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Stress and burnout in radiology healthcare workers during the COVID-19 pandemic

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The worldwide novel coronavirus disease (COVID-19) pandemic has led to psychological stress in health workers (HCWs). In this study, we aimed to assess the psychological impact of COVID-19 on a group of front-line HCWs, namely, radiology department staff, and demonstrate how this pandemic has affected their lives. Between May 21 and June 25, 2020, radiology staff (RS), including technicians, technologists, and other RS from hospitals across different regions of the Kingdom of Saudi Arabia were invited to complete an online questionnaire regarding concerns and fears about the COVID-19 pandemic, along with the 10-item Perceived Stress Scale. Among the 1051 radiology staff respondents, 66.6% were men and 33.4% were women. Women and married staff showed significantly higher stress scores than men, and single staff, respectively. The 40–49 age group scored the least on the stress scale. Staff with a history of mental illness showed a significantly higher stress on the scale. The COVID-19 imposes a significant level of anxiety and stress on radiology staff involved in caring for infected patients, with their main concern being at risk of transmitting the infection to their families or acquiring it themselves. The need for psychological education and support for radiology staff as front-line HCWs is important for improving their psychological tolerance and reducing stress.

Keywords: Coronavirus, COVID-19, Stress, Radiology, Burnout, Technicians

INTRODUCTION

Recent years have seen a variety of infectious disease outbreaks that have significantly affected worldwide public health and healthcare community. In 2002, we experienced the severe acute respiratory syndrome coronavirus or SARS-CoV, followed by the H1N1 influenza disease outbreak in 2009, and the Middle East respiratory syndrome coronavirus (MERS-CoV), which was identified in Saudi Arabia in 2012. (Alsulimani et al.2020)

The outbreak of the novel coronavirus, referred to as severe acute respiratory syndrome coronavirus-2 (SARS-CoV-2), which was thereafter named coronavirus disease 2019 (COVID-19) by the World Health Organization (WHO), (Barry et al.2020) reported its first case in Wuhan province of the People's Republic of China, in December 2019 and spread rapidly beyond China. As the number of cases rose globally, countries began taking necessary action in line with the information provided by research and the best available evidence to control the spread of the infection. Countries began announcing a state of emergency and citizens were required to stay home, while the key sectors continued working, possibly among the most complex decisions governments were required to make in recent history. (Celmece and Menekay 2020).

The first confirmed case of COVID-19 in Saudi Arabia was reported on March 2, 2020; the

patient was returning home from abroad.(Chaaya et al.2010)

The number of confirmed cases continued to rise; by April 6 there were 2,463 cases, mostly due to contact transmission, with a death count of 34. (Cleverley et al.2020)

To slow the spread of the disease, authorities adopted strict measures such as closing all governmental agencies and private sector businesses with the exception of supermarkets, pharmacies, and healthcare centers. On March 23, a partial lockdown was implemented by the authorities, which was later extended to 24 hours across the country.

Frontline healthcare workers (HCWs) who care for patients in close contact were under tremendous pressure and risk of contracting COVID-19. They experienced both physical and psychological pressure and were at risk of developing higher levels of psychological problems, including depression, anxiety, post-traumatic stress symptoms, and sleep disturbances. Several factors contributed to this psychological distress among HCWs, including fear of being infected or infecting family members, shortage of personal protective equipment (PPE), and being overwhelmed by the workload. (Cohen et al.1983)

Part of this stress could be related to the unfamiliarity and perceived uncontrollability of the hazards involved (Du et al.2020)

Although most radiology staff are not on the front line, unlike their colleagues in emergency rooms and intensive care units, radiographers and technologists are always in close contact with COVID-19 patients during radiology procedures. Chest radiography (CXR) and computed tomography (CT) have emerged as key components of the patient investigation and management pathways for COVID-19. (Gorbalenya et al.2020,Hussain , 2020,Marshall et al.2007,Matud, 2004,Mehta et al. 2021 and Pontone et al.2021)

Goal of this study

This study aimed to objectively assess and evaluate the amount of psychological distress, anxiety, and stress associated with the COVID‑19 crisis experienced by HCWs in the radiology department across Saudi Arabia.

