Correlation between anxiety and resilience of healthcare workers during COVID-19 pandemic in the southwest of Iran

Saba Rayani¹ · Mohammad Rayani^{2,3} · Fatemeh Najafi-Sharjabad²

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Abstract

The pandemic of COVID-19 has had a negative impact on healthcare providers. Resilience is thought to protect against mental illnesses and to help people cope with stress more effectively. The purpose of this research is to determine the relationship between resilience and anxiety in healthcare workers during the COVID-19 pandemic. A cross-sectional online survey was carried out on 184 eligible healthcare workers recruited from health centers in Bushehr and Borazjan cities. Data collection was performed using standard questionnaires that consist of sociodemographic and COVID-19-related information, the Corona Disease Anxiety Scale, and the Connor-Davidson Resilience Scale. The data were analyzed using SPSS software and descriptive statistics. The Mann–Whitney *U* test, Independent Sample *t*-test, Kruskal–Wallis, and Spearman correlation test were applied for analyzing data. Statistical significance was set at a *P*-value of <0.05 . The age mean of the participants was 35.54 ± 7.11 , and 40% of them experienced moderate and high levels of anxiety. Significant negative relationship was found between anxiety and resilience ($r = -0.211$, $p = 0.032$). Those who experienced death from COVID-19 in family or friends were more anxious than their counterparts ($p = 0.004$). This study showed more than one-third of the participants experienced moderate and high levels of anxiety in response to the COVID-19 pandemic. Anxiety was found to be related to resilience, and the greater the resilience, the lower the overall anxiety score. In policy development, this can be used to improve the resilience of healthcare workers and prevent mental health illnesses.

Keywords Healthcare worker · Resilience · Anxiety · COVID-19

Introduction

At the end of December 2019, the first cases of coronavirus disease (COVID-19) were found in Wuhan, China. Since then, COVID-19 cases have rapidly expanded to other areas. COVID-19 has been declared a public health emergency, requiring international attention by the World Health

Organization (Mahase 2020). On February 19, 2020, the first case was identified in Qom, Iran, and it quickly spread to other parts of the country (WHO 2020). In Iran, from 3 January 2020 to 11 April 2021, there have been 2,049,078 confirmed cases of COVID-19, with 64,232 deaths reported to WHO (WHO 2021).

COVID-19's negative impacts on healthcare personnel, as well as the disease burden on the healthcare system and the risk of infection, are all significant outcomes of this global pandemic (Wang et al. 2020a). The COVID-19 epidemic is forcing health professionals around the world to make hard decisions and work under duress. These considerations could include how to appropriately divide scarce resources among patients, how to balance their own physical and mental healthcare requirements with those of patients, how to establish a balance between their desire and duty to patients and their wants and responsibility to their family and friends, and how to care for all critically ill patients with constrained capacity. Healthcare personnel may suffer moral harm or

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✉ Fatemeh Najafi-Sharjabad
f.najafi@bpums.ac.ir

- ¹ Department of Psychology, Faculty of Literature and Humanities, Persian Gulf University, Bushehr, Iran
- ² Department of Public Health, Faculty of Health and Nutrition, Bushehr University of Medical Sciences, Bushehr, Iran
- ³ The Persian Gulf Tropical Medicine Research Center, The Persian Gulf Biomedical Sciences Research Institute, Bushehr University of Medical Sciences, Bushehr, Iran

mental health concerns as a result of this predicament (Liu et al. 2020b).

It has been reported that at least 152,888 healthcare employees have been infected worldwide, with at least 1413 deaths. Infections were mostly found in women and nurses, while men and doctors were the ones who died (Bandyopadhyay et al. 2020). The psychological reactions of healthcare workers to contagions are complicated. Loss of control or emotions of insecurity, the health of family members, changes in working conditions, anxiety about their surroundings, or loneliness are all potential sources of distress (Wong et al. 2005).

Healthcare practitioners who treat, diagnose, and care for COVID-19 patients are at risk for psychological distress and other mental health problems. The increased number of confirmed and suspected cases, an overburdened workload, a sense of being under-supported, a scarcity of specific medications, and a scarcity of personal protection supplies may all contribute to healthcare workers' mental health issues (Lai et al. 2020). Healthcare personnel who treat and care for COVID-19 patients may experience anxiety. According to a study conducted in China on healthcare workers treating COVID-19 patients, depressive symptoms were reported by 50.4% of all participants, insomnia by 34.0%, psychological distress by 71.5%, and anxiety by 44.6%. (Bahar et al. 2020).

