





Psychological effect of COVID-19 pandemic on healthcare professionals of Yemen and coping strategies

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ABSTRACT

COVID-19 pandemic has triggered psychological stress such as anxiety and depression among people around the globe. Due to the nature of the job, healthcare professionals (HCPs) are at high risk of infection and are facing social stigma as well. This research was conducted with the objective to evaluate the psychological influence of the COVID-19 pandemic among HCPs in Yemen and the coping strategies adopted thereof. A web-based, as well as face-to-face cross-sectional study was carried out from July to December 2021 among HCPs of Yemen. The generalized anxiety disorder (GAD-7), patient health questionnaire (PHQ-9), and Brief-COPE scales were applied for the evaluation of anxiety, depression, and coping strategies. A total of 197 HCPs participated in the study where 28.4% and 43.1% had anxiety and depression respectively. The prevalence of both anxiety and depression in the majority were found of the minimal to none and mild categories (71.6% vs. 56.9% respectively). The respondents who had received training on COVID-19 had statistically significant lower GAD-7 scores than those who did not (6.32 vs. 8.02 respectively). A significant statistical difference was observed between physicians versus nurses regarding depression based on the working area ($p < 0.05$). The physician and pharmacist had a significant positive association with brief COPE scores at the 50th centile compared to other HCPs. The female respondents had statistically significant higher mean Brief COPE scores than male respondents (78.11 vs. 69.50 respectively). Our findings illustrate the requirement for efficient policies through administrative, clinical, and welfare perspectives from the regulatory body in preparedness and preventive measures towards such a pandemic that aids HCPs to provide service in a stress-free condition and assurance of a better healthcare system..

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1. Introduction


The COVID-19 pandemic has become a serious public health threat worldwide. The World Health Organization (WHO), on 30 January 2020, announced the occurrence of the novel coronavirus and declared a Public Health Emergency of International Concern (PHEIC) under the International Health Regulations (IHR) [1]. Later, it was declared a pandemic on 11 March 2020 [2].

In such a critical situation, life has been changed due to the restrictions of movement and social contacts. In fact, healthcare professionals (HCPs) wholeheartedly continued providing services with a high risk of getting infected with COVID-19 in such a grave situation. Therefore, HCPs are regarded as one of the most susceptible types of professionals to get psychological

problems and mental catastrophes amid the COVID-19 pandemic [3]. Different studies are consistently showing that HCPs experience more stress related to work as compared to the general public [4].

As a standard procedure of containment strategy in such pandemics, a lockdown approach is usually imposed to bound the disease spread and lessen new potential cases by maintaining social distancing [5]. The HCPs, by the nature of their profession, are left exposed to deal with the health-related issues that arise due to such situations. HCPs experience unexpectedly lengthy office hours as they have to deal with a load of cases due to such a pandemic with the available resources and infrastructure that may not be up to the standard in such an emergency [6].

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They often face physical distress and from time-to-time difficulties in breathing while wearing personal protective equipment (PPE), which is mandatory for safety measures [7].

Because little is known about COVID-19, and subsequently, without proven therapy, many HCPs are unrehearsed to perform duties [8]. The fear of autoinoculation, social stigma, and the risk of transmitting the disease to family members and friends are adding extra burdens to them that definitely impact their mental health [8–10].

Thus, it is particularly significant to assess the HCPs who are at greater risk of exhaustion and are probable to get suffered from anxiety, depression, and stress in such a pandemic. It is also equally essential to recognize and manage the responsible factors for such mental stress. The mental health status of HCPs in Yemen and their coping strategies have not yet been fully studied. Therefore, this study is conducted with the objectives to assess the anxiety and depression faced by Yemeni HCPs and determine the coping strategies implemented amid the COVID-19 pandemic.

2. Materials and methods

2.1. Study design and participants

A cross-sectional survey was carried out via Google form as well as a self-administered questionnaire among healthcare professionals face-to-face for those who were not reachable with a web-based survey in Yemen from July to December 2021 (**Supplementary files 1a and 1b**). A total of 197 participants were selected by convenience sampling from different provinces all over Yemen.

