



The Relationship Between Job Stress and COVID-19-Induced Anxiety Among Healthcare Workers in Chaharmahal and Bakhtiari, Iran: A Cross-Sectional Study

Fatemeh Rezaei¹, Ebrahim Aghaei Brojeni², Maryam Nasirian^{3,*}

¹ Student Research Committee, School of Health, Isfahan University of Medical Sciences, Isfahan, Iran

² Faculty of Health, Esfahan University of Medical Sciences, Esfahan, Iran

³ Department of Epidemiology and Biostatistics, Infectious Diseases and Tropical Medicine Research Center, Health School, Isfahan University of Medical Sciences, Isfahan, Iran

*Corresponding Author: Department of Epidemiology and Biostatistics, Infectious Diseases and Tropical Medicine Research Center, Health School, Isfahan University of Medical Sciences, Isfahan, Iran. Email: maryamnasiarian17@gmail.com

Received: 10 March, 2024; Accepted: 18 June, 2024

Abstract

Background: Previous research has shown that the COVID-19 pandemic has negatively impacted the mental health of individuals, particularly healthcare workers (HCWs), who are at the front line of the battle against COVID-19.

Objectives: This study aimed to investigate the correlation between job stress and COVID-19-induced anxiety among HCWs.

Methods: This cross-sectional study was performed in the Chaharmahal and Bakhtiari province of Iran in 2022. Data were collected using three questionnaires, including the Demographic Questionnaire, the Health and Safety Executives (HSE) Questionnaire, and the Corona Disease Anxiety Scale (CDAS). To evaluate the correlation between job stress and COVID-19-induced anxiety, we employed logistic regression using SPSS software (version 22), considering a significance level of 0.05.

Results: This study found that HCWs in Chaharmahal and Bakhtiari province experienced moderate levels of job stress, and approximately half of them reported mild COVID-19-induced anxiety. In addition, COVID-19-induced anxiety was influenced by two other factors: History of COVID-19 (OR = 2.24, 95% CI = 1.18 - 6.40) and the history of death in the family due to COVID-19 (OR = 3.46, 95% CI = 1.23 - 9.70). Also, this study showed that job stress increases COVID-19-induced anxiety (OR = 3.80, 95% CI = 1.95 - 8.21).

Conclusions: Job stress has a direct positive effect on COVID-19-induced anxiety. However, the strengthening of the relationship between job stress and COVID-19-induced anxiety may be due to the confounding role of the COVID-19 pandemic. In addition, we must teach HCWs how to manage stress and anxiety during pandemics like the COVID-19 pandemic.

Keywords: Job Stress, COVID-19, Anxiety, Healthcare Workers

1. Background

SARS-CoV-2 virus, commonly known as COVID-19, was initially detected in Wuhan, China, and its rapid dissemination has resulted in a global pandemic (1). The World Health Organization (WHO) has identified COVID-19 as a major challenge for society due to its impact on lifestyle. The global outbreak of COVID-19 has had a detrimental impact on societal factors, such as the average age of marriage and fertility rates. In societies where the majority of the population is elderly, there is a direct correlation between the older age index and the rate of COVID-19 infection. This was observed through a positive correlation between indicators of population

aging and the number of cases and deaths caused by the virus. Developed countries like France, Italy, and Spain, which have a higher number of elderly individuals, are experiencing higher rates of COVID-19-related fatalities (2). Moreover, the COVID-19 pandemic has had deleterious impacts on the economic landscape, primarily through the disruption of supply chains, reduction of labor power, and exacerbation of pre-existing socioeconomic disparities (3).

As COVID-19 spread quickly, schools and universities had to shut down. Healthcare workers (HCWs) faced more sick people to care for, and hospitals became very busy. This posed a major challenge for healthcare systems in many countries (4). Additionally, numerous

physical and mental health problems were experienced by HCWs due to factors such as the daily rise in cases of the virus, increased workload, and concerns regarding disease transmission to others (5).