Anxiety in healthcare personnel must be treated since it increases the chance of negative consequences. According to a study, anxiety or depression in healthcare workers raises the chance of unfavorable events such as medical errors, work accidents, or driving accidents by up to 63% (Weaver et al. 2018). When dealing with the COVID-19 pandemic, the mental health of healthcare workers is a crucial element to address because it can alter how the pandemic is handled. When dealing with outbreaks, the ability to adapt and handle current problems is essential. Resiliency is the term for this. People with resilience are more resistant to mental diseases like anxiety and depression. This shows that the anxiety levels of healthcare employees are linked to their resilience. Increasing resilience leads to improved mental health (Gheshlagh et al. 2017).

Psychological resilience is defined as a person's ability to recover from traumatic events or successfully resolve transitions in the face of danger, trauma, adverse disasters, or other problems such as family and interpersonal problems, major health difficulties, or financial and occupational challenges (Bahar et al. 2020). Psychological resilience, according to the American Psychological Association, is people's ability to respond to stress factors such as distressing events, trauma, anxiety, depression, and danger. It refers to a person's ability to deal with and resolve challenges and uncertainties (Southwick et al. 2014).

According to a systemic review and meta-analysis in Iran, the overall prevalence of anxiety among front-line healthcare

workers was 25.8% (Salari et al. 2020). Several studies have documented longer lockdown conditions, as well as higher occurrences of positive cases among close relatives and friends, racial and ethnic minorities, people with lower socioeconomic status, and chronically ill patients have been linked to increased distress and poor psychological outcomes (Di Giuseppe et al. 2021). Resilience, on the other hand, is determined by sociodemographic, cultural, skills, and training aspects (Becvar 2012).

Despite the fact that various studies have looked into sleep problems, anxiety, and depression among healthcare professionals during the pandemic, there has been little research on resilience, prompting us to conduct this research. In the face of a long-term epidemic for which no definitive therapy has yet been identified, healthcare staff must remain resilient. (Cunningham et al. 2020; Sadati et al. 2020). The aim of this study is to examine the relationship between coronavirus disease anxiety and the personal resilience of healthcare workers in the southwest of Iran.

Methods

Study design and setting

A cross-sectional online survey was carried out on 184 eligible healthcare workers recruited from 10 public health centers in Bushehr and 6 centers in Borazjan cities. Bushehr Province is one of Iran's 31 provinces. It is in the country's south, with a long coastline on the Persian Gulf. Bushehr, the provincial capital, serves as its epicenter. The province is divided into ten counties. Borazjan is the capital city of Dashtestan county and is the most populous city of the province. Due to the limitation of the statistical population, the census method was used. Data collection lasted from August to September 2020.

Inclusion and exclusion criteria

Subjects were included in the study if they were working as healthcare workers in one of the public health centers of Bushehr or Borazjan cities. Those who had psychological disorders, unexpected events, and family problems (divorce, death of relatives, etc.) during the last 4 to 6 weeks were excluded from the study (Maghsoudi et al. 2020).

Sample size

In this study, although the data collection method was census, the minimum sample size was calculated so that the statistical tests used had the power to detect the difference between the actual value of the parameter and the assumed value or the relationship between statistical variables. The

PASS Software version 11 was applied for calculating sample size based on the following formula. According to a published study during the COVID-19 pandemic, the correlation between anxiety and resilience in front-line nurses was 0.22 (Labrague and De Los Santos 2020). Considering 5% significance level test ($\alpha=0.05$) with 80% power ($\beta=0.2$), the required sample size is approximately 160 ($N=160$).

The standard normal deviate for $\alpha=Z_{\alpha}=1.9600$.

The standard normal deviate for $\beta=Z_{\beta}=0.8416$

$$C = 0.5 * \ln[(1 + r)/(1 - r)] = 0.2237$$

$$\text{Total sample size} = N = [(Z_{\alpha} + Z_{\beta})/C]^2 + 3 = 160.$$

Ethical considerations

The review board of Persian Gulf University approved the study protocol. The researcher also referred to the Bushehr state health department and received the necessary permits to enter the health centers and coordinated with the managers of the healthcare facilities to collect data. Prior to participating in the study, all subjects completed an online informed consent form. Those who accepted were given the opportunity to fill out an online web-based questionnaire. The anonymity of the questionnaire ensured that the respondents' answers were kept confidential. All of the information gathered was kept private and only used for research purposes.