The survey included questions regarding psychological screening, bothering issues faced by the health professionals, assessment of sources of distress, coping strategies, or behavior. The questionnaire was developed and distributed in English and Arabic language. The questionnaire was validated by two experts in the field of infectious diseases and community medicine and was pilot tested among five participants.

2.2. Study site

The study was conducted in Yemen which is a country with a low-income economy and the poverty and the decade-long civil war have seriously affected the country. Many healthcare substructures are vulnerable and the basic healthcare facility is unobtainable to many people. Moreover, the shortage of medicines and medical equipment, the fragile healthcare status, and the limited healthcare resources are the challenging factors for healthcare delivery amid the COVID-19 pandemic in Yemen [11].

2.3. Inclusion/Exclusion criteria

All the HCPs comprising physicians, pharmacists, nurses, and others who provided care at the medical center were included in this study. The professionals who refused to participate, from a non-healthcare profession, and those who cannot read and write were excluded from the study.

2.4. Study questionnaire

The study questionnaire was categorized into four sections. All the questions were in understandable language and the participant was required to answer the questions on their own.

The first section of the questionnaires was about the demographics of participants that provided personal and organizational information about the health employee.

The second section of the questionnaire comprised a total of seven questions linked to the generalized anxiety scale (GAD-7) for anxiety assessment [12]. It had seven items with a score of 0 (not at all) to 3 (nearly every day) which provided a 0 to 21 score. The total score was classified into four severity groups, namely; minimal to none (≤ 4), mild (5–9), moderate (10–14), and severe (≥ 15). The anxiety was diagnosed if $GAD \geq 10$. The Cronbach's alpha value obtained was 0.81.

The third section consisted of a total of nine questions related to the patient health questionnaire (PHQ-9) to assess depression [13]. It had nine items with a score of 0 (not at all) to 3 (nearly every day) which provided a 0–27 score. The total score was divided into five severity groups, namely; minimal to none (≤ 4), mild (5–9), moderate (10–14), moderately severe (15–19), and severe (≥ 20). In the current study, the participants' attaining scores ≥ 10 on GAD-7 and PHQ-9 were regarded as anxiety and depression, respectively. The depression was diagnosed if $PHQ \geq 10$. The Cronbach's alpha value obtained was 0.83.

The sources of distress from the current pandemic were measured with a 14-item scale designed from an earlier study on anxiety among university students amid the SARS outbreak [14]. It was based on a two-point Likert scale. The items were categorized under 4 scales such as the health of the self, family, and loved ones (possible score: 3 to 6); transmission (possible score: 3 to 6); containment (possible score: 3 to 6); measures taken by authority (possible score: 3 to 6); and effects on daily activities (possible score: 3 to 6).

The fourth section was all about 28-questions of the Brief-COPE scale [15]. It aimed to identify the coping strategies implemented amid the COVID-19 pandemic. It consisted of four response choices ranging from the importance of doing activities to cope with the outbreak; (a) not doing this at all, (b) a little bit, (c) moderate amount, (d) doing this a lot. The adaptive coping

strategies contain 16 items (16–64) and the maladaptive coping strategies contain 12 items (12–48). That scale was developed to discover the 14 coping methods: self-distraction, active coping, denial, and substance use, use of emotional support, venting, behavioral disengagement, acceptance, positive reframing, planning, humor, use of instrumental support, religion, and self-blame. Likely scores for every subscale were in a range of 2 to 8, where higher scores indicated propensity to apply the analogous coping style. The Cronbach's alpha value obtained was 0.93.

2.5. Ethical approval

The study has been reviewed and approved by The Human Ethical Committee, University of the Punjab, Lahore (Reg. No. D/333/IIM). The ethics approval was also obtained from the Ministry Public Health and Population, Republic of Yemen (Reg. No. D/664). The ethical and professional considerations were followed throughout the study to keep the data and investigational information strictly confidential.