Studies have found that many health workers face mental health problems during the COVID-19 pandemic. A study in 2020 found that about 26% of HCWs in Zahedan experienced a moderate level of COVID-19-induced anxiety (6). Another study in China found that around 14% of HCWs had a high level of COVID-19-induced anxiety (7). According to findings published in 2020, the incidence of depression and insomnia among HCWs was reported to be 22.8% and 38.9%, respectively (8). In addition, da Silva Neto et al. declared that HCWs showed elevated levels of anxiety compared to individuals in different job roles (9).

It is important to consider factors beyond the COVID-19 pandemic, such as workplace stress, when assessing the root causes of anxiety. Some studies have shown that health workers need to reduce their COVID-19-induced anxiety (10). That's entirely true. First, we need to consider ways to reduce job stress. Job stress can make people feel anxious about COVID-19, so it is important to tackle this problem first.

According to Hans Selye, job stress refers to the mental burden induced by work-related occurrences. Job stress has been linked to a range of negative psychological outcomes, including depression, a sense of failure, social withdrawal, and job dissatisfaction (11). According to a study conducted by Sirti Nir et al. in 2019 in Tehran, individuals employed in therapeutic professions exhibit a significantly higher level of stress than those in non-therapeutic jobs (12). In a recent study, which utilized an online platform and digital survey methodology, it was discovered that the ongoing COVID-19 pandemic resulted in a consequential increase in stress levels among HCWs in the Republic of Moldova (13).

Previous research has shown that the COVID-19 pandemic has negatively impacted the mental health of individuals, particularly HCWs who are at the front line of the battle against the virus (10). Furthermore, anxiety disorders have been identified as a common issue among this group, which can exacerbate job stress. We need to research how job stress affects the mental health of HCWs in Iran because no one has studied it yet. With a view to possible future pandemics of infectious diseases, the results of this study will help healthcare professionals in their efforts to improve the mental health of HCWs.

To further explore this relationship, a study was conducted among HCWs in the Chaharmahal and

Bakhtiari provinces.

2. Objectives

This study aimed to assess the correlation between COVID-19-induced anxiety and job stress while considering other factors. The levels of COVID-19-induced anxiety and job stress in HCWs, as well as whether they are associated with these factors, were the main questions to be explored in this study.

3. Methods

The Ethical Committee of Isfahan University of Medical Sciences approved this study (IR.MUI.RESEARCH.REC.1400.263).

3.1. Population and Sample

This cross-sectional study was conducted in the Chaharmahal and Bakhtiari province of Iran between January 2022 and February 2022. The study population consisted of HCWs in health service centers within Chaharmahal and Bakhtiari province, selected through a cluster sampling method based on eligibility criteria. Eligibility criteria included working in the healthcare system for ≥ 1 year, willingness to cooperate/participate, completion of a consent form, and the ability to complete an online questionnaire. Exclusion criteria included individuals who were immigrants and those who did not fully complete the questionnaire. First, five districts from the ten districts of Chaharmahal and Bakhtiari province were randomly selected. Second, the formula ($N = [Z(1-(\alpha/2))^2 \times s^2]/d^2$) was applied to determine the sample size, yielding an estimated figure of approximately 739 participants. The parameters used in the formula included a confidence level of 95% (z), an estimated mean error of 0.75 (d), and the standard deviation of COVID-19-induced anxiety (s), which was calculated as 0.11.

3.2. Data Collection

Data were collected using three questionnaires, including the demographic checklist, Health and Safety Executives (HSE) Standard Questionnaire, and Corona Disease Anxiety Scale (CDAS). Demographic data on age, marital status, gender, educational level, employment status, work experience, and workplace status were collected. The HSE Standard Questionnaire was initially developed by the Health and Safety Executive, UK, in 1990. This questionnaire consists of 35 items divided into seven subscales: Demand, control, managerial support, peer support, relation, role, and changes. A 1 - 5

scale was used to score the items, where higher scores indicated higher job stress and lower scores indicated lower stress levels (14). Scores ranging from 129 - 175 indicate mild stress, 82 - 128 indicate moderate stress, and 35 - 81 indicate high stress (15). The Cronbach's alpha coefficients for demand, control, managerial support, peer support, relation, role, changes, and the total questionnaire were obtained to be 0.87, 0.86, and 0.91, respectively (14). The Coronavirus Disease Anxiety Scale (CDAS) was designed by Alipour et al. in 2020. This scale contains 18 items that assess COVID-19-induced anxiety across two subscales (psychological and physical symptoms). The CDAS uses a 1 - 4 scale to score items, resulting in a total score ranging from 0 to 54. Scores indicate the level of anxiety, with 0 - 16 representing mild anxiety and 17 - 54 representing high anxiety. The validity of the CDAS was 91% ($\alpha = 0.91$).

