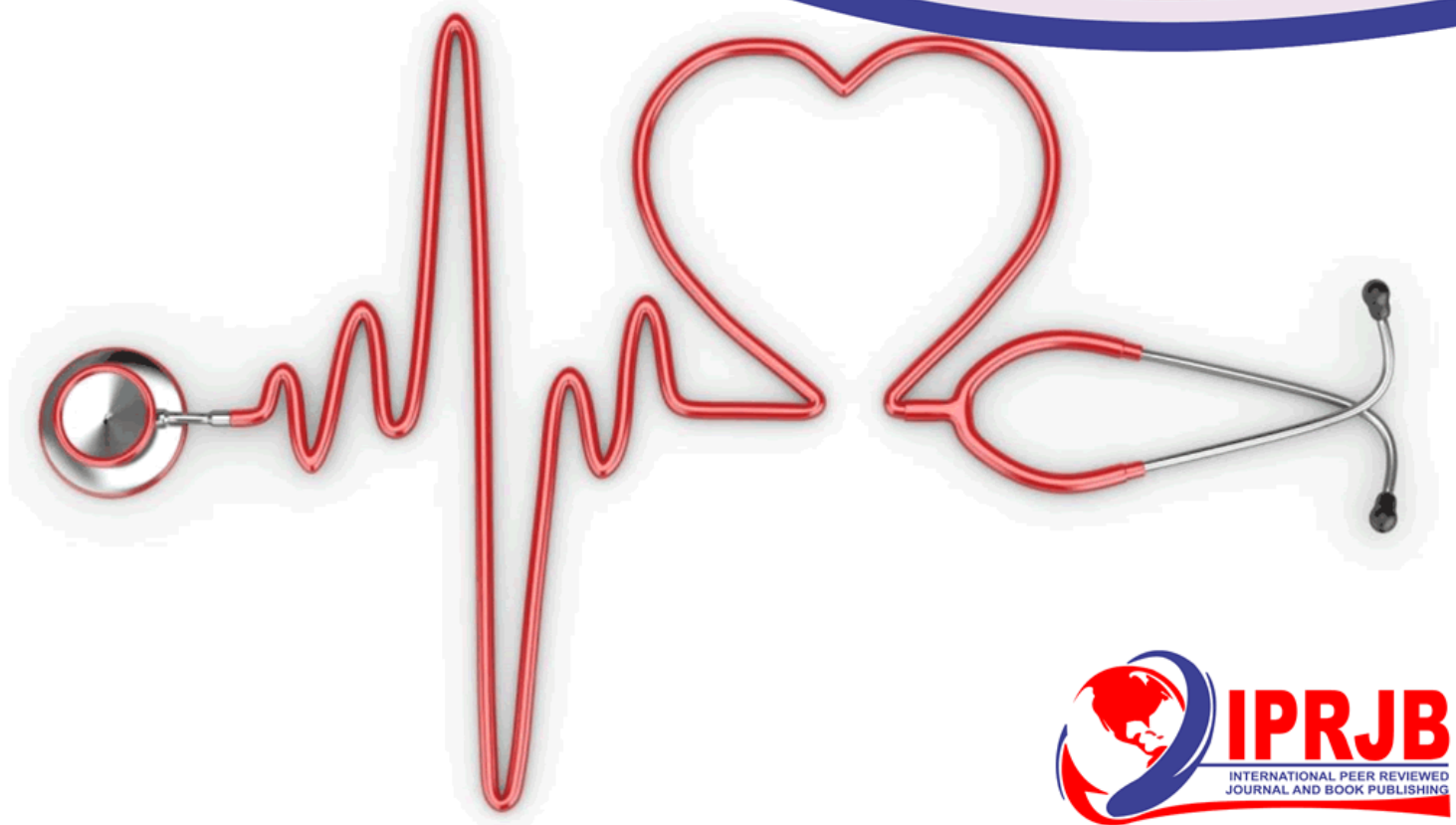


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FACTORS ASSOCIATED WITH PSYCHOLOGICAL OUTCOMES OF
HEALTHCARE WORKERS DURING THE COVID-19 PANDEMIC AND
ITS EFFECTS ON QUALITY OF LIFE

MRS. HANIN ABDULHAMEED SHALABY, MS. NORA BAROOM, MRS. RAWAN
ANWAR OBAID, AND DR. ENAAM RABOE



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DURING THE COVID-19 PANDEMIC AND ITS EFFECTS ON QUALITY OF LIFE

^{1*} Mrs. Hanin Abdulhameed Shalaby
Clinical Research and Data Management Specialist
King Fahd Armed Forces Hospital, Jeddah, Saudi Arabia
*Corresponding Author's E-mail: h.shalaby@hotmail.com

^{2*}Ms. Nora Baroom
Health Educator
King Fahd Armed Forces Hospital, Jeddah, Saudi Arabia

^{3*}Mrs. Rawan Anwar Obaid
Health Educator
King Fahd Armed Forces Hospital, Jeddah, Saudi Arabia

^{4*}Dr. Enaam Raboe
Pediatric Surgery Consultant
Medical Reference, Jeddah, Saudi Arabia

Abstract

Purpose: This study aimed at assessing the factors associated with psychological outcomes among HCWs in Saudi Arabia (SA) during the pandemic. It also aims to determine the factors affecting their QoL.