Research tools and procedure

In this study, the data collection instrument was a questionnaire which consisted of three parts: (A) Sociodemographic and COVID-19-related information including age, gender, marital status, education, income, number of children, work experience, underlying disease (heart disease, kidney disease, lung disease, hypertension, diabetes, asthma, cancer), catching COVID-19, having a confirmed case in family/friends, and having death from COVID-19 in family/friends.

(B) Corona Disease Anxiety Scale (CDAS).

This instrument included 18 items and 2 factors. Alipour et al. developed and validated this scale to assess the prevalence of coronavirus anxiety in the Iranian population. Physical symptoms are measured on items 1 through 9, and psychological symptoms are measured on items 10 through 18. The CDAS is measured on a 4-point Likert scale (never = 0, sometimes = 1, often = 2, and always = 3), so the respondents' lowest and highest scores on this scale are 0 and 54. Individuals with high scores have a higher level of anxiety. According to the range of standard *T* scores, in the study of Alipour et al., the total score of anxiety intensity was divided into three categories: non-anxiety or mild (0–16), moderate (17–29), and

severe (30–54). The CDAS had a high level of internal consistency ($\alpha=0.91$) and convergent validity, which correlated well with the GHQ-28 ($r=0.48$, $P<0.01$) (Alipour et al. 2020).

(C) The Connor-Davidson Resilience scale (CD-RISC).

This scale consisted of 25 items, each of which was scored on a 5-point scale ranging from not true at all (0) to true nearly all of the time (4). Greater resilience is indicated by higher scores. This scale's total scores range from 0 to 100. The CD-RISC has good psychometric properties and can differentiate between people who are resilient and those who are not (Derakhshanrad et al. 2014). In this study, the reliability of the instruments was obtained by Cronbach's alpha for the physical symptoms ($\alpha=0.93$), the psychological symptoms ($\alpha=0.90$), and the total anxiety items ($\alpha=0.94$). Moreover, Cronbach's alpha for personal resilience was ($\alpha=0.93$).

We created a questionnaire for data collection using Google Forms, a web-based app. Google Forms are frequently used to collect data through customized surveys. It was preferred because of its ease of use, effectiveness, and widespread popularity, especially during the current coronavirus pandemic. Respondents can access the form by clicking on a link, sending an email, or embedding it in a web page or blog. Data collected via the form is usually saved in a spreadsheet, and data from an Excel file can be imported into SPSS. The questionnaire link was shared with separate WhatsApp groups of healthcare staff in Bushehr and Borazjan, and those who clicked on it were guided to the Google Forms. To reduce missing data, participants were asked to complete all of the items in the online questionnaire or else they would be unable to progress to the next page; a notification box indicating that one or more items were not answered.

Statistical analysis

We used IBM SPSS Statistics version 24.0 to analyze the data. Descriptive statistics were done in the form of frequencies and percentages, mean and standard deviation. The normality of the dependent variable's data was screened using the Kolmogorov–Smirnov test. An Independent Sample *t*-test was applied to analyze the mean comparison of two independent groups. When the variable was ordinal or continuous but not normally distributed, the Mann–Whitney *U* test was applied to compare two independent groups. The nonparametric Kruskal–Wallis test was applied to assess if there were statistically significant differences between two or more groups of an independent variable on a continuous or ordinal variable. Spearman's correlation was used to measure of the strength and direction of association between two continuous variables. Statistical significance was set at a *P*-value <0.05 .

Results

Descriptive analysis

Out of 550 healthcare workers in Bushehr and Borazjan, 184 staff completed the web-based questionnaire, and the final response rate was 33%. The age mean of the respondents was 35.54 ± 7.11 , and out of 184 healthcare workers, 34 (18.5%) were males and 110 (81.5%) were females. Sociodemographic and COVID-19-related characteristics have been reported in Table 1.

