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Psychosocial Effects of COVID-19 pandemic on Yemeni healthcare workers: A Web-based, Cross-sectional Survey

Gamil Ghaleb Alrubaiee[a,b], Mohammed Alsabri [c], Farouk Abdulrahman Al-Qadasi[d], Talal Ali Hussein Al-Qalah[a], Jennifer Cole [e] and Yaser Abdullah Ghaleb Alburiahy[f]

aDepartment of Community Health, College of Nursing, Ha'il University, Hail, KSA; bDepartment of Community Health, Faculty of Medical Sciences, Al-Razi University, Sana'a City, Yemen; cEmergency Department, Al-Thawra Modern General Teaching Hospital, Sana'a City, Yemen; dEpidemiology and Medical Statistic, Health Officer, International Organization of Migration, Sana'a City, Yemen; eDepartment of Health Studies, Royal Holloway University of London, Egham, UK; fEmergency Department, Modern European Hospital, Sana'a City, Yemen

ABSTRACT

Yemeni healthcare workers (HCWs) experience high levels of psychosocial stress. The current study provides a psychosocial assessment of Yemeni HCWs during the COVID19 pandemic and the factors that influence this. Between 6 November 2020, and 3 April 2021, 1220 HCWs inside Yemen self-reported levels of stress, anxiety, insomnia, depression and quality of life using a web-based, cross-sectional survey. According to the findings, 73.0%, 57.3%, 49.8%, 53.2%, and 85.2% of all HCWs reported moderate or severe stress, insomnia, anxiety, depression, and a lower quality of life, respectively. Significant positive correlations were found between stress and anxiety, insomnia, and depression scores, as well as anxiety and insomnia and depression, and insomnia and depression ($p < 0.001$). There was also a significant inverse relationship between wellbeing scores and stress, anxiety, insomnia, and depression scores ($p < 0.001$). A high percentage of respondents (85.8%) were 40 years old or younger and 72.7% had fewer than 10 years' experience, suggesting that experienced medics leave Yemen for safer and more secure jobs elsewhere. Psychosocial support to assist in building resilience to the prevailing conditions may need to be embedded in medical school training and continuing professional development to help support HCWs within Yemen and prevent even more from leaving the country.

1. Introduction

SARSCoV2 is the name given by the International Committee on Virus Taxonomy (ICTV) to the novel coronavirus first detected in Wuhan, Hubei Province, China, in December 2019 [1]. SARSCov2 is the causative agent of COVID-19. On 11 March 2020, the World Health Organization (WHO) declared COVID-19 a global pandemic [2]. The consequences of infection range from asymptomatic carriage, through mild upper respiratory tract symptoms to respiratory failure, multi-organ failure and death [3], particularly in elderly patients and those with certain underlying health conditions, such as chronic lung or kidney disease. By 23 July 2021, the virus had infected more than 192 million people worldwide and the number of deaths had totaled more than 4 million [4]. Close to 10% of all COVID-19 cases worldwide, according to the WHO, were linked to HCWs [5]; COVID-19 may have killed 80,000 to 180,000 healthcare workers [6] by that time.

Frontline HCWs play a vital role in the care of patients with COVID-19, making them more susceptible to infection and more likely to spread an infection to others without the use of infection control measures and personal protective equipment (PPE) [7]. Additionally, they have had to deal with increased patient numbers and overstretched healthcare systems during the pandemic. Stress is the most common environmental risk factor for psychiatric illnesses, and people who are exposed to it for an extended period of time are more likely to develop depression or other mental illnesses. Among other negative health consequences, stress compromises their immune response, further increasing the likelihood of infection and potentially leading to more severe symptoms or even death.

One recent research paper reported that COVID-19 disease has been known to cause considerable mental health problems in infected patients, HCWs, families, children, and students [8]. Another study, which was conducted to assess the psychological impact of quarantine and how to reduce it, discovered that increasing incidence of COVID-19 causes fear, anxiety, and panic among the community, particularly among HCWs who are aware that they are one of the groups most at risk of infection [9]. Chen et al., (2021) and Li,

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Scherer, Felix, and Kuper (2021) also found that HCWs can suffer moderate to severe anxiety and depression at the same time. A study conducted by the TMGH-global COVID-19 collaborative with the goal of determining post-traumatic stress disorder (PTSD) status and factors contributing to the development of PTSD in quarantine/isolated HCW and Non-HCW during the pandemic, found several PTSD correlations among individuals quarantined/isolated during the COVID-19 pandemic, including education level, isolation, and being infected [10]. The same research group reported in another study that many characteristics, such as female gender, being single, religious affiliation, and a lack of formal education, were predictors of stress during the COVID-19 epidemic [11]. A meta-analysis study by Batra et al (2020) adds to the evidence of a higher psychological impact among HCWs, particularly females, nurses, and frontline responders [12]. Consequently, the mental health of HCWs should be given more attention during the COVID-19 pandemic [13,14].