Methodology: In this descriptive cross-sectional study, all HCWs who are working in direct and indirect contact with COVID-19 cases in tertiary hospitals of SA were invited voluntarily to complete the validated web-based survey during the study period. A total of 1,182 HCWs from different regions across SA and different specialties including physicians, nurses, pharmacists, health educators, technicians, and others responded to this study between the 1st of June and the 31st of July 2020. Psychological risk factors were evaluated using Patient Health Questionnaire depression scale; and the Generalized Anxiety Disorder (GAD-7) anxiety scale. QoL was assessed using the World Health Organization Quality of Life Questionnaire (WHOQOL). Socio-demographic data were summarized with frequency and percentages. The overall anxiety, depression, WHOQOL scores of the study participants were calculated according to mean value, SD, and median. The association between socio-demographic factors and anxiety, depression scales were examined using independent samples t-tests, one-way ANOVA, and the chi-square test (for categorical depression/ anxiety variables severe depression/severe anxiety against mild/moderate/moderately severe). While those factors and WHOQOL domains were examined using one-way ANOVA. Multivariate analysis was used to identify the front-line work predictors of depression and anxiety.

Findings: Poor QoL scores were observed, especially in the physical and psychological health domains. In general, low QoL was significantly higher among workers who reported higher levels of anxiety and depression. The observed factors affecting the psychological health and QoL were age, gender, living with children and/or older people, occupation, years of experience, participation in front-line work.

Unique contribution to theory, practice and policy: Specific characteristics of HCWs may act as protective or risk factors with regard to depression, anxiety, and QoL. Targeted interventions could mitigate the negative effects of front-line work to maintain medical professionals' optimal psychological and physical health. More research is needed to further determine how the COVID-19 pandemic and front-line work affect HCWs' mental and physical well-being.

Keywords: *COVID-19, psychosocial outcomes, depression, anxiety, quality of life, healthcare worker, front-line work*

1.0 INTRODUCTION

A recently detected strain of severe acute respiratory syndrome coronavirus (SARS-CoV-2) created a new infectious disease called coronavirus disease 2019 (COVID-19) (Alkhamees et al., 2020). By December 2019, COVID-19 was spreading rapidly throughout China after the first cases were diagnosed in Wuhan (Al-Hanawi et al., 2020). In most patients, COVID-19 initially affects the respiratory system, causing severe symptoms that can lead to death in the elderly and those with comorbidities (Al Sulais, Mosli, & AlAmeel, 2020). By January 2020, cases of COVID-19 were also appearing outside of China.

On March 7, 2020, the first case of COVID-19 was discovered in Saudi Arabia (SA). The government's response was swift and far-reaching. It started with the launch of a public awareness campaign via social media, encouraging the public to stay home and follow the Ministry of Health's (MOH) instructions. By March 23, 2020, Makkah, Medina, and Riyadh were in lockdown, with travel restrictions imposed across the country; within ten days, the curfew was extended to 24 hours, meaning that people were forced to remain in their homes (Alkhamees et al., 2020). The caseload in SA soon climbed to 2,385 with 34 deaths, prompting the Saudi authorities to take further preventive measures to contain the virus's spread, including closing schools and public places, imposing a curfew, and quarantining whole cities (Al Sulais, Mosli, & AlAmeel, 2020). Within a few months of detecting its first case, SA had a comparatively larger number of confirmed COVID-19 patients than other Arabian Gulf countries, which meant it also had a higher probability of health system pressure and fear of infection, causing more difficulties and worries (Al-Hanawi et al., 2020).

The rapid increase of COVID-19 cases along with the rapid societal changes left people, especially HCWs, alarmed and anxious (Alkhamees et al., 2020). Some of them developed psychiatric disorders such as depression, panic disorders, and anxiety (Al Sulais, Mosli, & AlAmeel, 2020). Although being stressed and fearful of getting sick is expected during any outbreak, this was further compounded by the government's stay-at-home orders and quarantines. The fear and anxiety experienced by HCWs in SA were also partly triggered by the uncertainty associated with the risk of COVID-19 effects, which further denigrated the quality of their lives (Alkhamees et al., 2020).

A recent study carried out in China concerning COVID-19 psychological impacts revealed that 53.8% of respondents showed moderate to severe psychological impacts, 16.5% and 28.8% reported moderate to high depressive or anxiety symptoms, and 8.1% reported moderate to high levels of stress. The anxiety and depression symptoms showed no decline in the four weeks after the COVID-19 pandemic was declared (Alkhamees et al., 2020).

Being tasked with having to work daily in the unprecedented crisis environment of COVID-19, HCWs face significant challenges when dealing with COVID-19 patients. The main challenges include reducing the spread of infection, developing suitable short-term strategies, formulating long-term plans, and continuing to treat non-COVID patients, as well as maintaining personal responsibilities such as taking care of their families and themselves (Shreffler, Petrey & Huecker, 2020). Being on the front-lines of fighting COVID-19 has led to an increase in the risk of HCWs developing psychological health complications and affecting their quality of life (QoL) of HCWs. According to the World Health Organization (WHO), the QoL is defined as "*an individuals' perceptions of their position in life in the*

context of the culture and value systems in which they live, and in relation to their goals, expectations, standards and concerns". It is a concept to incorporate the individuals' physical health, psychological state, level of independence, social relationships, beliefs, and relationships to the environment in a complex way (Greenberg, 2006 & WHOQOL Group, 1995).

Other burdens affecting the quality of life (QoL) of HCWs are aspects such as the shortage of personal protective equipment (PPE), insufficient number of ventilators, and the need to take stressful precautions during medical examinations and in the operative fields (Arafa et al., 2020). There is also an increase in their workload, including being tasked with unfamiliar clinical roles in dealing with COVID-19 patients (Al Sulais, Mosli, & AlAmeel, 2020; Almater et al., 2020). Added to their daily stress is the worry of getting infected or passing the disease on to their loved ones. All of these burdens might result in a reduction of their caring behaviors while at the same time increase their practice errors, leading to worse outcomes and additional costs (Arafa et al., 2020).