To maintain participant safety and prevent COVID-19 transmission, the questionnaires were completed online through the Porsline website (<http://survey.porsline.ir/s/WMjPPz6#?ref=wh>). A letter was sent to the health centers informing the HCWs of when they needed to complete the three questionnaires. Healthcare workers were asked to respond to the questions online over three days. In addition, participants were fully informed about the study, and consent was obtained prior to participation. The questionnaires did not collect any identifying information or personal data from respondents.

3.3. Statistical Analysis

Data were analyzed using SPSS software (version 22). Mean and standard deviation (SD) were used to describe continuous data, while frequency (%) was used to describe categorical data. Logistic regression was applied to evaluate the factors associated with COVID-19-induced anxiety, adjusting for confounding factors in the multivariate analysis, including age, marital status, work experience, history of vaccination, and job stress. A P-value of less than 0.05 was considered significant for all analyses.

4. Results

A total of 739 participants met the eligibility criteria and were included in this study. The HCWs had an average age of 38.78 (SD = 8.51). Furthermore, females accounted for the largest proportion of HCWs, comprising 65.90%, and 74.40% were married. Approximately 43% of the individuals held a bachelor's degree. More than 50% of HCWs worked without formal employment arrangements. Additionally, more than half of the participants (57.10%) worked in urban health

centers. Nearly one-fifth of the respondents had 10 to 15 years of work experience. Around 50% of HCWs had been infected with COVID-19, and 10% reported that someone in their family had died due to COVID-19. A small percentage of HCWs (7.33%) reported hospitalization due to COVID-19. Among the 739 HCWs, 712 (96.35%) were vaccinated (Table 1).

Table 1. Demographic and Occupational Characteristics of Participants ^a

Variables	Values
Demographic Characteristics	
Age; mean \pm SD	35.77 \pm 8.51
Gender	
Female	487 (65.90)
Male	252 (34.10)
Marital status	
Single	176 (23.80)
Married	550 (74.40)
Divorced	9 (1.30)
Widow	1 (0.50)
Educational level	
Elementary	9 (2.1)
Diploma and under-diploma	197 (26.7)
Associate degree	138 (18.7)
Bachelor	319 (43.2)
Master's degree and higher	76 (10.3)
Occupational Characteristics	
Employment status	
Informal	378 (51.2)
Formal	361 (48.80)
Work experience	
Under 5 years	233 (31.50)
5 to 9 years	122 (16.50)
10 to 15 years	147 (19.90)
15 to 24 years	144 (19.50)
25 years and above	93 (12.60)
Workplace status	
Urban	422 (57.10)
Rural	317 (42.90)
History of COVID-19	370 (50.07)
History of being hospitalized due to COVID-19	27 (7.33)
History of death in family due to COVID-19	49 (10.72)
History of vaccination	712 (96.35)

^a Values are expressed as No. (%), unless otherwise indicated.

This study found that 50% of HCWs experienced high levels of COVID-19-induced anxiety. Additionally, the research revealed that HCWs' job stress levels were moderate, as indicated by their mean (SD) job stress score of 89.91 (17.09). The highest scores were in the demand (24.5 ± 6.45) and control (15.39 ± 4.48) subscales, while the lowest scores were in the role (8.85 ± 3.65) and changes (7.85 ± 2.62) subscales.