2.6. Statistical analysis

The data were coded, entered into the excel 2019 v16.0 (Microsoft, WA, USA), and exported to SPSS (IBM, version 22) for further analysis. Descriptive statistics were presented in the form of frequency, percentage (%), medians (min-max), means, and standard deviations (SD). The normality using the Kolmogorov-Smirnov and Shapiro-Wilk tests, and statistical interactions were assessed. The data followed an abnormal distribution; so, non-parametric tests (Mann Whitney U test and Kruskal Wallis H test) were applied to assess the association of continuous variables (anxiety, depression, and coping skills score) with socio-demographic factors. Post hoc analysis with Bonferroni adjustments was performed for findings that were significant in the Kruskal Wallis H test to assess the group difference for each continuous variable. The chi-square test and binary logistics regressions were applied to estimate the relationship between anxiety status and depression status with the socio-demographic factors of the respondents. The quantile regression was used to estimate the relationship of brief COPE score over the three (10th, 50th, and 90th) percentiles with the independent socio-demographic variables. The P-value < 0.05 was taken for statistical significance.

3. Results

There was a total of 197 respondents ($n = 197$) in our study. The socio-demographic characteristics of respondents are depicted in Table 1. The majority of the participants were of age between 20–29 years (n

$= 111$) followed by 30–39 years ($n = 44$) and ≥ 40 ($n = 42$). Most of the participants were male ($n = 135$) and almost half of the respondents were physicians ($n = 83$) followed by other health professionals ($n = 41$), nurses ($n = 37$), and pharmacists ($n = 36$). Approximately 21% of total HCPs were working in COVID-19 isolation wards and around 11% were performing duties in the COVID-19 intensive care unit (ICU). Meanwhile, 47.7% of respondents were working in quarantines, and the rest of the 19.8% were in other healthcare areas.

The median anxiety (GAD-7), depression (PHQ-9), and coping (Brief COPE) scores were 6, 8, and 75 respectively. The mean anxiety, depression, and coping scores were 7.03 ± 5.29 , 8.53 ± 6.52 , and 72.21 ± 18.17 respectively. Based on the 10 points cut-offs on GAD-7 and PHQ-9, anxiety and depression were present in 28.4% and 43.1% respectively. Similarly, the majority of the participants were in minimal to none (37.6% vs. 32.5%) and mild (34.0% vs. 24.5%) groups of anxiety and depression (Table 2).

The female respondents had statistically significant higher mean Brief COPE scores than male respondents (78.11 vs. 69.50 respectively). The respondents who had received training on COVID-19 had statistically significant lower GAD-7 scores than those who did not (6.32 vs. 8.02 respectively). Similarly, the age groups, occupations, and experience had a significant relationship with the Brief COPE score. Additionally, the occupations had a significant relationship with GAD-7 and PHQ-9 scores.

Post hoc tests showed that the age group 20–29 years had statistically significant differences with the age group ≥ 40 years in terms of Brief COPE score (aP-value: 0.003). The physicians and nurses had statistically significant differences (aP-value < 0.05) in terms of both anxiety and depression scores. In terms of coping ability (Brief COPE scale), physicians and others (aP-value: 0.012), pharmacists and others (aP-value: 0.002), and nurses and pharmacists (aP-value: 0.024) had statistically significant differences. Those with experience of less than 5 years had significantly higher Brief cope scores than those with an experience of more than 5 years (aP-value: < 0.001). The HCPs working in ICU had a significantly higher mean value of Brief COPE score than those working in the quarantine area (aP-value: 0.029) (Table 3).

None of the socio-demographic factors had a statistically significant association with anxiety status (≥ 10 GAD-7) (Table 4).

The nurse respondents had significantly more than two folds higher odds of depression status (OR: 2.46, 95% CI 1.11–5.44, P-value 0.026) than physician respondents. The rest of the socio-demographic factors did not have a statistically significant association with depression status (Table 5).