Since the beginning of the pandemic, numerous studies have been published in the literature. However, limited studies address issues around HCWs and how the stressful pandemic environment is affecting their QoL. Therefore, the purpose of the present research is to assess in-depth the main factors associated with psychological outcomes among HCWs in Saudi Arabia during the COVID-19 pandemic and to gauge the effects of these outcomes on the HCWs' QoL.

2.0 METHODOLOGY

2.1 Study Design

We developed a descriptive research method using a web-based cross-sectional study. It was distributed electronically through social media and WhatsApp accounts using snowball sampling. The data were collected using an online questionnaire tool (Google forms) in order to adhere to the social distancing and lockdown protocols. The survey was conducted from the 1st of June and the 31st of July 2020.

2.2 Study Population

In this descriptive cross-sectional study, all HCWs who are working in direct and indirect contact with COVID-19 cases in tertiary hospitals of SA were invited voluntarily to complete the validated web-based survey during the study period. A total of 1,182 HCWs from different regions across SA and different specialties including physicians, nurses, pharmacists, health educators, technicians, and others responded to this study.

The participants were informed about the study's aim and objectives and that they have the right to withdraw at any time. They also informed that all information and opinions provided would be anonymous and confidential. Also, it was explained that they would be signing the consent by default if they completed the survey. The survey tool automatically verified that all questions had to be answered completely prior to submission and could not be submitted twice (Peng et al., 2020).

2.3 Measurement Tools

The questionnaire consists of COVID-19-related questions divided into four main sections. The questions cover factors associated with psychological outcomes among HCWs in Saudi Arabia during the COVID-19 pandemic.

The first section includes socio-demographic variables (age, gender, marital status, living with children and/or elderly people, occupation, city of residence, years of experience, participation in front-line work, and place of work). The second section uses the Patient Healthcare

Questionnaire (PHQ-9) consisting of 9 items representing the criterion symptoms for depressive disorders. The respondents were asked how much each symptom bothered them over the past two weeks, with response options of “not at all”, “several days”, “more than half the days”, and “nearly every day”, scored as 0, 1, 2, and 3, respectively. The third section uses the Generalized

Anxiety Disorder (GAD-7) and has 7 items with response options employed to measure symptoms of anxiety during the previous two weeks. Scores of 5, 10 and 15 were classified as mild, moderate and severe anxiety, respectively (Kroenke, Spitzer & Williams, 2001; Pitzer, Kroenke & Williams, 1999).

The fourth section uses the World Health Organization Quality of Life (WHOQOL) instrument, which is administered to assess QoL scores in four domains (physical health, psychological health, social relationship, and environmental). All domain scores were standardized on a scale of 0 to 100, with higher scores representing higher QoL (WHOQOL Group, 1993).

2.4 Statistical Methods

Statistical analysis was performed using SPSS statistical software, version 22.0 (IBM Corp). The significance level was set at $\alpha = .05$. Data analysis included tabulations for demographic data (table 1) were summarized with frequency and percentages. The overall anxiety, depression and WHOQOL scores of the study participants were calculated according to mean value, SD, and median. The association between socio-demographic factors and anxiety/ depression scales were examined using independent samples t-tests, one-way ANOVA, and the chi-square test (for categorical depression/ anxiety variables severe depression/severe anxiety against mild/moderate/moderately severe). The association between socio-demographic factors and WHOQOL domains were examined using one-way ANOVA (table 2, 3& 4).

Multivariate analysis was used to identify the front-line work predictors of depression and anxiety. The results were presented in the table (Table 5) with corresponding model coefficients, standard errors, p-values (to reflect statistical significance), overall model fit (R-square).

3.0 RESULTS

3.1 Socio-Demographic Results:

Descriptive characteristics of study participants are reported in Table 1. As shown, most HCWs were aged between 31 and 40 years, with the majority being female (79%), and living with children and/or elderly people (68%). Most of the respondents were nurses (44%), followed by physicians (33%), nearly half

(47%) of them live in Jeddah, and the majority (60%) have 12-17 years of experience. Furthermore, most of the HCWs (72%) participated in front-line work and just over one-third (35%) work at MOH hospitals.

Table 1: Socio-demographic characteristics of sample participants (N = 1,182)

| Socio-demographic characteristics | Frequency (%) |
|---|----------------------|
| Age | |
| 25-30 | 55 (5%) |
| 31-35 | 389 (33%) |
| 36-40 | 354 (30%) |
| 41-45 | 222 (19%) |
| 46-55 | 108 (9%) |
| 56-60 | 54 (4%) |
| Gender | |
| Female | 935 (79%) |
| Male | 247 (21%) |
| Living with children or/and elderly people | |
| Yes | 857 (73%) |
| No | 325 (27%) |
| Occupation | |
| Physician | 391 (33%) |
| Nurse | 522 (44%) |
| Other | 269 (23%) |
| City of living | |
| Riyadh | 379 (32%) |
| Jeddah | 551 (47%) |
| Makkah | 158 (13%) |
| Eastern province | 22 (2%) |
| Other | 72 (6%) |
| Years of Experience | |
| 5 years or less | 18 (1%) |
| 6-11 years | 139 (12%) |
| 12-17 years | 707 (60%) |
| More than 17 years | 318 (27%) |
| Participate in front-line work | |
| Yes | 637 (54%) |
| No | 545 (46%) |
| Place of work | |
| Military hospital | 269 (23%) |
| MOH | 411 (35%) |
| Governmental hospital | 304 (25%) |
| Private hospital | 198 (17%) |

3.2 Analysis of Depression Scores

The depression level of the participating HCWs was assessed using the PHQ-9 instrument, with possible composite scores ranging between 0 and 27. Higher scores corresponded to higher levels of depressive

symptoms. The overall depression score for all study participants ranged between 3 and 24, with a mean value of 15.29 and SD = 5.01. The median depression score was 16. Depression scores were also categorized into mild (0-5), moderate (6-10), moderately severe (11-15), and severe (16-27). Examining the categorical depression levels, we found the majority of subjects to have severe (52%) or moderately severe (30%) depression. Only 14% were categorized as having moderate or mild (4%) levels of depression.