MATERIALS AND METHODS

The Institutional Review Board of King Saud University, College of Medicine approved the survey (Ref. No. 20/0552/IRB). A total of 1,051 radiology staff from different regions of Saudi Arabia were invited to participate in this study (Table 1). Responses were collected from a cross-sectional Arabic language web-based survey using an online survey platform (Google Forms, Google, Mountain View, California USA). Data were collected anonymously from May 21 to June 25, 2020.

Table 1: Demographic characteristics and information of the study sample (N = 1051)

Variable	N (%)
Total No. Gender	1051 (100%)
Male	700 (66.6%)
Female	351 (33.4%)
Age	
20–29	327 (31.1%)
30–39	564 (53.7%)
40–49	125 (11.9%)
50–60	35 (3.3%)
Marital Status	
Single	317 (30.2%)
Married	707 (67.3%)
Others (widowed, divorced)	27 (2.6%)
Children	
No	339 (32.3%)
Yes	712 (67.7%)
Professional Title	
Technician & technologists	966 (91.9%)
Seniors technologists	85 (8.01%)
Specialty	
Basic (General X-ray, Angiography, CT, US)	873 (83.1%)
Advanced (MRI, NM, Others)	178 (16.9%)
History of any mental illnesses such as anxiety, depression, others	
Yes	144 (13.7%)
No	907 (86.3%)
Suffering from disturbed sleep problems	
Yes	369 (35.1%)
No	682 (64.9%)

The participants were informed about the nature and purpose of the survey at the outset. Subsequently, if they consented to participate, they were taken to the next page (first section) of the survey. The first part of the questionnaire collected demographic information (age, gender, occupational status, region, type of family, specialty within the radiology department, and

position). Participants were asked about their level of exposure to COVID-19 patients and the number of working shifts per week. They were asked whether they had orientation and education on how to handle COVID-19 patients, as well as whether they had a known pre-existing medical or psychiatric illness.

In the second section, a widely used self-report tool, the "10-item Perceived Stress Scale, (Rubin et al.2020) was used. The scale comprises 10 items (six negatively stated and four positively stated). Each item is scored on a 5-point Likert scale ranging from 0 (*never*) to 4 (*very often*). A validated Arabic version was adopted. (Qi et al.2020)

The scale assesses perceived stress in terms of the degree to which a situation in a person's life is self-evaluated as stressful. It investigates experiences and responses to stress over the previous month (a sample question: "In the last month, how often did you feel that you could not cope with all the things that you have to do?", "In the last month, how often did you feel that the difficulties were piling up so high that you could not overcome them?"). The total Perceived Stress Scale score ranges from 0–40, with higher scores indicating higher levels of perceived stress. Scores ranging from 0–13 are considered low stress, scores ranging from 14–26 are considered moderate stress, and scores ranging from 27–40 are considered high perceived stress.

In the final section, the participants were asked about possible sources of stress during the past month. Examples of possible sources of stress include access and availability of PPE, being exposed to COVID-19 at work, exposing their family to the virus, not having rapid access to COVID testing, and the concomitant fear of propagating infection at work.

Statistical analysis

The data were described as frequencies, percentages, and means. For statistical analysis, associations between dependent and independent variables were tested using chi-square and Fisher's exact tests as appropriate. The significance level was set at $p = 0.05$. Data were analyzed using SPSS® version 21.0 (IBM Inc., Chicago, Illinois, USA).

RESULTS

Demographic Features

The questionnaire was available online and directed to radiographers and technical staff working in radiology departments in Saudi Arabia, who completed it in an average of 15 minutes. Among the 1,051 respondents, 700 were men (66.6%) and 351 were women (33.4%). Most participants were in the age group of 30–39 years (n = 564, 53.7%), with the remaining participants aged 20–29 years (n=327, 31.1%) or above 40 years (n = 160, 15.2%). Most were technicians or technologists (n=450, 42.1%) and (n = 516, 48.3%), respectively, while the remaining senior staff held positions in administration (n = 85, 8.01%). Workplace classification revealed that most respondents were from the general X-ray, angiography, computed tomography (CT), and ultrasound (US) (n = 873, 83.1%) sections, while the remaining were from magnetic resonance imaging (MRI), nuclear medicine (NM), or other sections (n = 178, 16.9%). The marital status of the respondents was also recorded; 317 (30.2%) were single, 707 (67.3%) were married, and the remaining 27 (2.6%) were divorced or widowed. Most participants had children (n = 712, 67.7%).