Healthcare workers in Yemen are used to working under high levels of psychosocial stress. Over the past six years, ongoing war and civil unrest have severely impacted the country's infrastructure, including its health facilities. At present, Yemen's healthcare system is in a state of near collapse. According to WHO, only about half of Yemen's 5,056 pre-war health facilities are still operational, and even in those that are, there is a severe shortage of medical personnel and essential emergency medical equipment [15,16]. Despite the fact that the COVID-19 pandemic has exacerbated an already difficult situation, it is important to understand the impact of psychological stress on Yemen's healthcare workers so that appropriate interventions can be put in place to support psychological resilience in challenging situations. Recently, there have been calls for more research on the impacts of Yemeni HCWs' mental health on their ability to function [17] and on the humanitarian aid sector to provide more support for HCWs' mental health needs [18].

The struggle against COVID-19 began for Yemeni medics on 10 April 2020 when the first case was confirmed in Ash Shihr, Hadramout Province in southern Yemen. On 29 April 2020, five more cases of COVID-19 were confirmed and registered in the capital, Aden. Afterwards, cases in other cities began to increase on a daily basis. A year later, as of 7 April 2021, there had been 4,247 confirmed cases, with 882 deaths [19]. Yemen, with a critical shortage of healthcare professionals and healthcare supplies, including basic PPE, and limited testing capacity, has the highest case fatality rate (29%) in the world [20]. However, this figure is almost certainly an underestimate because of the political situation and the country's fragile and weak health system.

In the context of the COVID-19 response, HCWs in Yemen are exposed to a variety of occupational hazards that put them at risk of disease, injury, psychological disturbances, and even death, including (a) occupational infection with COVID-19; (b) skin disorders and heat stress from prolonged use of PPE; (c) exposure to toxic substances due to increased use of disinfectants; and (d) psychological distress [21,22]. In addition, the emergence of new strains of SARSCoV2, and the possibility of these types being transmitted to a highly devastated country, has triggered even further concern among HCWs. To quantify the problem's scope, Yemen's first-line healthcare workers must be assessed for their mental health. This will evidence the need for psychological interventions to help anticipate and avoid the consequences that may arise during the epidemic's lifetime. Therefore, this aim of this study is to assess the psychosocial status and associated factors of Yemeni healthcare workers during the COVID-19 pandemic.

2. Methods

2.1. Ethics approval statement

The study obtained ethical approval from Al-Razi University's Ethics Committee (Ref: RU/ 056/FOMS/ 2020), and all methods were performed within the frame of the relevant guidelines and regulations.

2.2. Participants' consent and ethical approval

The objectives of the study were explained to the respondents. They were also informed that participation was voluntary, anonymity was assured and that they could withdraw from the study at any time. Before they could complete the web-based, self-report questionnaire, respondents had to confirm their voluntary participation by answering a yes or no question on the screen.

2.3. Study design, area, and time period

Yemeni HCWs who provide patient healthcare services were assessed for their levels of stress, anxiety, insomnia, depression, and overall well-being in a web-based cross-sectional survey. The survey took place between 6 November 2020, and 3 April 2021.

2.4. Sample size determination

The sample size was estimated by the equation of one proportion formula using OpenEpi program based on the prevalence of severe anxiety among healthcare providers (27.7%) from a previous study in Yemen [19] with design effect 4. The calculated sample was 1,231. A total of 1,220 HCWs responded to the survey and are included in this study.

2.5. Study instrument

A survey instrument adapted from previously published studies was used in the current study. The survey was divided into two sections: socio-demographic information and five standardised scales. Section (1) is concerned with socio-demographic factors such as age, gender, marital status, living situation, occupation, educational level, current hospital worked in, and working unit in that hospital. Section (2) surveyed the respondents using the Perceived Stress Scale (PSS-10 items) [23], Generalized Anxiety Disorder (GAD-7 items) [24], the Insomnia Severity Index (ISI-7 items) [25], the Depression Severity Scale (PHQ-9 items) [24], and the Well-Being Scale (WHO-5 items) [26].