The association between socio-demographic factors and depression was examined using independent samples t-tests, one-way ANOVA, and the chi-square test (for categorical depression variable severe depression against mild/moderate/moderately severe). The results are presented in Table 2. Based on the participants' responses, we found the following factors to have a statistically significant association with depression scores: age, gender, living with children and/or older people, occupation, years of experience, and participation in front-line work. For example, we found that the 25-40 age group was significantly more depressed compared to other age groups, and that the 25-30 and 36-40 age groups were the most depressed, with 78% and 70% experiencing severe depression, respectively. Also, females were significantly more depressed than males, with 62% of female HCWs being severely depressed compared to only 15% of male HCWs.

HCWs who live with children and/or older people were significantly more depressed than those who do not. Moreover, 57% of HCWs who live with children and/or older people were severely depressed, compared to 42% of those who do not. Physicians showed the lowest levels of depression, while nurses showed the highest, with 78% of nurses showing severe depression. Also, HCWs with 6-11 or 17+ years of experience were least depressed, while HCWs with 5 years of experience or less were most depressed.

Additionally, we found that all (100%) of the HCWs with experience ≤ 5 years reported severe depression. It is worth noting, however, that there were only 18 subjects in this experience category. Also, HCWs who work on the front lines with COVID-19 patients were found to be the most depressed, with 71% being severely depressed. This is significantly more than the 3% of HCWs with severe depression who do not work on the front lines.

Table 2. Association between socio-demographic factors and depression

| Socio-demographic characteristics | Depression score, mean \pm SD | Independent samples t-test/ one-way ANOVA | Depression level, N (%) | | Chi-square test |
|---|---------------------------------|---|---------------------------------|-----------|---------------------------------|
| | | | Mild/moderate/moderately severe | Severe | |
| Age | | | | | |
| 25-30 | 16.18 ^c \pm 5.33 | F(5,1176) = 73.82, p < .001 | 12 (22%) | 43 (78%) | $\chi^2(5) = 167.15$, p < .001 |
| 31-35 | 17.11 ^c \pm 3.23 | | 167 (43%) | 222 (57%) | |
| 36-40 | 16.73 ^c \pm 4.83 | | 108 (30%) | 246 (70%) | |
| 41-45 | 12.49 ^b \pm 3.88 | | 174 (78%) | 48 (22%) | |
| 46-55 | 12.83 ^b \pm 5.17 | | 72 (67%) | 36 (33%) | |
| 56-60 | 8.33 ^a \pm 6.91 | | 36 (67%) | 18 (33%) | |
| Gender | | | | | |
| Female | 16.78 \pm 4.00 | t(1180) = 24.27, p < .001 | 359 (38%) | 576 (62%) | $\chi^2(1) = 170.13$, p < .001 |
| Male | 9.67 \pm 4.41 | | 210 (85%) | 37 (15%) | |
| Living children/ people with elderly | | | | | |
| Yes | 16.08 \pm 4.40 | t(1180) = 8.07, p < .001 | 343 (43%) | 459 (57%) | $\chi^2(1) = 28.82$, p < .001 |
| No | 13.63 \pm 5.75 | | 226 (59%) | 154 (41%) | |
| Occupation | | | | | |
| Physician | 12.82 ^a \pm 4.68 | F(2,1179) = 134.21, p < .001 | 258 (66%) | 133 (34%) | $\chi^2(2) = 262.36$, p < .001 |
| Nurse | 17.63 ^c \pm 4.17 | | 114 (22%) | 408 (78%) | |
| Other | 14.35 ^b \pm 4.93 | | 197 (73%) | 72 (27%) | |
| City of residence | | | | | |
| Riyadh | 14.81 \pm 5.05 | F(4,1177) = 1.63, p = .17 | 197 (52%) | 182 (48%) | $\chi^2(4) = 4.39$, p = .36 |
| Jeddah | 15.39 \pm 5.09 | | 262 (47%) | 289 (53%) | |
| Makkah | 15.74 \pm 4.80 | | 69 (44%) | 89 (56%) | |
| Eastern province | 15.73 \pm 5.06 | | 10 (45%) | 12 (55%) | |
| Other | 15.96 \pm 4.48 | | 31 (43%) | 41 (57%) | |
| Years of experience | | | | | |
| 5 years or less | 21.00 ^c \pm 0.00 | F(3,1178) = 31.90, p < .001 | 0 (0%) | 18 (100%) | $\chi^2(3) = 64.67$, p < .001 |
| 6-11 years | 13.56 ^a \pm 3.42 | | 102 (73%) | 37 (27%) | |
| 12-17 years | 16.15 ^b \pm 4.34 | | 299 (42%) | 408 (58%) | |
| More than 17 years | 13.81 ^a \pm 6.28 | | 168 (53%) | 150 (47%) | |
| Participate in front-line work | | | | | |
| | 17.41 \pm 3.53 | t(1180) = 31.71, p < .001 | 250 (29%) | 602 (71%) | $\chi^2(1) = 431.9$, p < .001 |

Note: ^{a b c d} represent significantly different means based on Tukey's post-hoc test

3.3 Analysis of Anxiety Scores:

The anxiety levels of HCWs were assessed using the GAD-7 instrument, with possible composite scores ranging between 0 and 21. Higher scores corresponded to higher levels of anxiety symptoms. The overall anxiety score for all the study participants ranged between 3 and 21, with a mean value of 14.44 and SD = 4.61. The median anxiety score was 15. Anxiety scores were also categorized into mild (0-5), moderate (6-10), moderately severe (11-15), and severe (16-21). Examining categorical anxiety levels, we found that the majority of subjects had severe (48%) or moderately severe (33%) anxiety, while only 9% could be categorized as having moderate or mild (10%) levels of depression.