The mean scores of the respondents' anxiety and resilience were 16.24 ± 11.39 and 69 ± 15.823 , respectively

Table 1 Sociodemographic and COVID-19-related characteristics' of healthcare workers ($N=184$)

Variable	M	SD	N	(%)
Age	35.54	7.11		
Number of children	1.33	1.24		
Years of work experience	11.09	7.61		
Gender				
Male			34	18.5
Female			150	81.5
Education				
Diploma			44	23.9
Associate degree			32	17.4
BSc			93	50.5
MSc/Doctoral degree			15	8.2
Marital status				
Single			41	22.3
Married			143	77.7
Economic status				
Poor			20	11
Moderate			127	69
Good			37	20
Underlying disease				
No disease			146	79.3
One disease			26	13.5
Two diseases			9	5
$\geq$ Three diseases			3	1.5
Catching COVID-19				
Yes			80	43.5
No			104	56.5
Confirmed case of COVID-19 in family/friends				
Yes			152	85.3
No			32	14.7
Death from COVID-19 in family/friends				
Yes			74	40.2
No			110	59.8

(Table 2). As shown in Fig. 1, 40% of respondents had moderate and high levels of COVID-19 anxiety. The normality assumption was checked using the Kolmogorov–Smirnov test. The data for the resilience score was normally distributed ($p > 0.05$), whereas the data for the total anxiety score was not ($p < 0.05$).

Relationship between anxiety and sociodemographic, COVID-19-related variables

Among COVID-19-related variables, only the death of family members/friends due to COVID-19 was associated with anxiety. The Mann–Whitney U test indicated that the anxiety score was higher among healthcare workers who had COVID-19-related death among family members/friends ($Mdn=14$) than those who did not ($Mdn=2$, $U=2811$, $p=0.004$).

The COVID-19 anxiety scale composite score had no significant relationship with demographic variables, according to bivariate analysis (Table 3).

The Spearman correlation test showed no significant relationship between anxiety and age ($p=0.356$), number of children ($p=0.899$), and working experience ($p=0.168$).

Furthermore, the Kruskal–Wallis test showed that there was not a statistically significant difference in total anxiety score between different levels of education ($p=0.088$) and economic status ($p=0.787$).

Relationship between resilience and sociodemographic, COVID-19-related variables

Among sociodemographic variables, only the number of children was associated with resilience. There was a weak ($r=0.21$) but statistically significant positive association between resilience and number of children ($p=0.04$). This shows that as the number of children increases, so does resilience. No significant association was found between resilience and other sociodemographic variables and COVID-19-related variables (Table 4). Furthermore, there was no statistically significant difference in resilience score between different levels of education ($p=0.661$) and economic status ($p=0.703$).

Table 2 Descriptive values of COVID-19 anxiety and resilience scores

Variable	N	M $\pm$ SD	Med	Min	Max
Psychological symptom	184	12.40 ± 6.70	12	0	27
Physical symptom	184	3.83 ± 5.62	2	0	27
Total anxiety	184	16.24 ± 11.39	14	0	54
Resilience	184	63.10 ± 15.84	64	17	100

Fig. 1 Prevalence of COVID-19 anxiety among healthcare providers ($n = 184$) **Table 3** Comparison of anxiety score based on demographic and COVID-19-related characteristics of healthcare workers

Variable	Group	N	Mean rank	U	P-value
Gender	Male	34	84.27	2220	0.354
	Female	150	93.70		
Marital status	Single	41	81.89	2282	0.293
	Married	143	92.04		
Having an underlying disease	Yes	38	93.10	2426	0.639
	No	146	88.50		
Catching COVID-19	Yes	80	91.25	3806	0.784
	No	104	89.10		
Having a confirmed case in family/friends	Yes	152	94.96	1906	0.094
	No	32	77.48		
Death from COVID-19 in family/friends	Yes	74	104.25	2811	0.004
	No	110	81.06		

Table 4 Comparison of resilience score based on demographic and COVID-19-related characteristics of healthcare workers

Variable	Group	N	M ± SD	P-value
Gender	Male	34	66 ± 15	0.295
	Female	150	62 ± 16	
Marital status	Single	41	62 ± 16	0.811
	Married	143	63 ± 15	
Having an underlying disease	Yes	38	63 ± 16	0.654
	No	146	64 ± 17	
Catching COVID-19	Yes	80	62 ± 16	0.460
	No	104	64 ± 15	
Having a confirmed case in family/friends	Yes	152	62 ± 15	0.141
	No	32	67 ± 17	
Death from COVID-19 in family/friends	Yes	74	63 ± 13	0.951
	No	110	63 ± 15	

Relationship between resilience and anxiety

The relationship between resilience and anxiety was analyzed using the Spearman correlation test. There was a weak

but significant negative relationship between resilience and COVID-19 anxiety ($r = -0.211$, $p = 0.032$). This shows that with increasing resilience in subjects, their stress level decreases (Table 5).