Perceived stress scale

The results of the linear regression analysis used to test various variables and perceived stress levels are summarized in Table 2. Concerning gender differences, we found higher levels of perceived stress among women than men ($P<0.001$). The 40–49 age group showed a significantly lower level of perceived stress than the other age groups ($P=0.037$). Married participants showed a significantly higher level of perceived stress than those who were single ($P=0.038$). No significant differences were found in perceived stress in those with children and those without, as well as in the position or location within the radiology department. Participants with a history of mental illness and those suffering from sleep disturbances had a significantly higher level of stress than their counterparts without ($P<0.001$).

Possible sources of stress

There were differences among participants with regard to the sources of stress during the past month working with COVID-19 patients; of the 1,051 who responded to the questionnaire, 677 (63.4%) agreed that access to and availability of PPE was their major source of stress.

Table 2: Regression analysis for Perceived Stress

Variable	Reference	Unstandardized Coefficients		t	Sig.	R^2	F-test	P-value
		B	Std. Error					
(Constant)		13.432	0.539	24.902	0.000	20.6%	26.92	0.000
Gender								
Female	Male	3.096	0.464	6.674	0.000			
Age								
40-49	20-29	-2.509	1.203	-2.085	0.037			
Marital Status								
Married	Single	1.364	0.658	2.073	0.038			
Children								
Yes	No	1.013	0.624	-1.626	0.104			
History of any mental illnesses such as anxiety, depression, or others?								
Yes	No	4.908	0.631	7.781	0.000			
Suffering from disturbed sleep problems?								
Yes	No	3.542	0.462	7.664	0.000			

Being exposed to COVID-19 at work and exposing their family to the virus was a major source of stress for participants, and 734 (68.6%) agreed that the fear of transmitting the virus to their family was a source of stress. Not having rapid access to COVID testing and the concomitant fear of propagating infection at work was another source of stress (n=765, 71.6%). Other sources of stress included inaccessibility to childcare during increased work hours and school closures (n=580, 54.3%), support for other personal and family needs as work hours and demands increased (n=533, 48.8%), and lack of access to current information and status of the patients they were handling (n=543, 50.8%).

Most participants had perceptions of being avoided by others because of their work in the hospital (n=787, 54.3%).

DISCUSSION

During a crisis such as the COVID-19 pandemic, it is common for individuals to experience increased levels of stress and anxiety. The important role of radiology staff, including radiographers, during a pandemic as front-liners is vital and significant. This increases their exposure to anxiety and stress due to the overwhelming demands of the healthcare system, in addition to the fear of acquiring the infection and transmitting it to their family and friends. This study investigated issues related to stress and anxiety among radiographers and radiology staff in Saudi Arabia during the COVID-19 pandemic. We used the 10-item Perceived Stress Scale (PSS-10) as a personal stress-screening tool to measure the levels of anxiety and stress among radiology staff during the COVID-19 pandemic. Results indicated that participants had high and moderate stress scores of 8.5% and 53.8%, respectively. We investigated the psychological impact of socio-demographic variables (gender, with or without children, age, and marital status), nature of work and position, as well as psychological health and the level of stress related to the COVID-19 pandemic. Regarding socio-demographic variables, we found differences in stress largely emerged according to gender, age, and marital status. Consistent with previous studies, women showed higher levels of stress than men. (Rubin et al.2020) Concerning marital status, we found that married participants experienced higher stress than singles, which can be explained by the fact that married individuals have more responsibilities when it comes to their spouses and children. A study by (Zhu et al. (2020) and Su et al. 2016) revealed that living with family members while worrying about oneself or family members being infected by COVID‑19 contributed to increased anxiety symptoms.

It is clear that individuals with a history of mental disorders and sleep disturbances suffer more than others because they are more sensitive and susceptible to stress (Talaee et al. 2020 and Temsah et al. 2020)

Conversely, neither workplace nor position significantly affected respondents' stress levels.