The association between socio-demographic factors and anxiety was examined using independent samples t-tests, one-way ANOVA, and the chi-square test (for categorical anxiety variable severe anxiety against mild/moderate/moderately severe). The results are presented in Table 3. We found the following factors had a statistically significant association with anxiety score: age, gender, living with children and/or older people, occupation, years of experience, and participation in front-line work. For instance, we found that the 25-40 age group was significantly more anxious compared to other age groups, and that the 25-30 and 31-35 age groups were the most anxious, with 78% and 66% having severe anxiety, respectively.

The other factor we noticed was that female HCWs were significantly more anxious than their male counterparts, with 59% of female HCWs being severely anxious, compared to only 7% of male HCWs. Additionally, HCWs who live with children and/or elderly people were significantly more anxious than those who do not. Specifically, 53% of workers who live with children and/or elderly people were severely anxious compared to 38% of the other group. Overall, physicians and others showed the lowest anxiety levels, while nurses showed the highest, with 83% of nurses showing severe anxiety levels. In addition, HCWs with 17+ years of experience were the least anxious, while HCWs with 5 years' or less experience were the most anxious. All (100%) of the participating HCWs with experience ≤ 5 years reported severe anxiety. Moreover, 65% of HCWs who perform front-line work had severe anxiety, compared to only 4% of those who do not work in the front lines.

There was also a strong positive correlation between PHQ-9 and GAD-7 scores, $r(1182) = 0.78, p < .001$. This indicates that HCWs with high levels of depression also reported high levels of anxiety

Table 3. Association between socio-demographic factors and anxiety

| Socio-demographic characteristics | Anxiety score, Mean \pm SD | Independent samples t-test/ one-way ANOVA | Anxiety level, N (%) | | Chi-square test |
|--|-------------------------------|---|-------------------------------------|-----------|-------------------------------------|
| | | | Mild / moderate / moderately severe | Severe | |
| Age | | | | | |
| 25-30 | 15.60 ^d \pm 6.19 | | 12 (22%) | 43 (78%) | |
| 31-35 | 16.04 ^d \pm 3.05 | F(5,1176) = 72.22, | 132 (34%) | 257 (66%) | $\chi^2(5) = 238.20,$ $p < .001$ |
| 36-40 | 15.42 ^d \pm 3.83 | p < .001 | 150 (42%) | 204 (58%) | |
| 41-45 | 11.89 ^b \pm 4.83 | | 174 (78%) | 48 (22%) | |
| 46-55 | 13.83 ^c \pm 4.12 | | 90 (83%) | 18 (17%) | |
| 56-60 | 7.00 ^a \pm 5.01 | | 54 (100%) | 0 (0%) | |
| Gender | | | | | |
| Female | 16.11 \pm 3.16 | t(1180) = 34.34, | 383 (41%) | 552 (59%) | $\chi^2(1) = 209.57,$ $p < .001$ |
| Male | 8.11 \pm 3.62 | p < .001 | 229 (93%) | 18 (7%) | |
| Living with children/elderly people | | | | | |
| Yes | 15.08 \pm 4.17 | t(1180) = 7.09, | 378 (47%) | 424 (53%) | $\chi^2(1) = 21.6,$ $p < .001$ |
| No | 13.09 \pm 5.16 | p < .001 | 234 (62%) | 146 (38%) | |
| Occupation | | | | | |
| Physician | 12.12 ^a \pm 4.48 | F(2,1179) = 255.6, | 325 (83%) | 66 (17%) | $\chi^2(2) = 452.80,$ $p < .001$ |
| Nurse | 17.29 ^b \pm 2.40 | p < .001 | 90 (17%) | 432 (83%) | |
| Other | 12.29 ^a \pm 4.98 | | 197 (73%) | 72 (27%) | |
| City of residence | | | | | |
| Riyadh | 14.12 \pm 4.67 | F(4,1177) = 1.27, p = .28 | 210 (55%) | 169 (45%) | $\chi^2(4) = 5.09,$ $p = .28$ |
| Jeddah | 14.44 \pm 4.69 | | 284 (51%) | 267 (49%) | |
| Makkah | 14.78 \pm 4.19 | | 76 (48%) | 82 (52%) | |
| Eastern province | 15.05 \pm 4.28 | | 11 (50%) | 11 (50%) | |
| Other | 15.21 \pm 4.56 | | 31 (43%) | 41 (57%) | |
| Years of experience | | | | | |
| 5 years or less | 19.00 ^c \pm 0.00 | F(3,1178) = 22.97, | 0 (0%) | 18 (100%) | $\chi^2(3) = 44.32,$ $p < .001$ |
| 6-11 years | 14.63 ^b \pm 4.61 | p < .001 | 73 (52%) | 66 (48%) | |
| 12-17 years | 15.00 ^b \pm 4.03 | | 335 (47%) | 372 (53%) | |
| More than 17 years | 12.87 ^a \pm 5.41 | | 204 (64%) | 114 (36%) | |
| Participate in front-line work | | | | | |
| Yes | 16.25 \pm 3.32 | t(1180) = 27.84, | 296 (35%) | 556 (65%) | $\chi^2(1) = 354.7,$ $p < .001$ |
| No | 9.78 \pm 4.173 | p < .001 | 316 (96%) | 14 (4%) | |
| Place of work | | | | | |
| | | F(3,1178) = 0.87, | | | $\chi^2(3) = 1.81,$ |

Note: ^{a b c d} represent significantly different means based on Tukey's post-hoc test

3.4 Analysis of WHOQOL Scores

The WHOQOL instrument was administered to assess quality of life scores in four domains (physical health, psychological health, social relationship, and environmental). All domain scores were standardized to a 0-100 scale, with higher scores representing higher QoL.