Table 2. The Predicted Variables with COVID-19 Anxiety in the Healthcare Workers in This Study

Variables	COVID-19 Anxiety; OR ^a (95%CI)	
	Crude	Adjusted ^b
Age	1.14 (1.04 - 5.23) ^a	1.08 (0.93 - 5.52)
Gender		
Female	1	1
Male	2.21 (0.28 - 5.19)	2.05 (0.91 - 5.80)
Marital status		
Single	1	1
Married	3.28 (1.35 - 5.28) ^a	2.79 (0.89 - 6.48)
Divorced	2.91 (0.71 - 6.54)	2.15 (0.51 - 6.43)
Widow	1.22 (0.26 - 5.95)	1.92 (0.63 - 18.48)
Educational level		
Illiterate	-	-
Elementary	1	1
Diploma and under-diploma	2.70 (0.91 - 7.32)	3.34 (0.89 - 9.20)
Associate Degree	1.67 (0.21 - 7.37)	1.84 (0.40 - 8.71)
Bachelor	3.23 (0.32 - 8.79)	3.79 (0.30 - 9.71)
Master's degree and higher	1.52 (0.40 - 7.36)	1.84 (0.82 - 8.73)
Employment status		
Informal	1	1
Formal	1.63 (0.24 - 5.28)	1.78 (0.36 - 5.79)
Work experience		
Under 5 years	1	1
5 to 9 years	3.72 (1.25 - 6.20) ^a	3.79 (1.36 - 6.16)
10 to 15 years	3.04 (0.70 - 5.37)	3.78 (0.27 - 5.70)
15 to 24 years	2.71 (1.36 - 8.06) ^a	2.28 (0.98 - 7.56)
25 years and above	2.83 (0.12 - 5.55)	2.36 (0.66 - 5.13)
Workplace status		
Urban	1	1
Rural	1.35 (0.12 - 6.31)	1.39 (0.75 - 6.56)
History of COVID-19	1.33 (0.69 - 5.98)	2.24 (1.18 - 6.40) ^a
History of being hospitalized due to COVID-19	2.24 (0.34 - 8.84)	2.36 (0.67 - 8.40)
History of death in family due to COVID-19	3.11 (1.77 - 8.45)	3.46 (1.23 - 9.70) ^a
History of vaccination	3.18 (1.56 - 6.80) ^a	2.03 (0.26 - 5.33)
Job stress	3.14 (1.09 - 7.19) ^a	3.80 (1.95 - 8.21) ^a

^a Conditional logistic regression was used to estimate the odds ratio considering P-value < 0.05.

^b Adjusted for age, marital status, work experience, history of vaccination, and job stress.

In logistic regression analysis, after adjusting for confounding variables (e.g., age, marital status, work experience, history of vaccination, and job stress), HCWs who had previously contracted COVID-19 (OR = 2.24, 95% CI = 1.18 - 6.40), lost family members to COVID-19 (OR = 3.46, 95% CI = 1.23 - 9.70), or experienced job stress (OR = 3.80, 95% CI = 1.95 - 8.21) were more likely to feel anxious about the virus (Table 2).

5. Discussion

This study found that HCWs in the Chaharmahal and Bakhtiari province experienced moderate levels of job stress, and approximately half of them reported moderate COVID-19-induced anxiety. In addition, the results of this study showed that COVID-19-induced anxiety is influenced by three factors: A history of COVID-19, a history of death in the family due to COVID-19, and job stress. Worldwide, job stress is a major challenge for HCWs and their organizations (16). The job of HCWs entails immense responsibility, which subjects

them to various stressors in the workplace (17). Healthcare workers can feel stressed and burnt out due to long working hours, challenging tasks, excessive responsibilities, heavy workloads, insufficient staffing, and rotating shifts (18). These stressors can potentially impact their physical and emotional health as they work towards ensuring the well-being and successful treatment of patients. Due to COVID-19, stressful situations worsened for people working in healthcare and caused them to experience even more workplace stress (17). A study showed that about 60% of HCWs felt moderately stressed during the COVID-19 pandemic (19), while another study showed that about 33% of HCWs felt very stressed during the COVID-19 pandemic (20). Some studies have found that making work environments more comfortable and allowing HCWs to take breaks can help them manage stress (21).

This study showed that over half of HCWs experienced a high level of COVID-19-induced anxiety. Previous research on epidemics such as SARS, Ebola, and

MERS has shown that when a new and deadly disease emerges, it can lead to mental health problems for HCWs (22-24). Healthcare workers spend long periods in COVID-19 patient diagnosis and treatment units, placing them at significant risk of contracting the virus. They may experience a strong fear of death due to working closely with COVID-19 patients, many of whom are critically ill, and some even die (8). According to a study, two-thirds of individuals have concerns about their own health and the health of their loved ones (19). Another study found that around 30% of HCWs experienced anxiety during the COVID-19 pandemic (25).