Although awareness and educational campaigns were initiated in our institution as well as in most health institutes, and almost all participants confirmed that they attended at least one educational session on infection prevention and control of COVID-19 infection, HCWs had significantly higher anxiety from COVID-19

compared to that from MERS-CoV and seasonal influenza. (Temsah et al. 2020)

This was probably since COVID-19 was a newly emerging virus with uncertain mechanisms of contagion, rapid spread, lack of information, and unavailability of confirmed treatments or vaccines. (Yao et al. 2020)

Strengths and limitations

The strengths of this study include the large sample size, the representativeness of the sample with respect to the overall population, the consideration of a wide array of occupational profiles, and data collection performed during the lockdown period of the pandemic.

The response rate was relatively high. Individual psychological characteristics were considered among possible predictors.

The relevance of this study should be viewed in the light of the fact that the study included the areas of Saudi Arabia most burdened by COVID-19 cases and deaths.

A limitation of the study was that other contextual and organizational variables that might have played a significant role in the prediction of burnout were not included in the analyses.

Recommendations:

Female radiology staff appear more likely to suffer from anxiety and show moderate to high symptoms of stress than male radiology staff. The psychological needs of radiology staff in particular and healthcare providers in general should be addressed appropriately during the pandemic. Efforts should be made to establish a psychological support unit, especially for high-risk healthcare providers.

CONCLUSION

The current study is an addition to the growing body of literature that highlights the stress and burnout among HCWs.[21-24] This study focused on the stress among a group of frontline HCWs, namely, radiology staff in the Kingdom of Saudi Arabia during the COVID-19 pandemic. Independent risk factors for stress and anxiety were gender, marital status, and age. Attention should be given to this group of HCWs, especially to those with a history of mental disorders. There is a need for psychological education and support to help HCWs manage their responses to stress and improve their psychological tolerance.

CONFLICT OF INTEREST

The authors declared that present study was performed in absence of any conflict of interest.

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AUTHOR CONTRIBUTIONS

FB proposed, designed the study, obtained the IRB approval and helped in distributing the study questionnaire. AJ prepared, distribute the online questionnaire, collected the data and did the statistical analysis. Both authors contributed to manuscript writing. Both authors read and approved the final version.

REFERENCES

Alsulimani LK , Farhat AM, Borah RA, AlKhalifah JA, Alyaseen SA, Alghamdi SA, Bajnaid MJ, 2021. Health care worker burnout during the COVID-19 pandemic A cross-sectional survey study in Saudi Arabia. Saudi Med J 42(3): 306-314.

Barry M, Al Amri M, Memish ZA, 2020. COVID-19 in the Shadows of MERS-CoV in the Kingdom of Saudi Arabia. J Epidemiol Glob Health 10(1): 1-3.

Celmece N, Menekay M, 2020. The Effect of Stress, Anxiety and Burnout Levels of Healthcare Professionals Caring for COVID-19 Patients on Their Quality of Life. Front Psychol 11: 597624

Chaaya M, Osman H, Naassan G, Mahfoud Z, 2010. Validation of the Arabic version of the Cohen Perceived Stress Scale (PSS-10) among pregnant and postpartum women. BMC Psychiatry 10: 111.

Cleverley J, Piper J, Jones MM, 2020. PRACTICE POINTER The role of chest radiography in confirming covid-19 pneumonia. BMJ 370: m2426.

Cohen S, Kamarck T, Mermelstein R, 1983. A

global measure of perceived stress. J Health Soc Behav 24(4): 385-96.

Du J, Dong L, Wang T, Yuan C, Fu R, Zhang L, Liu, B, Zhang M, Yin Y, Qin J, Bouey J, Zhao M, Li X, 2020.Psychological symptoms among frontline healthcare workers during COVID-19 outbreak in Wuhan. Gen Hosp Psychiatry 67; 144-145.

Gorbalenya AE, Baker SC, Baric RS, de Groot RJ, Drosten C, Gulyaeva AA, Haagmans BL, Lauber C, Leontovich AM, Neuman BW, Penzar D, Perlman S, Poon LM, Samborskiy D, Sidorov IA, Sola I, Ziebuhr J, 2020. The species Severe acute respiratory syndrome-related coronavirus: classifying 2019-nCoV and naming it SARS-CoV-2. Nat Microbiol 5(4): 536-544.

Hussain S, 2020. Evolving Role of Radiology in COVID-19 Pandemic: A Review. Annals of King Edward Medical University Lahore Pakistan 26: 199-205.