Overall, the study participants reported relatively low scores for QoL, especially in the physical and psychological health domains. The scores for each domain were as follows: physical health $M = 13.44$, $SD = 7.27$; psychological health $M = 9.36$, $SD = 8.33$; social relationship $M = 42.80$, $SD = 15.69$; and environmental $M = 43.10$, $SD = 10.62$.

We found significant correlations between PHQ-9 score and the physical health domain and psychological health domain: $r(1182) = 0.115$, $p < .001$ and $r(1182) = 0.336$, $p < .001$ respectively. Furthermore, we detected a correlation between the GAD-7 score and physical health domain and psychological health domain: $r(1182) = 0.113$, $p < 0.001$ and $r(1182) = 0.27$, $p < 0.001$, respectively.

The association between socio-demographic factors and WHOQOL domain scores was examined using independent samples t-tests and one-way ANOVA. The results are presented in Table 4. Significant associations were found in some factors, such as age, gender, HCWs who live with children and/or older people, occupation, city of residence, years of experience, and participation in front-line work.

Furthermore, the age category had a significant relationship with the physical health domain score. The 36-40 age group had the lowest physical health domain score ($M = 12.83$) compared with the other age groups. As well, age category had a significant relationship with the psychological health domain score. Older HCWs (56-60 age group) had the highest psychological health domain score ($M = 13.97$). Gender had a significant association with physical and psychological health domain scores. Specifically, females had the lowest physical and psychological health domain scores ($M=12.95$; $M=8.45$), respectively. HCWs who live with children or/and older people were associated with significantly lower physical health domain scores ($M=12.83$) compared to other living arrangements ($M= 14.72$).

Occupation had a significant relationship with psychological health domain scores ($p = 0.004$). It was found that nurses had the lower domain score ($M = 8.50$) compared to physicians ($M = 10.27$) and other occupations ($M=9.70$). City of residence played a significant role in psychological health and environmental domain scores. For the psychological health domain, the highest score ($M = 10.00$) was reported in Riyadh compared to other cities. However, in the environmental domain, the highest score ($M = 45.45$) was reported among HCWs in Makkah compared to Riyadh ($M = 42.54$) and others ($M = 40.93$).

Years of experience had significant association with psychological health domain scores ($p = 0.003$). It was noticed that HCWs with 5 years or less experience had the lowest score ($M = 6.25$) compared to those with 17 or more years of experience ($M = 10.69$). Doing front-line work had a significant relationship with physical and psychological health domain scores. HCWs who work on the front lines had the lowest domain scores compared to others ($M = 13.07$ physical health, $M = 8.13$ psychological health).