Table 1. Socio-demographic characteristics of the respondents of Yemen ($n = 197$).

Variables	Frequency	Percentages (%)
Age (years)		
20–29	111	56.3
30–39	44	22.3
≥ 40	42	21.3
Gender		
Female	62	31.5
Male	135	68.5
Occupation		
Physician	83	42.1
Nurse	37	18.8
Pharmacist	36	18.3
Other HCPs ¹	41	20.8
Experience		
< 5	110	55.8
5–10	31	15.7
> 10	56	28.4
Province		
Aden	44	22.3
Hadramaut	52	26.4
Taiza	59	29.9
Aldhaleh	9	4.6
Sanaa	4	2.0
Ibb	8	4.1
Abyan	2	1.0
Hajjah	1	0.5
Shabwah	7	3.6
Lahij	11	5.6
Working area (Placement)		
Quarantine	94	47.7
Isolation	42	21.3
ICU	22	11.2
Other ²	39	19.8
Training of COVID-19		
No	81	41.1
Yes	116	58.9

¹Others HCPs: Office assistants.

²Other working area: In-patient wards, out-patient clinics.

From the quantile regression, it was observed that the age in years (20–29 and 30–39 years) was positively associated and significant at the 10th centile of the Brief COPE score. The female respondents had a significantly higher positive association with brief COPE scores at the 10th and 50th centile. Statistically significant differences were also observed between physicians and other HCPs, and pharmacists and other HCPs regarding coping abilities at the 50th centile of the brief COPE score. Those with experience less than 5 years, and 5–10 years

had a significant positive association at the 50th and 90th centile of the Brief COPE score respectively than those with an experience of more than 10 years. The HCPs working in isolation had a significant negative association at the 10th and 90th centile of Brief COPE score than those HCPs working in other areas of the hospital/clinics. Those respondents without training in COVID-19 had a significant positive association with a brief COPE score at the 10th centile (Table 6).

The fear of the health of self and family members as a source of distress was found higher in the provinces Sanaa (4.75 ± 0.96), Lahij (4.57 ± 1.27), and Abyan (4.50 ± 2.12) as compared to other provinces. The measures taken by the authority were highest in the province Abyan (4.50 ± 2.12) and Lahij (4.14 ± 1.46) (Supplementary file 2).

The religious coping strategy was reported highest in province Aldhaleh (3.33 ± 0.87) followed by acceptance in province Lahij (3.14 ± 0.69), and humor in province Abyan and Lahij (3.00 ± 1.41 , 3.00 ± 0.82), whereas it was the lowest for behavioral disengagement (0.00 ± 0.00) in province Abyan (Supplementary file 3).

4. Discussion

From the various studies regarding mental health issues of people around the globe amid such a pandemic, there is no doubt that HCPs are experiencing unparalleled extents of COVID-19-related psychological stress across the personal and professional spheres. This is why, this study was undertaken to interpret the quality assessment of psychological exhaustion of COVID-19 pandemic in Yemeni HCPs as well as their behavior during such a pandemic [16–20].

A total of 197 HCPs from different provinces of the country participated in this study where a male-to-female ratio was found to be 2.18 with 68.5% male HCPs. Such findings of this study are in line with the study conducted in Nepal, where 54.2% of male participants were included [21]. Among the

Table 2. Measures of anxiety using the GAD-7, depression using PHQ9 and coping strategies using brief COPE tool ($n = 197$).