2.6. Scoring of stress, anxiety, insomnia, depression, and wellbeing scales

The stress level scores were calculated by assigning scores of 0, 1, 2, 3, and 4 to the response levels 'never, almost never, sometimes, fairly often, and very often', respectively. For questions 4, 5, 7, and 8 the scores were reversed (0 = 4, 1 = 3, 2 = 2, 3 = 1, 4 = 0). The ten-question scores were then summed and ranged from 0 to 40. A score of <14 was considered low perceived stress, scores of 14–26 were considered moderate perceived stress, while a score of >26 was considered high perceived stress [23]. Similarly, the levels of insomnia ranged from 0 to 28. A score of 8 indicated that there was no clinically significant insomnia, a score of 8–14 indicated mild insomnia, a score of 15–21 indicated moderate insomnia, and a score of 22 or above indicated severe insomnia [25]. The total cumulative score of anxiety levels ranged from 0 to 24. A score of 0–5 was considered minimal anxiety, 6–10 was considered mild anxiety, 11–15 was considered moderate anxiety, and 16–24 was considered severe anxiety. Scores for depression ranged from 0 to 27. A score of 0–4 indicated no depression, a score of 5–9 indicated mild depression, a score of 10–14 indicated moderate depression, a score of 15–19 indicated moderately severe depression, and a score of 20–27 indicated severe depression [24]. The total wellbeing level scores ranged from 0 to 25. A score of <13 was considered the worst possible perceived quality of life, a score of 13–18 scores was considered a moderate perceived quality of life, while a score of >19 was considered the best possible perceived quality of life. The correlation coefficient was interpreted using the following criteria: 0–0.25 = weak correlation, >0.25–0.5 = fair correlation, >0.5–0.75 = good correlation, and greater than 0.75 = excellent correlation [26].

3. Validity and reliability

The adapted English questionnaire used in this study was subjected to a cross-cultural adaptation process. The translation process from the source (English) into the target (Arabic) language was conducted by two independent bilingual translators, fluent in Arabic and English, with more than a year of experience in Arabic-English translation to ensure that it retained the same meaning and measures when used in a target population. The content validity of the questionnaire items was then reviewed by a team of four experts – two epidemiologists and two infectious disease specialists – as well as translators, to ensure they had been correctly translated and made sense in the new context. Some words were modified in response to their suggestions, but no items were added or removed. The adapted Arabic version was pre-tested with 30 participants in a pilot study. The level of comprehensibility of each item was also assessed using a four-point scale (0, not comprehensible; 1, slightly comprehensible; 2, moderately comprehensible and 3, highly comprehensible). Cronbach's alpha was used to assess the reliability of the survey questions. Cronbach's alpha values for stress were 0.82, anxiety 0.75, insomnia 0.80, depression 0.89, and overall wellbeing 0.78.

4. Participants

Inclusion criteria for the study was all HCWs working in public sector health institutions within Yemen, males and females, 18 years of age and up, who agreed to participate. They were chosen because they are considered to be under extreme stress while caring for COVID-19 patients. HCWs who worked in private hospitals or declined to participate were excluded.

5. Data collection

In this study, the researchers used a non-probability, convenience sampling strategy because they did not have access to the sampling frame. Because of the ongoing COVID-19 outbreak, data was gathered using a self-reported questionnaire created in Google Forms, as recommended by the Ministry of Health and Population to avoid face-to-face contact between researchers and research participants. The URL link to the form was distributed to the HCWs via emails and social media including WhatsApp and Telegram. The participants were encouraged to send the link to as many other colleagues as possible to increase the response rate of the survey. To avoid entering multiple responses from the same respondent, the email address of each respondent was used as a unique

identifier. A total of 1,220 HCWs responded to the survey and are included in this study.

6. Data analysis

The collected data were managed and analyzed using Statistical Package for Social Sciences (IBM SPSS), version 24.0. Mean values and standard deviations were used to describe continuous variables, while dichotomous or categorical variables were described using the counts and percentages. Independent samples T-test and one-way ANOVA were used to compare the participants' demographic characteristics and levels of perceived stress, anxiety, insomnia, depression, and well-being. Spearman's correlation coefficient was used to determine the relation between stress, anxiety, insomnia, depression, and wellbeing scores. A p-value of < 0.05 levels (two-tailed) with a 95% confidence interval was considered statistically significant.