Table 4. Association between socio-demographic factors and WHOQOL

| Socio-demographic characteristics | WHOQOL domain scores, mean \pm SD | | | |
|--|-------------------------------------|---------------------------|--------------------------------|--------------------------------|
| | Physical health | Psychological health | Social relationship | Environmental |
| Age | ANOVA p = .037 | ANOVA p <0.001 | ANOVA p = .15 | ANOVA p = .14 |
| 25-30 | 14.48 \pm 8.86 | 8.18 \pm 6.89 | 41.67 \pm 16.82 | 45.63 \pm 10.50 |
| 31-35 | 13.04 \pm 6.30 | 8.03 \pm 6.51 | 42.35 \pm 16.06 | 43.65 \pm 10.10 |
| 36-40 | 12.83 \pm 6.79 | 8.59 \pm 7.63 | 44.56 \pm 15.56 | 43.17 \pm 10.66 |
| 41-45 | 13.89 \pm 7.65 | 10.41 \pm 8.58 | 42.23 \pm 14.83 | 42.20 \pm 11.09 |
| 46-55 | 14.31 \pm 8.06 | 12.77 \pm 10.08 | 40.28 \pm 15.05 | 42.60 \pm 10.30 |
| 56-60 | 15.57 \pm 10.66 | 13.97 \pm 12.36 | 43.06 \pm 16.96 | 40.86 \pm 12.30 |
| Gender | t-test p = .006 | t-test p <0.001 | t-test p = .83 | t-test p = .72 |
| Female | 12.95 \pm 6.78 | 8.45 \pm 7.09 | 42.69 \pm 15.74 | 43.26 \pm 10.59 |
| Male | 15.27 \pm 8.65 | 12.70 \pm 10.66 | 43.22 \pm 15.56 | 42.49 \pm 10.72 |
| Living with children/elderly people | t-test p < .001 | t-test p = .37 | t-test p = .10 | t-test p = .19 |
| Yes | 12.83 \pm 6.49 | 8.626 \pm 7.82 | 42.76 \pm 15.34 | 43.12 \pm 10.41 |
| No | 14.72 \pm 7.56 | 10.92 \pm 8.59 | 42.87 \pm 16.32 | 43.05 \pm 11.06 |
| Occupation | ANOVA p = .80 | ANOVA p = .004 | ANOVA p = .33 | ANOVA p = .08 |
| Physician | 13.51 \pm 7.51 | 10.27 \pm 9.41 | 42.43 ^a \pm 14.96 | 42.13 \pm 10.89 |
| Nurse | 13.28 \pm 6.98 | 8.50 \pm 7.61 | 42.43 ^b \pm 16.10 | 43.51 \pm 10.40 |
| Other | 13.63 \pm 7.48 | 9.70 \pm 6.95 | 44.05 \pm 15.93 | 43.73 \pm 10.58 |
| City of residence | ANOVA p = .21 | ANOVA p = .003 | ANOVA p = .053 | ANOVA p = .017 |
| Riyadh | 13.52 \pm 7.30 | 10.0 \pm 8.67 | 41.86 \pm 16.29 | 42.54 ^a \pm 10.38 |
| Jeddah | 13.46 \pm 7.37 | 9.14 \pm 7.73 | 42.63 \pm 15.57 | 43.05 \pm 10.56 |
| Makkah | 12.45 \pm 6.71 | 8.70 \pm 8.85 | 45.99 \pm 14.65 | 45.45 ^b \pm 10.51 |
| Eastern province | 14.02 \pm 5.97 | 7.58 \pm 6.25 | 45.45 \pm 15.59 | 44.18 \pm 11.30 |
| Other | 14.81 \pm 7.78 | 9.61 \pm 7.15 | 41.20 \pm 15.06 | 40.93 ^a \pm 11.71 |
| Years of experience | ANOVA p = .21 | ANOVA p = .003 | ANOVA p = .058 | ANOVA p = .057 |
| 5 years or less | 15.28 \pm 6.65 | 6.25 \pm 5.00 | 38.89 \pm 16.42 | 48.96 \pm 8.51 |
| 6-11 years | 13.66 \pm 6.61 | 9.14 \pm 7.13 | 41.13 \pm 15.61 | 43.06 \pm 9.67 |
| 12-17 years | 13.10 \pm 6.97 | 8.88 \pm 7.45 | 43.79 \pm 15.80 | 43.22 \pm 10.79 |
| More than 17 years | 13.98 \pm 8.16 | 10.69 \pm 9.86 | 41.56 \pm 15.34 | 42.32 \pm 10.67 |
| Participate in front-line work | t-test p = .002 | t-test p <0.001 | t-test p = .37 | t-test p = .442 |
| Yes | 13.07 \pm 6.80 | 8.13 \pm 8.62 | 42.50 \pm 15.85 | 43.30 \pm 10.47 |
| No | 14.37 \pm 8.29 | 12.54 \pm 10.53 | 43.59 \pm 15.28 | 42.60 \pm 10.10 |
| Place of work | ANOVA p = .54 | ANOVA p = .92 | ANOVA p = .13 | ANOVA p = .82 |
| Military hospital | 13.11 \pm 7.47 | 9.48 \pm 8.11 | 42.10 \pm 14.70 | 42.61 \pm 10.10 |
| MoH | 13.79 \pm 7.31 | 9.21 \pm 7.80 | 43.88 \pm 15.96 | 43.36 \pm 10.78 |
| Gov't hospital | 13.51 \pm 7.27 | 9.57 \pm 8.55 | 41.09 \pm 16.00 | 43.03 \pm 11.15 |
| Private hospital | 13.32 \pm 6.92 | 9.17 \pm 8.31 | 42.93 \pm 15.86 | 43.34 \pm 10.20 |

Note: ^{a b c d} represent significantly different means based on Tukey's post-hoc test

3.5 Multivariate Analysis of Front-Line Work

To analyze the impact of front-line work on our HCW participants, we used multivariate analysis (factorial ANOVA), including socio-demographic factors that were found statistically significant in bivariate analysis (age, gender, living with children and/or older people, occupation, and years of experience). The results are presented in Table 5.

Both models were found to be statistically significant and to account for 73% variability in depression and 77% variability in anxiety scores. We found age, living with children and/or elderly people, occupation, years of experience, and participation in front-line work to be the only significant predictors of depression (model 1). The four significant predictors of anxiety (model 2) were: age, gender, occupation, years of experience, and participation in front-line work.

Participating in front-line work was significant with regard to depression ($p < .001$) and anxiety ($p < .001$), controlling for other factors. Participating in front-line work increased the depression score on average 8.28 units and anxiety by 5.89 units, with all other factors held constant.

Table 5. Multivariate models

| Model predictors | Model 1: Dependent variable PHQ-9 | Model 2: Dependent variable GAD-7 |
|--|---|---|
| Age | p < .001 | p < .001 |
| 25-30 | 4.59 (0.71) *** | -0.21 (0.59) |
| 31-35 | 4.28 (0.51) *** | 1.19 (0.43) ** |
| 36-40 | 4.13 (0.47) *** | 1.95 (0.40) *** |
| 41-45 | 1.53 (0.46) *** | 1.80 (0.39) *** |
| 46-55 | 2.19 (0.45) *** | 4.60 (0.37) *** |
| 56-60 | reference | reference |
| Gender | p = .24 | p < .001 |
| Female | 0.64 (0.54) | 2.49 (0.46) *** |
| Male | reference | reference |
| Living with children / elderly people | p = .008 | p = .11 |
| Yes | 0.45 (0.17) ** | 0.23 (0.14) |
| No | reference | reference |
| Occupation | p < .001 | p < .001 |
| Physician | -0.56 (0.23) * | 0.99 (0.20) *** |
| Nurse | 0.74 (0.23) *** | 3.96 (0.19) *** |
| Other | reference | reference |
| Years of experience | p < .001 | p < .001 |
| 5 years or less | 1.48 (0.82) | 3.86 (0.69) *** |
| 6-11 years | -3.16 (0.38) *** | 2.26 (0.32) *** |
| 12-17 years | -0.48 (0.25) * | 1.12 (0.21) *** |
| More than 17 years | reference | reference |
| Participate in front-line work | p < .001 | p < .001 |
| Yes | 8.28 (0.26) *** | 5.89 (0.22) *** |
| No | reference | reference |
| Overall model | F(14,1167) = 220.33, p < .001, R² = 0.73 | F(14,1167) = 282.22, p < .001, R² = 0.77 |