According to the findings of the current study, having contracted COVID-19 in the past resulted in heightened levels of COVID-19-induced anxiety. Initial evidence suggests that patients diagnosed with COVID-19 may experience symptoms such as confusion, low mood, anxiety, and insomnia (26). COVID-19 may lead to psychological aftereffects by infecting the central nervous system (CNS) directly or indirectly through an immune reaction (27). Research conducted through various means, including clinical studies, post-mortem examinations, animal testing, laboratory experiments, and cell culture investigations, has indicated that coronaviruses can affect the nervous system and potentially cause harm to neurons (28). While brain infiltration is possible, the immune response to coronaviruses, known as a "cytokine storm," could potentially lead to neurological inflammation and psychiatric symptoms (29,30).

Furthermore, this study found that HCWs felt more anxious when a member of their family died from COVID-19. COVID-19 can intensify fears of dying, as it has led to numerous fatalities. It can also exacerbate anxiety about death (31). New research has found that individuals who have lost family members due to COVID-19 are more distressed than those who have lost family members for other reasons (32). Losing someone to the virus can be overwhelming, as a vast majority (two in three) tend to feel intense sorrow and struggle to perform routine tasks around friends, coworkers, and family (33).

This study found that HCWs who experienced job stress were more likely to feel anxious. Stress-inducing factors at work include job insecurity, heavy workloads, lack of proper tools, difficulty with new technology or communication, and adapting to changes in schedule or work environment. These stressors can lead to workplace anxiety and affect the mental health of HCWs, especially during the COVID-19 pandemic (34). A study conducted in Korea found that HCWs who experienced job stress were more likely to have anxiety disorders

during the COVID-19 pandemic (35). Studies conducted before COVID-19 have also found a relationship between workplace stress and anxiety. A study by Khalilzadeh et al. found that job stress increases anxiety (36). However, the strengthening of the relationship between job stress and COVID-19-induced anxiety may be due to the compounding effects of the COVID-19 pandemic.

The findings of this study suggest that in emergencies such as disease pandemics, health policymakers should incorporate psychological interventions, including adaptive methods for coping with anxiety and stress management training for HCWs. This study only included HCWs in the Chaharmahal Bakhtiari province Health Network. In future studies, it is recommended to repeat the study with hospital staff to increase the generalizability of the results and allow for a comparison of outcomes.

Our study had some limitations, similar to other studies. The first limitation was that health workers were often too busy and did not have enough time to participate, which made them reluctant to engage in the study. We attempted to explain the importance of the study to health workers and encouraged their participation by calling them several times. The second limitation was the use of online questionnaires, which may have introduced information bias. We checked the information frequently to improve accuracy.

5.1. Conclusions

Considering the positive impact of job stress on COVID-19-induced anxiety in HCWs, it seems essential to implement plans to reduce job stress among HCWs during infectious disease epidemics to decrease their COVID-19-induced anxiety.

Acknowledgements

This study was funded by the Isfahan University of Medical Sciences. The authors thank everyone who helped with the study.

Footnotes

Authors' Contribution: It was not declared by the authors.

Conflict of Interests Statement: The authors declare no conflict of interests.

Data Availability: The dataset presented in the study is available on request from the corresponding author during submission or after publication.

Ethical Approval: The ethical committee of Isfahan University of Medical Sciences approved this study (IR.MUI.RESEARCH.REC.1400.263).

Funding/Support: This study was funded by the Isfahan University of Medical Sciences.

Informed Consent: Participants were fully informed about the study, and consent was obtained prior to participation.