7. Results

7.1. Respondents' characteristics

A total of 1,220 (72.8% males and 27.2% females) participated in this survey. The mean age of the participants was 32.5 years with 8.40 years standard deviation. About half were in the age group less than or equal to 30 years (47.2%) and 38.6% in the age group 31–40 years. Approximately two-thirds of the sample (67.0%) were married and 82.8% lived with family members. Physicians and nurses were the most frequently represented occupations (31.5% and 21.1% respectively). About half of the participants (50.2%) had a bachelor's degree as their highest degree and the other educational levels were distributed as follows: Diploma (27.4%), Master's (12.0%), Medical Board (7.4%), and Ph.D. (3.1%). With regards to the respondents' working area, 17.5% worked in a non-specific unit, 15.8% in the emergency and ICU department, 14.3% in the surgical (general, orthopedic with anesthesia) department and 6.2% in the internal medicine department. Most of the participants (72.5%) had less than or equal to 10 years of working experience, and most worked 8 hours or less per day (67.3%) on 4 to 6 days per week (80.3%). More details are given in Table 1.

7.2. Descriptive analysis findings

As shown in Table 2, 73.0% of study participants reported moderate or severe stress, divided into moderate (65.0%) and severe (8.0%); only a quarter (27%) reported low stress. Anxiety symptoms were reported by just under half of the respondents, with a total prevalence of 49.8% divided into three categories: mild (29.0%), moderate (14.7%), and severe (6.1%).

Insomnia was observed in 57.3% of the medical staff and was classified as mild (35.0%), moderate (18.6%), or severe (3.7%). The level of depression reported by study participants was 54.3%, with severity ranging from mild (46.8%) to moderate (7.4%) to moderately severe (54.3%) (0.1%). 85.2% of study participants reported having the worst possible quality of life, while 13.0% and 1.7% reported having a moderate and best possible quality of life, respectively.

7.3. Bivariate analysis findings

According to Table 3, participants with 0–10 years of experience, as well as those working more than 16 hours per day, had significantly higher levels of stress and insomnia (p-values 0.003 & 0.002) and (p-values 0.015 & 0.036), respectively. Furthermore, anxiety levels were significantly higher among subjects with 0–10 years of experience, those working more than 16 hours per day, and those working seven days a week (p-value 0.007, 0.033 & 0.030), respectively. Those working in the emergency room (ER) had higher rates of insomnia than those working in other departments. Participants who were divorced had significantly higher levels of depression than others (p-value 0.021), while singles and married people reported significantly higher levels of happiness than divorced and widowed people (p-value 0.018). Participants in the age groups ≤30 years and 31–40 years reported significantly higher wellbeing than those >40 years of age (p-value 0.027).

7.4. Findings of the study variables' correlation

Table 4 demonstrates that there were significant positive correlations between stress and anxiety, insomnia, and depression scores, as well as a significant negative correlation between stress and wellbeing scores. There was also a significant positive correlation between anxiety and insomnia and depression, as well as insomnia and depression. Nonetheless, there was a significant negative correlation between wellbeing scores and anxiety, insomnia, and depression scores.

8. Discussion

Our objective was to assess the psychosocial effects of COVID-19 on Yemeni healthcare workers. The study's findings paint a depressing picture of life as a healthcare worker in Yemen. Nearly three-quarters (73%) of Yemeni HCWs report moderate or severe stress; nearly half (49.8%) suffer from moderate or severe anxiety, a higher percentage (57.3%) suffer from insomnia, and a similar proportion suffer from mild-severe depression (54.3%). The vast majority (82.5%) of respondents rated their quality of life as the worst possible.

Table 1. Socio-demographic characteristics of the study participants.