Table 5 Relationship between anxiety and resilience

Correlation	<i>N</i>	<i>r</i>	<i>p</i> -value
Anxiety and resilience	184	0.211	0.032

Discussion

This study aimed to evaluate the correlation between coronavirus disease anxiety and the resilience of healthcare workers in the south of Iran. This study revealed that 40% of the respondents experienced moderate and high levels of anxiety in response to the COVID-19 pandemic. Studies from other countries have documented anxiety prevalence rates of 77.9% in Egypt (Khalaf et al. 2020), 69.6% in Northwest Ethiopia (Mekonen et al. 2020), 58.6% in Spain (Luceño-Moreno et al. 2020), 56.3% in Indonesia (Setiawati et al. 2021), and 55.4% in Guangdong, China (Wang et al. 2020b), all of which were higher than our study. In Singapore, the prevalence of anxiety was 14.5% (Tan et al. 2020) which was lower than our study. Differences in cultural, social, behaviors, environmental factors, and a lack of appropriate safety equipment and services to help healthcare workers cope with the psychological impact of the pandemic could be responsible for the disparity (Mekonen et al. 2020). Furthermore, close interaction with COVID-19 patients increases the risk of mental disorders in healthcare workers. According to an Italian study working directly with COVID-19-infected patients on the frontlines causes more psychosocial symptoms (Conti et al. 2020).

An online survey by Setiawati et al. in 2020 in Indonesia indicated more than half of healthcare workers at a COVID-19 referral hospital experienced moderate-to-high levels of anxiety (Setiawati et al. 2021). Another web-based study in China revealed that 45% of healthcare workers demonstrated symptoms of anxiety during this pandemic (Liu et al. 2020a). Moreover, only 16% of the total respondents in an international survey done in Singapore and India experienced anxiety symptoms (Chew et al. 2020). The high level of anxiety among healthcare workers in Setiawati's study could be linked to the situation in East Java, which has the greatest number of positive COVID-19 cases in Indonesia, with a case fatality rate (CFR) of 7.3%, which is higher than the Indonesian and global CFRs (5.1%) as of 30 June 2020. Infection of large numbers of healthcare workers with COVID-19 in East Java can also lead to increased levels of anxiety among health staff (Setiawati et al. 2021).

During a pandemic, one of the major concerns for medical personnel is the possibility of infecting others, particularly family members (Adams and Walls 2020). According to research conducted in China and Spain, nurses who were worried about infecting family members had a higher risk of anxiety (Cui et al. 2020; Luceño-Moreno et al. 2020). It is

important to note that in the current study, healthcare workers who lost family members or friends due to COVID-19 had a higher psychological burden than their counterparts. Guilt over infecting family members, as well as a lack of sufficient care and attention, can all contribute to high levels of anxiety.

Studies in China, Turkey, and Ethiopia found that having a chronic disease raises the risk of developing anxiety (Koksall et al. 2020; Zhu et al. 2020). That might be because people with chronic diseases are more likely to experience severe COVID-19-related complications and die (Zhou et al. 2020). The current study's findings differ from those of previous research. Since the majority of research participants did not interact directly with patients, they may have felt less at risk for COVID-19 illness and anxiety.

Studies on the health outcomes of COVID-19 affected healthcare workers reveal a significant proportion of mental health problems, especially among women (Conti et al. 2020). Female healthcare workers scored higher on anxiety than males in this study. Because of their cultural obligations in the family, child care, and professional employment, women may have felt the strain of working in the COVID-19 situation more than their male colleagues. Women, on the other hand, place a higher value on their own internal views and others' emotional states than men (Galdas et al. 2005; Seidler et al. 2016).

In challenging healthcare facilities, especially during a pandemic, healthcare workers require a high level of resilience. Mental health difficulties are a worry not just during the pandemic, but they also remain a burden once it is ended. A good illustration of this was the SARS epidemic in 2003. The psychological strain on healthcare professionals in Toronto hospitals that treated SARS cases was higher than in Hamilton hospitals that did not handle SARS cases, according to a research done 2 years after the SARS pandemic in Canada. Despite this, burnout and psychological stress were found to be lower among healthcare workers who worked in high-risk environments. This is believed to be due to the increased resilience that comes with more work experience (Maunder et al. 2006).