Effect of COVID-19 on HCPs	Measures	
	Frequency (%)	Mean \pm SD [Median (Min-Max)]
Anxiety		
Minimal to none (≤ 4)	74 (37.6)	1.76 \pm 1.52 [2 (0–4)]
Mild (5–9)	67 (34.0)	7.16 \pm 1.43 [7 (5–9)]
Moderate (10–14)	38 (19.3)	11.95 \pm 1.34 [12 (10–14)]
Severe (≥ 15)	18 (9.1)	17.78 \pm 1.80 [18 (15–21)]
Depression		
Minimal to none (≤ 4)	64 (32.5)	1.45 \pm 1.53 [1 (0–4)]
Mild (5–9)	48 (24.4)	6.96 \pm 1.37 [7 (5–9)]
Moderate (10–14)	47 (23.9)	11.85 \pm 1.59 [12 (10–14)]
Moderately severe (15–19)	26 (13.2)	16.27 \pm 1.34 [16 (15–19)]
Severe (≥ 20)	12 (6.1)	22.83 \pm 2.73 [22 (20–27)]
Overall scores	Mean \pm SD	Median (Min-Max)
Anxiety	7.03 \pm 5.29	6 (0–21)
Depression	8.53 \pm 6.52	8 (0–27)
Coping skills using brief COPE	72.21 \pm 18.17	75 (28–106)

Table 3. Measures of psychological effects of COVID-19 pandemic on HCPs of Yemen ($n = 197$).

Variables	GAD-7 Mean \pm SD	P-value	PHQ-9 Mean \pm SD	P-value	Brief COPE Mean \pm SD	P-value
Age (years)		0.611		0.706		0.004*
20–29	6.77 \pm 5.34		8.73	8.73 \pm 6.57	75.17 \pm 18.51	
30–39	7.50 \pm 4.93		8.80 \pm 6.81		72.05 \pm 15.37	
≥ 40	7.21 \pm 5.57		7.74 \pm 6.17		64.55 \pm 18.11	
Gender¹		0.499		0.133		0.002*
Female	7.37 \pm 4.44		9.56 \pm 6.46		78.11 \pm 16.15	
Male	6.87 \pm 5.64		8.06 \pm 6.52		69.50 \pm 18.46	
Occupations		0.036*		0.036*		<0.001*
Physicians	7.02 \pm 5.30		7.40 \pm 6.12		74.95 \pm 18.28	
Nurses	7.38 \pm 4.54		11.22 \pm 6.98		67.78 \pm 15.96	
Pharmacists	6.42 \pm 5.36		7.69 \pm 5.39		78.97 \pm 18.16	
Others	7.24 \pm 5.94		9.15 \pm 7.21		64.71 \pm 16.80	
Experience		0.426		0.426		0.001*
<5	6.71 \pm 5.30		8.16 \pm 6.22		76.00 \pm 18.32	
5–10	7.45 \pm 5.30		9.97 \pm 7.11		72.19 \pm 15.34	
>10	7.41 \pm 5.31		8.46 \pm 6.78		64.77 \pm 17.26	
Working area		0.695		0.695		0.045*
Quarantine	7.02 \pm 4.89		8.81 \pm 6.75		69.80 \pm 17.90	
Isolation	7.19 \pm 5.72		8.67 \pm 6.96		72.50 \pm 17.93	
ICUs	7.73 \pm 5.78		9.09 \pm 6.14		81.50 \pm 17.25	
Others	6.46 \pm 5.57		7.41 \pm 5.75		72.46 \pm 18.51	
Training of COVID-19		0.024*		0.106		0.489
No	8.04 \pm 5.12		9.43 \pm 6.06		73.28 \pm 16.84	
Yes	6.32 \pm 5.31		7.91 \pm 6.78		71.46 \pm 19.08	

¹For gender and training of COVID-19 (involving two groups), we used Mann-Whitney U test; Kruskal-Wallis H test was used for the rest of the variables (involving 3 or more groups).

*Significant at P-value<0.05.

Table 4. Association of socio-demographic factors of the respondents with their anxiety status during COVID-19 pandemic ($n = 197$).