Demographic characteristic		N (%)
Age	≤ 30 Year	576 (47.2)
	31–40 Year	471 (38.6)
	41–50 Year	120 (9.8)
	>50 Year	53 (4.3)
	Mean ± SD	**32.53 ± 8.41**
Sex	Male	888 (72.8)
	Female	332 (27.2)
Marital Status	Single	385 (31.6)
	Married	817 (67.0)
	Divorced	5 (0.4)
	Widow	13 (1.1)
Living Status	Living Alone	210 (17.2)
	Living with Family	1010 (82.8)
Occupation	Nurse	257 (21.1)
	Physician	384 (31.5)
	Others	579 (47.5)
Educational Level	Diploma	334 (27.4)
	Bachelors	612 (50.2)
	Masters	146 (12.0)
	Ph.D.	38 (3.1)
	Board	90 (7.4)
Working Area	Emergency/ICU	193 (15.8)
	Surgical	175 (14.3)
	Internal Medicine	76 (6.2)
	No specific unit	214 (17.5)
	Others	562 (46.1)
Experience Years	0–10 Years	887(72.7)
	11–20 Years	260(21.3)
	>20 Years	73(6.0)
	Mean ± SD	**7.76 ± 6.81**
Working Hours per day	0–8 Hours	821 (67.3)
	9–16 Hours	373 (30.6)
	>16 Hours	26 (2.1)
	Mean ± SD	**8.97 ± 3.38**
Days of working per week	1–3 Days	136 (11.1)
	4–6 Days	980 (80.3)
	7 Days	104 (8.5)
	Mean ± SD	**5.23 ± 1.21**

The situation from which these conditions emerge is unlikely to improve in the foreseeable future. Challenges with burnout amongst Yemeni HCWs have been recorded for more than a decade [27], as have challenges to establishing and supporting mental health programs in Yemen [28], leading to claims that the right to mental health care in the country is being ignored [29].

The findings of the current study are consistent with the results of previous studies [30–32] showing a considerable level of depression, anxiety, and insomnia among all HCWs during the COVID-19 outbreak. The results are in line with the result of Alnazly et al. [31], who found thatCOVID-19 has had a significant impact on the overall psychological wellbeing of frontline HCWs in Jordan. Likewise, Titi et al. [33], found that lower and middle-income healthcare workers across 12 Arab countries have a greater prevalence rate of various psychosocial symptoms than high-income healthcare workers. Furthermore, the results are also in line with the result of a previous study on Yemen by Alrubaiee et al. [19] who found similarly high levels of respondent anxiety during the battle against the COVID-19 outbreak. The results of this study differ from the results of Shamsan et al. [34] and Al Ammari et al. [35] from Saudi Arabia, who found that Saudi HCWs have lower levels of anxiety, depression and insomnia than were observed in Yemen. These contradictory findings could be due to the differences in settings of the studies, availability of PPE, and the diversity of the respondents who participated in the study.

It is not surprising, in this context, that many HCWs do not stay in Yemen for long once they qualify to practice somewhere else [36]. Of the total 1,220 respondents, 72.7% had less than 10 years of working experience, and 85.8% were 40 years of age or less. This is indicative of the challenges Yemen faces with retaining HCWs who train in the country: many leave soon after qualification. This situation is unlikely to improve with the increased challenges the pandemic brings. Those who have remained in Yemen bear the scars of this. Statistically higher scores for stress ($p = 0.02$), anxiety ($p = 0.06$), and insomnia ($p = 0.03$) were reported from those with more than 10 years of experience than those with less experience, and the older participants were also statistically significantly ($p = 0.027$) more likely to report the worst quality of life. This suggests that the older HCWs may not be staying in the highly stressful conditions they endure in Yemen by choice, or at the very least that they are far from happy with their current situation.

Table 2. Descriptive analysis findings.

Variables		N (%)
Stress	Low stress	329 (27.0)
	Moderate stress	793 (65.0)
	High stress	98 (8.0)
Anxiety	Minimal anxiety	613 (50.2)
	Mild anxiety	354 (29.0)
	Moderate anxiety	179 (14.7)
	Severe anxiety	74 (6.1)
Insomnia	No insomnia	521 (42.7)
	Mild insomnia	427 (35.0)
	Moderate insomnia	227 (18.6)
	Severe insomnia	45 (3.7)
Depression	No depression	558 (45.7)
	Mild depression	571 (46.8)
	Moderate depression	90 (7.4)
	Moderately severe depression	1 (0.1)
Wellbeing	Worst possible quality of life	1040 (85.2)
	Moderate quality of life	159 (13.0)
	Best possible quality of life	21 (1.7)

These findings support the results reported by Alnazly et al. [31] that respondents' perceived depression, anxiety, and insomnia were significantly associated with the greater years of clinical experience. In contrast, the results seem to differ from those of Alhurishi et al. [30], who stated that depression, anxiety, and insomnia among respondents during the COVID-19 pandemic did not significantly differ based on the number of experience years. This result thus requires further research. Regarding the perceived well-being of the participants, it was found to vary significantly based on the respondents' age. This corroborates previous studies [36–39], which reported a significant association between respondents' mental health such as generalized anxiety disorder, depressive symptoms, and their age.

