulnerability to disease. Sex, age, nationality, civil status, and number of children were not determinants of infectability, germ aversion or perceived stress. Longer years of experience led to significant differences in germ aversion. It is noteworthy that the perceived vulnerability to disease did not translate into stress. Considerable attention to addressing the concerns of the nurses in this study could improve preventive practices and positive behaviours in battling this pandemic.

Recommendations

The acknowledgment of the frontline nurses to high vulnerability to disease and moderate stress factors requires timely intervention. Therefore, it is recommended that hospital administrators provide ways to maintain the wellness of the frontline healthcare workers by focusing on the supportive work culture vital to preserving the resilience of nurses during an outbreak or pandemic.

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Conflict of interest

The author has no conflict of interest to declare.

Ethical approval

The Institutional Review Board (IRB) of University of Hail (IRB# H-2020-088) approved this study.

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