References

1. Akbarzadeh H, Saadati RMT, Ebrahimi M, Sina S, Ghabimi M. [Coronavirus disease 2019 (Covid-19), Perinatal And Neonatal Outcomes: A Systematic Review Study]. *Nurs and Mid J*. 2021;**18**(10):785-94. FA.
2. Noshirvanpour F. [The effect of the consequences of the corona pandemic (Covid-19) on the population structure]. *J New Res Approach Manage Account*. 2021;**54**(2):72-86. FA.
3. Ahimzadeh GENM, Kadkhodaei Elyaderani F, Navaeifar MR, Enayati AA, Manafi Anari A. [Covid 19: The Worst Health Calamity Of The World]. *Iran J of Bio*. 2020;**3**(6):144-51. FA.
4. Zadi Akhuleh O, Nasiri E, Heidari M, Bazari Z. Frequency of sharp injuries and its related factors among high-risk wards staff. *J Nurs Midwifery Sci*. 2019;**6**(4). e140993. https://doi.org/10.4103/jnms.jnms_25_19.
5. Du M, Hu K. Frontline Health Care Workers' Mental Workload During the COVID-19 Pandemic: A Cross-Sectional Study. *Asia Pac J Public Health*. 2021;**33**(2-3):303-5. [PubMed ID: 33622039]. <https://doi.org/10.1177/1010539521997257>.
6. Rahmani R, Sargazi V, Shirzaei Jalali M, Babamiri M. Relationship between COVID-19-caused Anxiety and Job Burnout among Hospital Staff: A Cross-sectional Study in the Southeast of Iran. *J Occupational Hygiene Engin*. 2021;**7**(4):61-9. <https://doi.org/10.52547/johe.7.4.61>.
7. Cheng FF, Zhan SH, Xie AW, Cai SZ, Hui L, Kong XX, et al. Anxiety in Chinese pediatric medical staff during the outbreak of Coronavirus Disease 2019: a cross-sectional study. *Transl Pediatr*. 2020;**9**(3):231-6. [PubMed ID: 32775241]. [PubMed Central ID: PMC7347772]. <https://doi.org/10.21037/tp.2020.04.02>.
8. Pappa S, Ntella V, Giannakas T, Giannakoulis VG, Papoutsis E, Katsounou P. Prevalence of depression, anxiety, and insomnia among healthcare workers during the COVID-19 pandemic: A systematic review and meta-analysis. *Brain Behav Immun*. 2020;**88**:901-7. [PubMed ID: 32437915]. [PubMed Central ID: PMC7206431]. <https://doi.org/10.1016/j.bbi.2020.05.026>.
9. da Silva Neto RM, Benjamim CJR, de Medeiros Carvalho PM, Neto MLR. Psychological effects caused by the COVID-19 pandemic in health professionals: A systematic review with meta-analysis. *Prog Neuropsychopharmacol Biol Psychiatry*. 2021;**104**:110062. [PubMed ID: 32771337]. [PubMed Central ID: PMC7409979]. <https://doi.org/10.1016/j.pnpbp.2020.110062>.
10. Hasannia E, Mohammadzadeh F, Tavakolizadeh M, Davoudian N, Bay M. Assessment of the Anxiety Level and Trust in Information Resources among Iranian Health-Care Workers During the Pandemic of Coronavirus Disease 2019. *Asian J Soc Health Behav*. 2021;**4**(4):163-8. https://doi.org/10.4103/shb.shb_68_21.
11. Rajabi F, Mokarami H, Cousins R, Jahangiri M. Structural equation modeling of safety performance based on personality traits, job and organizational-related factors. *Int J Occup Saf Ergon*. 2022;**28**(1):644-58. [PubMed ID: 32842916]. <https://doi.org/10.1080/10803548.2020.1814566>.
12. Sirati Nir M, Karimi L, Khalili R. The Perceived Stress Level of Health Care and Non-health Care in Exposed to COVID-19 Pandemic. *Iran J Psychiatry Clin Psychol*. 2020;**26**(3 Special Issue on COVID-19):294-305. <https://doi.org/10.32598/ijpcp.26.3405.1>.
13. Aditya MR, Mansyur M, Mokoagow MI, Adi NP, Fitriani DY, Tobing H, et al. Stress among healthcare workers during the COVID-19 pandemic and the determinant factors: a cross-sectional study. *Med J Indonesia*. 2022;**31**(3):148-54. <https://doi.org/10.13181/mji.0a.226030>.