The exodus of Yemeni healthcare workers to safer positions and better-equipped healthcare sectors elsewhere forces those who remain to work long hours, creating a stress-inducing cycle. Two-thirds of all HCWs (67.3%) reported working more than eight hours a day, and 8.5% work seven days a week. Those working more than 16 hours a day reported – hardly surprisingly – statistically significantly higher levels of stress ($p = 0.015$), anxiety ($p = 0.033$), and insomnia ($p = 0.036$). Those working 7 days a week were also more likely to report problems with anxiety ($p = 0.030$). This becomes even more concerning when one considers that those under 40 years of age are statistically more likely ($p = 0.028$) to be the ones working longer hours than those in the older age groups. The increased risk of stress, anxiety, and insomnia associated with working longer hours is hardly likely to increase young medics' enthusiasm for remaining in Yemen (See S1 Table). This result is in line with a previous study [33] carried out across 12 Arab ountries, which indicated that longer working hours during the COVID-19 outbreak were highly associated with poorer psychological outcomes. The family situation provided interesting results that would require more research to fully understand.

Divorced and widowed HCWs reported statistically higher scores for depression ($p = 0.021$) and lower scores for perceived wellbeing ($p = 0.018$) compared with those who were single but this may not be indicative of the conflict and humanitarian aid situation; it may simply be a reflection of the loss of, or separation from, a loved one that would be reflected within Yemeni society more widely. Further research would be needed to unpack this, particularly as there were no significant differences between respondents living alone and those living with family members. This is interesting as it may suggest that the fear of taking infection home to family members is being offset by the emotional support and companionship family members provide. Further qualitative research to investigate the effects of these factors would add value to understanding. Our findings differ from those of a recent study on HCWs in Saudi Arabia during the COVID-19 pandemic, which found significant associations between depression, anxiety, and stress levels and the HCWs' age, gender, marital status, and work experience [35].

There were no statistically significant differences observed between levels of reported stress, anxiety, depression, insomnia, or wellbeing based on gender, occupation within the hospital, level of qualification, or which hospital department respondents were employed in, suggesting that negative experiences are spread evenly but widely throughout the Yemeni healthcare workforce.

The findings of this study reveal psychosocial-related issues among various Yemeni healthcare professionals during the COVID-19 pandemic and emphasize the importance of developing strategies and support systems to improve the wellbeing of healthcare professionals who are responsible for ensuring COVID-19 patients receive high-quality medical care. According to the findings, Yemeni frontline healthcare professionals experience moderate to severe stress, insomnia, anxiety, depression, and a lower quality of life. These findings will contribute to a better understanding of the psychosocial condition of healthcare workers during the COVID-19 pandemic and will suggest steps that go beyond simply protecting them from COVID-19 infection to develop and implement need-based interventions.

This study has several limitations which should be addressed in future research. First, our study was an electronic-based cross-sectional survey, hence we could not define the causal inferences; further qualitative work would be valuable to help understand specific drivers of stress. Second, we used an electronic web-based survey and voluntary sampling to avoid the potential transmission of COVID-19 infection; therefore, selection bias is possible, particularly as not all HCWs may have access to the internet.

Table 3. Bivariate analysis findings.