Resilient people are upbeat and secure in their abilities to control their circumstances, even when things are not going well (Gheshlagh et al. 2017). Many characteristics, such as adaptability, optimism, positive self-image, self-confidence, responsiveness, and empathy, indicate resilience in people. The ability to respond favorably as a result of a combination of personality traits and life circumstances is known as resilience (Matheson et al. 2016; McAllister and McKinnon 2009).

In an Indonesian study, during the COVID-19 pandemic, a significant correlation was discovered between the level of resilience and anxiety experienced by healthcare professionals. The more anxiety one experiences, the lower

one's resilience is (Setiawati et al. 2021). In a survey of 204 healthcare professionals in Turkey, Yildirim et al. found that resilience negatively predicted mental health issues, while perceived threat and coronavirus fear positively predicted stress, depression, and anxiety (Yildirim and Solmaz 2020). Labrague's study in the Philippines among front-line nurses revealed weak and significant negative relationships between personal resilience and COVID-19 anxiety ($r = -0.217$, $p < 0.001$) (Labrague & De los Santos 2020).

In line with other studies during the COVID-19 pandemic, our study showed a significant negative correlation between respondents' resilience and anxiety. A low degree of anxiety was related to the high level of resilience. Because this study used a cross-sectional approach, it was unable to demonstrate a causal association between anxiety and resilience, although it did support earlier research (Färber and Rosendahl 2018; Setiawati et al. 2021; Labrague and De Los Santos 2020).

A study in Italy demonstrated that females were more likely to experience psychological distress, while men adjust better to stressful situations. Men were shown to be substantially more resilient than their female counterparts (Conversano et al. 2020). This study showed as the number of children increased, so did the degree of resilience. Furthermore, women had lower resilience scores than men, although this comparison did not show a statistically significant difference. A study among nurses in Ahvaz, a city in the south of Iran, indicated that women had lower resilience than men during the COVID-19 pandemic disaster (Afshari et al. 2021).

Resilience is a skill that can be learned. Experiential learning and formal training are some of the ways to improve resilience (Matheson et al. 2016; McAllister and McKinnon 2009). In addition, self-observation, anticipation, altruism, and humor are all mature ego defense mechanisms that can boost resilience during a pandemic (Marčinko et al. 2020). To train healthcare professionals to cope with emergencies and reduce mental health issues in the future, the development of resilience must be prioritized (Duncan 2021; Santarone et al. 2020). Good relationship structuring, maintaining positivity, gaining emotional insight, managing a professional and social life, and improving spirituality are all ways to build psychological resilience (Bahar et al. 2020).

Methods for cognitive restructuring, balancing professional and social lives, getting to know one's own self, improving problem-solving abilities, and reinforcing personal goals can all be considered key applications for improving psychological resilience in healthcare workers (Bahar et al. 2020). Interventions may be designed to improve psychological resilience among healthcare employees, such as shift limitations, clear communication, rest areas with broad access, and comprehensive rules on the use and management of protective equipment (Pappa et al. 2020).

Limitations

Since this research used a cross-sectional approach, it was unable to demonstrate a causal relationship between anxiety and resilience. Because the questions of the research questionnaires were self-report, so we were always faced with the possibility of providing incorrect information or not providing information. Therefore, the researcher explained the objectives of the study and emphasized the confidentiality of the data and asked the participants to answer honest questions.

Conclusion

This study showed that more than one-third of participants experienced moderate and high levels of anxiety in response to the COVID-19 pandemic. Healthcare staff with family members/friends who died due to COVID-19 infection had a higher level of anxiety. The levels of resilience and anxiety experienced by healthcare staff were found to have a significant correlation. The lower one's resilience, the more anxiety one feels. In policy development, this can be used to improve the resilience of healthcare workers and prevent mental health illnesses.

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Author contribution Fatemeh Najafi-Sharjabad: conceptualization, study design, statistical analysis, writing original draft preparation. Mohammad Rayani: manuscript writing review and editing. Saba Rayani: data collection, data entry. All authors have read and agreed to the published version of the manuscript.

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Data availability All data generated or analyzed during this study are included in this published article (and its supplementary information files). The datasets used and/or analyzed during the current study are available from the corresponding author on reasonable request.

Declarations

Ethics approval and consent to participate The review board of Persian Gulf University approved the study protocol. Prior to participating in the study, all subjects completed an online informed consent form. The anonymity of the questionnaire ensured that the respondents' answers were kept confidential. All of the information gathered was kept private and only used for research purposes.

Consent for publication Not applicable.

Competing interests The authors declare no competing interests.

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