14. Azadmarzabadi E. [Reliability and Validity Assessment for the HSE Job Stress Questionnaire]. *Int J Behav Sci*. 2011;**4**(4):291-7. FA.
15. Health and Safety Executive. *Management standards for tackling work related stress*. Health and Safety Executive; 2004. Available from: <https://www.hse.gov.uk/stress/standards/>.
16. D'Ettorre G, Pellicani V, Vullo A. Gender assessment of job stress in healthcare workers. Implications for practice. *Med Lav*. 2019;**110**(1):22-8. [PubMed ID: 30794245]. [PubMed Central ID: PMC7810005]. <https://doi.org/10.23749/mdl.v110i1.7421>.
17. Zare S, Mohammadi Dameneh M, Esmaeili R, Kazemi R, Naseri S, Panahi D. Occupational stress assessment of health care workers (HCWs) facing COVID-19 patients in Kerman province hospitals in Iran. *Heliyon*. 2021;**7**(5). e07035. [PubMed ID: 33997362]. [PubMed Central ID: PMC8112293]. <https://doi.org/10.1016/j.heliyon.2021.e07035>.
18. Pius U A, Thomas A O, Eno U I, Mary E I. Employee Stressors and Wellbeing of Healthcare Workers in Government owned Hospitals in Calabar, Nigeria. *J Public Administr*. 2020;**2**(4):36-43. <https://doi.org/10.22259/2642-8318.0204004>.
19. Wang H, Liu Y, Hu K, Zhang M, Du M, Huang H, et al. Healthcare workers' stress when caring for COVID-19 patients: An altruistic perspective. *Nurs Ethics*. 2020;**27**(7):1490-500. [PubMed ID: 32662326]. <https://doi.org/10.1177/0969733020934146>.
20. Teo I, Chay J, Cheung YB, Sung SC, Tewani KG, Yeo LF, et al. Healthcare worker stress, anxiety and burnout during the COVID-19 pandemic in Singapore: A 6-month multi-centre prospective study. *PLoS One*. 2021;**16**(10). e0258866. [PubMed ID: 34679110]. [PubMed Central ID: PMC8535445]. <https://doi.org/10.1371/journal.pone.0258866>.
21. Maraqa B, Nazzal Z, Zink T. Palestinian Health Care Workers' Stress and Stressors During COVID-19 Pandemic: A Cross-Sectional Study. *J Prim Care Community Health*. 2020;**11**:2150132720955030. [PubMed ID: 32847464]. [PubMed Central ID: PMC7457680]. <https://doi.org/10.1177/2150132720955026>.
22. Liu X, Kakade M, Fuller CJ, Fan B, Fang Y, Kong J, et al. Depression after exposure to stressful events: lessons learned from the severe acute respiratory syndrome epidemic. *Compr Psychiatry*. 2012;**53**(1):15-23. [PubMed ID: 21489421]. [PubMed Central ID: PMC3176950]. <https://doi.org/10.1016/j.comppsy.2011.02.003>.
23. Lung FW, Lu YC, Chang YY, Shu BC. Mental Symptoms in Different Health Professionals During the SARS Attack: A Follow-up Study. *Psychiatr Q*. 2009;**80**(2):107-16. [PubMed ID: 19247834]. <https://doi.org/10.1007/s1126-009-9095-5>.
24. Wu P, Fang Y, Guan Z, Fan B, Kong J, Yao Z, et al. The psychological impact of the SARS epidemic on hospital employees in China: exposure, risk perception, and altruistic acceptance of risk. *Can J Psychiatry*. 2009;**54**(5):302-11. [PubMed ID: 19497162]. [PubMed Central ID: PMC3780353]. <https://doi.org/10.1177/070674370905400504>.
25. Marvaldi M, Mallet J, Dubertret C, Moro MR, Guessoum SB. Anxiety, depression, trauma-related, and sleep disorders among healthcare workers during the COVID-19 pandemic: A systematic review and meta-analysis. *Neurosci Biobehav Rev*. 2021;**126**:252-64. [PubMed ID: 33774085]. [PubMed Central ID: PMC9754720]. <https://doi.org/10.1016/j.neubiorev.2021.03.024>.