Variable		Stress Mean ± SD	Anxiety Mean ± SD	Insomnia Mean ± SD	Depression Mean ± SD	Wellbeing Mean ± SD
Age	≤ 30 Year	18.10 ± 5.89	6.79 ± 4.88	9.97 ± 6.09	5.06 ± 2.71	9.16 ± 3.70
	31–40 Year	17.55 ± 6.0	6.65 ± 5.17	9.38 ± 6.74	5.13 ± 2.85	9.63 ± 3.88
	41–50 Year	16.87 ± 6.09	5.56 ± 4.34	8.53 ± 5.63	4.67 ± 2.83	8.87 ± 3.57
	>50 Year	17.91 ± 6.30	6.79 ± 5.61	9.13 ± 6.87	4.81 ± 3.15	8.40 ± 3.39
	F	1.70	2.07	2.06	0.99	3.08
	p-value	0.165	0.102	0.104	0.397	0.027
Sex	Male	17.82 ± 5.96	6.67 ± 5.09	9.55 ± 6.45	4.95 ± 2.77	9.22 ± 3.65
	Female	17.56 ± 6.00	6.43 ± 4.66	9.59 ± 6.06	5.28 ± 2.85	9.44 ± 3.99
	t	0.69	0.75	-0.12	-1.87	-0.93
	p-value	0.490	0.456	0.905	0.062	0.351
Marital Status	Single	17.84 ± 5.92	6.31 ± 4.73	9.48 ± 6.13	4.92 ± 2.73	9.51 ± 3.89
	Married	17.67 ± 5.99	6.73 ± 5.05	9.56 ± 6.43	5.09 ± 2.82	9.22 ± 3.68
	Divorced	22.00 ± 2.82	9.60 ± 6.46	16.60 ± 5.68	8.40 ± 1.94	6.00 ± 3.00
	Widow	18.38 ± 6.85	7.07 ± 6.76	9.30 ± 6.43	4.07 ± 2.62	7.07 ± 2.87
	F	0.96	1.26	2.08	3.26	3.37
	p value	0.410	0.287	0.101	0.021	0.018
Living Status	Alone	17.92 ± 5.78	6.92 ± 5.20	9.74 ± 6.29	4.88 ± 2.77	9.30 ± 3.46
	With Family	17.72 ± 6.01	6.54 ± 4.93	9.52 ± 6.36	5.07 ± 2.80	9.27 ± 3.81
	t	0.46	1.01	0.46	-0.89	0.08
	p-value	0.647	0.315	0.645	0.374	0.939
Occupation	Nurse	18.15 ± 6.26	6.89 ± 5.39	9.83 ± 6.58	5.04 ± 2.94	9.23 ± 4.40
	Physician	17.47 ± 6.00	6.17 ± 4.82	9.16 ± 6.14	4.84 ± 2.61	9.30 ± 3.39
	Others	17.77 ± 5.82	6.78 ± 4.88	9.71 ± 6.38	5.17 ± 2.84	9.29 ± 3.67
	F	1.00	2.26	1.13	1.62	0.03
	p-value	0.368	0.105	0.324	0.197	0.973
Educational Level	Diploma	17.98 ± 6.16	6.56 ± 4.84	9.35 ± 6.35	5.12 ± 2.91	9.34 ± 4.33
	Bachelors	17.72 ± 5.85	6.67 ± 5.13	9.76 ± 6.38	5.01 ± 2.77	9.31 ± 3.65
	Masters	17.54 ± 6.01	6.69 ± 4.87	8.76 ± 6.51	5.04 ± 2.74	9.29 ± 3.06
	Ph.D.	16.52 ± 5.15	5.10 ± 4.68	8.42 ± 5.88	4.52 ± 2.55	9.84 ± 3.49
	Board	18.01 ± 6.38	6.85 ± 4.75	10.75 ± 5.85	5.14 ± 2.65	8.53 ± 3.19
	F	0.61	0.97	1.93	0.45	1.15
	p-value	0.653	0.423	0.103	0.776	0.332
Working Area	Emergency/ICU	17.93 ± 6.10	6.45 ± 4.94	9.85 ± 6.68	5.14 ± 2.98	9.12 ± 3.84
	Surgical	17.51 ± 6.40	6.30 ± 5.20	9.26 ± 6.20	4.83 ± 2.69	9.2 ± 3.97
	Internal Medicine	18.84 ± 6.40	7.38 ± 5.35	9.57 ± 6.64	5.09 ± 2.55	9.12 ± 3.48
	No specific unit	17.84 ± 5.60	6.57 ± 4.74	9.52 ± 6.13	5.07 ± 2.73	9.59 ± 4.02
	Others	17.59 ± 5.88	6.68 ± 4.97	9.58 ± 6.34	5.06 ± 2.83	9.27 ± 3.59
	F	0.85	0.71	0.20	0.31	0.52
	p-value	0.492	0.584	0.937	0.869	0.723
Experience Years	0–10 Years	18.13 ± 5.87	6.89 ± 5.06	9.91 ± 6.32	5.15 ± 2.78	9.33 ± 3.68
	11–20 Years	16.88 ± 6.12	5.99 ± 4.77	8.87 ± 6.35	4.83 ± 2.78	9.33 ± 4.06
	>20 Years	16.38 ± 6.28	5.53 ± 4.49	7.82 ± 6.36	4.55 ± 3.06	8.51 ± 3.42
	F	6.48	5.11	5.70	2.52	1.66
	p-value	0.002	0.006	0.003	0.081	0.191

(Continued)

Table 3. (Continued).