Note: reported values are model coefficients (SE); significance * p < .05, ** p < .01, *** p < .001

4.0 DISCUSSION

The well-being of HCWs is essential for providing quality of care. For that reason, the present study investigated the association of risk factors of the psychological outcomes (depression and anxiety) on HCWs' QoL during the COVID-19 pandemic. Notably, we designed the study in order to collate evidence and to obtain a reference against which to compare the scores measured during the pandemic. To the best of our knowledge, several studies have already investigated the pandemic's impact on psychological distress among Saudi HCWs. This study, however, attempts to determine the risk factors associated with the psychological outcomes and their relationship to HCWs' QoL.

Our cross-sectional survey enrolled 1,182 respondents and revealed a high prevalence of anxiety and depression among Saudi HCWs during the COVID-19 pandemic. Severe and moderately severe depression and anxiety were prevalent among HCWs (82%, 81%, respectively), similar to the study performed by (Zaki et al., 2020). On the other hand, this result is relatively high compared to other studies conducted in SA at the beginning of the COVID-19 pandemic (Alzaid et al., 2020; Al-Hanawi et al., 2020). The relatively lower levels of anxiety found in the mentioned previous studies might be because the research was conducted in the early phase of the pandemic, when low mortality rates were documented and the case rate was low, whereas our study was conducted during the Saudi government's nation-wide lockdown (Capuano et al., 2020).

Additionally, the present study reported low scores for QoL, especially in the physical and psychological health domains, which correlated with high levels of depression and anxiety. Since QoL can be negatively affected by psychological health, the negative changes detected through WHOQOL were consistent with reports in the literature showing that QoL scores were low among patients with high depression scale scores. The literature has other studies with the same results (Araç, Dönmezgil, 2020, Asante, Li, Liao, Huang, Hao, 2019). Likewise, QoL is severely affected in all cases of psychiatric or physical disorders, and this is reflected in the scores on scales that measure QoL (Araç, Dönmezgil, 2020).

Furthermore, in the present work, particular risk factors were more affected than others. Our study reports that age group, being female, and living with children and/or older people were associated with experiencing severe depression and anxiety. The high incidence of depression and anxiety among females may be explained by their concerns as mothers, wives, and caregivers about infecting their family members, including children, partners, or older people who live with them. This result supports similar evidence compiled by Araç et al., 2020. Other studies in SA, China and Italy have found that females are more likely to be depressed and anxious than males and relate the gender differences to the hormonal response to stress, as women's hormones increase both stress and anxiety responses (Al-Hanawi et al., 2020; Alzaid et al., 2020 & Moccia et al., 2020).

With regard to the living with children and/or elderly people factor, most of the HCW participants worried about the risk of infecting their family members and loved ones, which increased the chance of psychological health outcomes. Moreover, as preventive measures, many of the HCWs were separated from their family members, especially those who have chronic diseases, to reduce the risk of disease transmission (Moccia et al., 2020; Qiu, Shen, Zhao, Wang, Xie, Xu, 2020; Que et al. Fet, 2020).

We found that nurse respondents and those who have 5 years of experience or less had significantly higher mean scores of depression and anxiety. This might be attributed to their close contact with infected patients, which made them at high-risk for exposure to infectious diseases, especially with COVID-19. They also spend a much longer time in patient care than other health professionals, particularly those who have fewer years' experience and capability to overcome and deal with such situations. Most HCWs have not been exposed to such a rare medical situation as the COVID-19 pandemic in recent decades. A similar finding was observed in Chinese studies, which reported that nurses, compared with other health professionals, experienced more unfavorable psychological outcomes (Abolfotouh, Almutairi, Banimustafa, Hussein, 2020; Lai et al., 2020; Khanal, Devkota, Dahal, Paudel, Joshi, 2020). In contrast, with regard to work experience, a study by Khanal et al. (2020) found that those who had less than 5 years' work experience had lower chances of having mental health symptoms compared with those with 5 or more years' experience. Lai et al.'s (2020) study supports our findings, mentioning that most of the nurses were junior, which means most of them had fewer years of work experience.

Overall, we found that performing front-line work was the most important independent risk factor for the psychological outcomes that may affect QoL in all aspects. It is noteworthy that, amongst the health professionals, front-line workers suffer the most from severe depression and anxiety, which is parallel with findings from the literature (Qiu, Shen, Zhao, Wang, Xie, Xu, 2020, Que et al., 2020; Ersoy, 2020).

The results of this study revealed that the QoL among the HCWs who participated in our study was low. This indicates that impaired QoL is severally associated with high anxiety levels and severe depression outcomes. Factors that led to low QoL in the physical health domain scale were age group, gender, living with children and/or older people, and working on the front lines. Additionally, the psychological health domain-associated parameters are age group, gender, occupation, city of residence, years of experience, and performing front-line work. Conversely, the social relationship domain has no factors associated with QoL, while the city of residence factor only plays a role with regard to the environmental domain.

Given the crucial findings of this study, more research is needed to further examine how the COVID-19 pandemic and front-line work affect the mental and physical well-being of HCWs. Specific characteristics of HCWs may act as protective or risk factors when it comes to depression and quality of life. Therefore, targeted interventions could mitigate the negative effects of front-line work and help to maintain the optimal psychological and physical health of medical professionals.

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