Marshall RD, Bryant RA, Amsel L, Suh EJ, Cook JM, Neria Y, 2007. The psychology of ongoing threat - Relative risk appraisal, the September 11 attacks, and terrorism-related fears. Am Psychol 62(4): 304-316.

Matud MP, 2004. Gender differences in stress and coping styles. Personality and Individual Differences 37(7): 1401-1415.

Mehta S, Machado F, Kwizera A, Papazian L, Moss M, Azoulay E, Herridge M, 2021. COVID-19: a heavy toll on health-care workers. Lancet Respir Med 9(3): 226-228.

Pontone G, Scafuri S, Mancini ME, Agalbato C, Guglielmo M, Baggiano A, Muscogiuri G, Fusini L, Andreini D, Mushtaq S, Conte E, Annoni A, Formenti A, Gennari AG, Guaricci AI, Rabbat MR, Pompilio G, Pepi M, Rossi A, 2021. Role of computed tomography in COVID-J Cardiovasc Comput Tomogr 15(1): 27-36.

Qi J , Xu J, Li B-H, Huang J-H, Yang Y, Zhang Z-T, Yao D-A, Liu Q-H, Jia M, Gong D-K, Ni X-H, Zhang Q-M, Shang F-R, Xiong N, Zhu C-L, Wang T, Zhang X, 2020.The evaluation of sleep disturbances for Chinese frontline medical workers under the outbreak of COVID-19. Sleep Med 72:1-4.

Rubin GD et al., 2020. The Role of Chest Imaging in Patient Management During the COVID-19 Pandemic A Multinational Consensus Statement From the Fleischner Society. Chest 158(1): 106-116.

Rubin GD, Ryerson CJ, Haramati LB, Sverzellati N, Kanne JP, Raoof S, Schluger NW, Volpi A, Yim J-J, Martin AB, Anderson DJ, Kong C, Altes T, Bush A, Desai S, Goldin J, Goo JM, Humbert M, Inoue Y, Kauczor H-U, Luo F, Mazzone PJ, Prokop M, Remy-Jardin M, Richeldi L, Shaefer-Prokop C, Tomiyama N, Wells AU, Leung AN, 2020. The Role of Chest Imaging in Patient Management during the COVID-19 Pandemic: A Multinational Consensus Statement from the Fleischner Society. Radiology 296(1): 172-180.

Su S, Wong G, Shi W, Liu J, Lai AC, Zhou J, Liu W, Bi Y, Gao GF, 2016.Epidemiology, Genetic Recombination, and Pathogenesis of Coronaviruses. Trends Microbiol. 24(6): 490-502.

Talaee N, Varahaman M, Jamaati H, Salim A, Attarchi M, Dizaji MK, Sadr M, Hassani S, Farzanegan B, Monjazebi F, Seyedmehdi SM , 2020. Stress and burnout in health care workers during COVID-19 pandemic: validation of a questionnaire. Z Gesundh Wiss; 6:1-6.

Temsah MH, AL-Sohime F, Alamro N, Al-Eyadhy A, Al-Hasan K, Jamal A, Al-Maglouth I, Aljamaan F, Al Amri M, Barry M, Al-Subaie S, Somily AM , 2020. The psychological impact of COVID-19 pandemic on health care workers in a MERS-CoV endemic country. J Infect Public Health 13(6): 877-882.

Vicario-Merino A., Muñoz-Agustin N, 2020. Analysis of the Stress, Anxiety and Healthy Habits in the Spanish COVID-19 Confinement. Health Science Journal 14(2).

World Health Organization, 2020. Coronavirus Disease 2019 (COVID‑19) Situation Report‑43.

World Health Organization, 2020. Coronavirus Disease 2019 (COVID‑19) Situation Report‑77 HIGHLIGHTS. World Health Organization.

Yao H, Chen JH, Xu YF, 2020. Patients with mental health disorders in the COVID-19 epidemic. Lancet Psychiatry 7(4): e21.

Zhu Z, Xu S, Wang H, Zheng L, Wu J, Li G, Miao J, Zhang C, Yang Y, Sun W, Zhu S, Fan Y, Chen Y, Hu J, Liu J, Wang W, 2020. COVID-19 in Wuhan: Sociodemographic characteristics and hospital support measures associated with the immediate psychological impact on healthcare workers. EClinicalMedicine 24: 100443.