Variable		Stress Mean ± SD	Anxiety Mean ± SD	Insomnia Mean ± SD	Depression Mean ± SD	Wellbeing Mean ± SD
Working Hours per day	0–8 Hours	17.44 ± 5.86	6.43 ± 4.90	9.23 ± 6.35	4.97 ± 2.81	9.33 ± 3.71
	9–16 Hours	18.29 ± 6.13	6.85 ± 5.07	10.22 ± 6.25	5.17 ± 2.70	9.17 ± 3.78
	>16 Hours	19.84 ± 6.48	8.76 ± 5.54	10.42 ± 6.88	5.07 ± 3.58	9.03 ± 4.47
	F	**4.21**	**3.42**	**3.34**	**0.67**	**0.28**
	p-value	**0.015**	**0.033**	**0.036**	**0.513**	**0.757**
Working Days per week	1–3 Days	17.64 ± 5.44	6.88 ± 5.04	9.01 ± 6.27	5.11 ± 2.69	9.76 ± 4.11
	4–6 Days	17.78 ± 6.01	6.45 ± 4.89	9.53 ± 6.35	4.99 ± 2.80	9.17 ± 3.70
	7 Days	17.58 ± 6.27	7.76 ± 5.57	10.53 ± 6.40	5.37 ± 2.88	9.62 ± 3.65
	F	**0.08**	**3.51**	**1.74**	**0.92**	**1.93**
	p-value	**0.923**	**0.030**	**0.175**	**0.399**	**0.145**

Table 4. Findings of the study variables' correlation.

Variable	Correlation coefficient	P-value
Stress + Anxiety	0.628**	<0.001
Stress +Insomnia	0.493**	<0.001
Stress +Depression	0.453**	<0.001
Stress +Wellbeing	−0.095**	0.001
Anxiety +Insomnia	0.576**	<0.001
Anxiety +Depression	0.546**	<0.001
Anxiety +Wellbeing	−0.204**	<0.001
Insomnia+ Depression	0.476**	<0.001
Insomnia+ Wellbeing	−0.172**	<0.001
Depression+ Wellbeing	−0.180**	<0.001

Third, the results of the self-reported survey should be taken with caution, as these results may differ from those obtained through face-to-face interviews; the conditions surveyed were not subject to clinical diagnosis. Finally, previous physical and mental illness, as well as the potential effect of the Yemeni war on HCW quality of life, were not considered, which may influence the study's validity.

9. Conclusion

Yemeni HCWs face unprecedented challenges from internal conflict and now from COVID-19. Considerable levels of stress, anxiety, depression, insomnia, and poor quality of life reported by HCWs shows an increasingly positive correlation with age, years of experience, and also with number of hours and days worked. Long working hours, and working every day of the week, is concentrated in the younger age groups, thus adding to their stress. These factors will increase the challenges Yemen already faces in retaining its healthcare workforce for the future and presents a requirement on the healthcare sector to train more medical staff than it needs, as many are likely to leave for jobs elsewhere. This exodus puts an additional burden on an already under-resourced and over-stretched system. In the short term, support for the Yemeni healthcare sector will be required from international aid agencies, who may need to be mindful of stationing their staff in-country for anything other than short periods to avoid exposing them to the risk factors experienced by the local staff. Psychosocial support to build resilience to the prevailing conditions may need to be embedded into medical school training and continuing professional development to help retain HCWs within Yemen.

Abbreviations

COVID-19: Coronavirus Disease 2019; HCWs: Healthcare workers; WHO: World Health Organization; SARS-CoV-2: severe acute respiratory syndrome coronavirus2; PPE: Personal protective equipment; PTSD: post-traumatic stress disorder.

Availability of data and materials

The paper results contain all relevant data. DOI: 10.6084/m9. figshare.21266067 for the dataset used in this study.

Disclosure statement

No potential conflict of interest was reported by the author(s).

Consent for publication

Not applicable.

ORCID

Mohammed Alsabri 🔟 http://orcid.org/0000-0002-7278-2289
Jennifer Cole 🔟 http://orcid.org/0000-0001-8787-8892

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