26. Rogers JP, Chesney E, Oliver D, Pollak TA, McGuire P, Fusar-Poli P, et al. Psychiatric and neuropsychiatric presentations associated with severe coronavirus infections: a systematic review and meta-analysis with comparison to the COVID-19 pandemic. *Lancet Psychiatry*. 2020;7(7):611-27. [PubMed ID: 32437679]. [PubMed Central ID: PMC7234781]. [https://doi.org/10.1016/S2215-0366\(20\)30203-0](https://doi.org/10.1016/S2215-0366(20)30203-0).
27. Wu Y, Xu X, Chen Z, Duan J, Hashimoto K, Yang L, et al. Nervous system involvement after infection with COVID-19 and other coronaviruses. *Brain Behav Immun*. 2020;87:18-22. [PubMed ID: 32240762]. [PubMed Central ID: PMC7146689]. <https://doi.org/10.1016/j.bbi.2020.03.031>.
28. Desforges M, Le Coupanec A, Dubeau P, Bourgouin A, Lajoie L, Dube M, et al. Human Coronaviruses and Other Respiratory Viruses: Underestimated Opportunistic Pathogens of the Central Nervous System? *Viruses*. 2019;12(1). [PubMed ID: 31861926]. [PubMed Central ID: PMC7020001]. <https://doi.org/10.3390/v12010014>.
29. Dantzer R. Neuroimmune Interactions: From the Brain to the Immune System and Vice Versa. *Physiol Rev*. 2018;98(1):477-504. [PubMed ID: 29351513]. [PubMed Central ID: PMC5866360]. <https://doi.org/10.1152/physrev.00039.2016>.
30. Netland J, Meyerholz DK, Moore S, Cassell M, Perlman S. Severe acute respiratory syndrome coronavirus infection causes neuronal death in the absence of encephalitis in mice transgenic for human ACE2. *J Virol*. 2008;82(15):7264-75. [PubMed ID: 18495771]. [PubMed Central ID: PMC2493326]. <https://doi.org/10.1128/JVI.00737-08>.
31. Ozguc S, Kaplan Serin E, Tanriverdi D. Death Anxiety Associated With Coronavirus (COVID-19) Disease: A Systematic Review and Meta-Analysis. *Omega (Westport)*. 2024;88(3):823-56. [PubMed ID: 34622711]. [PubMed Central ID: PMC10768329]. <https://doi.org/10.1177/00302228211050503>.
32. Eisma MC, Tamminga A, Smid GE, Boelen PA. Acute grief after deaths due to COVID-19, natural causes and unnatural causes: An empirical comparison. *J Affect Disord*. 2021;278:54-6. [PubMed ID: 32950843]. [PubMed Central ID: PMC7487144]. <https://doi.org/10.1016/j.jad.2020.09.049>.
33. Lee SA, Neimeyer RA. Pandemic Grief Scale: A screening tool for dysfunctional grief due to a COVID-19 loss. *Death Stud*. 2022;46(1):14-24. [PubMed ID: 33349159]. <https://doi.org/10.1080/07481187.2020.1853885>.
34. Deguchi Y, Iwasaki S, Niki A, Kadowaki A, Hirota T, Shirahama Y, et al. Relationships between Occupational Stress, Change in Work Environment during the COVID-19 Pandemic, and Depressive and Anxiety Symptoms among Non-Healthcare Workers in Japan: A Cross-Sectional Study. *Int J Environ Res Public Health*. 2022;19(2). [PubMed ID: 35055803]. [PubMed Central ID: PMC8775764]. <https://doi.org/10.3390/ijerph19020983>.
35. Park S, Lee Y, Kim T, Jung SJ. Anxiety and COVID-19 Related Stressors Among Healthcare Workers Who Performed Shift Work at Four COVID-19 Dedicated Hospitals in Korea. *J Occup Environ Med*. 2021;63(10):875-80. [PubMed ID: 34597284]. [PubMed Central ID: PMC8478099]. <https://doi.org/10.1097/JOM.0000000000002250>.
36. Khalilzadeh R, Yavarian R, Khalkhali HR. [The Relationship of Job Stress, Depression and Anxiety of Nursing Staff of Urmia University of Medical Sciences]. *Nurs Midwifery J*. 2005;3(1):0. FA.