Variables	Anxiety (GAD-7)		Binary logistic regression		
	No (%)	Yes (%)	OR	95% CI	P-value
Age (years)					0.393 ¹
20–29	81 (73.0)	30 (27.0)	1		
30–39	28 (63.6)	16 (36.4)	1.54	0.73–3.24	0.253
≥ 40	32 (76.2)	10 (23.8)	0.84	0.37–1.92	0.686
Gender					0.734 ¹
Female	43 (69.4)	19 (30.6)	1		
Male	98 (72.6)	37 (27.4)	0.85	0.44–1.65	0.640
Occupations					0.730 ¹
Physician	59 (71.1)	24 (28.9)	1		
Nurse	29 (78.4)	8 (21.6)	0.68	0.27–1.69	0.406
Pharmacists	24 (66.7)	12 (33.3)	1.23	0.53–2.84	0.630
Others	29 (70.7)	12 (29.3)	1.02	0.45–2.32	0.968
Experience					0.950 ¹
<5	78 (70.9)	32 (29.1)	1		
5–10	22 (71.0)	9 (29.0)	0.99	0.41–2.39	0.995
>10	41 (73.2)	15 (26.8)	0.89	0.43–1.83	0.755
Working area					0.557 ¹
Quarantine	70 (74.5)	24 (25.5)	1		
Isolation	30 (71.4)	12 (28.6)	1.17	0.52–2.63	0.711
ICU	13 (59.1)	9 (40.9)	2.02	0.77–5.32	0.155
Others	28 (71.8)	11 (28.2)	1.15	0.49–2.65	0.750
Training of COVID-19					0.055 ¹
No	52 (64.2)	29 (35.8)	1		
Yes	89 (76.7)	27 (23.3)	0.54	0.29–1.02	0.057

¹P-value from chi-square tests.

respondents, physicians were the majority HCPs whereas the nurses were found more vulnerable to anxiety and depression. In gender-wise analysis, female HCPs were reported less in number as well as more depressed and anxious as compared to their male counterparts. This finding is in agreement with the outcome of a study conducted in Saudi Arabia by Al-Hanawi et al. (2020) [22]. The cultural perspective and the more concerns towards

taking care of family members might be the contributing factors in this regard. More exposure to the patients within the ward and workload are the leading cause of susceptibility to psychological stress among nurses [23]. Out of 22 provinces, the maximum number of HCPs participated from province Taiz (29.95%) as it is the largely populated province of Yemen. Though it was a nationwide survey, no HCPs participated from 11 provinces

Table 5. Association of socio-demographic factors of the respondents with their depression status during COVID-19 pandemic ($n = 197$).

Variables	Depression (PHQ-9)		Binary logistic regression		
	No (%)	Yes (%)	OR	95% CI	P-value
Age (years)					0.749 ¹
20–29	62 (55.9)	49 (44.1)	1		
30–39	24 (54.5)	20 (45.5)	1.05	0.52–2.13	0.882
≥40	26 (61.9)	16 (38.1)	0.78	0.38–1.61	0.500
Gender					0.104 ¹
Female	30 (48.4)	32 (51.6)	1		
Male	82 (60.7)	53 (39.3)	0.61	0.33–1.11	0.105
Occupations					0.141 ¹
Physician	52 (62.7)	31 (37.3)	1		
Nurse	15 (40.5)	22 (59.5)	2.46	1.11–5.44	0.026
Pharmacists	20 (55.6)	16 (44.4)	1.34	0.61–2.97	0.468
Others	25 (61.0)	16 (39.0)	1.07	0.49–2.32	0.856
Experience					0.187 ¹
<5	66 (60.0)	44 (40.0)	1		
5–10	13 (41.9)	18 (58.1)	2.08	0.93–4.66	0.077
>10	33 (58.9)	23 (41.1)	1.05	0.54–2.01	0.894
Working area					0.281 ¹
Quarantine	53 (56.4)	41 (43.6)	1		
Isolation	24 (57.1)	18 (42.9)	0.97	0.47–2.02	0.934
ICU	9 (40.9)	13 (59.1)	1.87	0.73–4.79	0.194
Others	26 (66.7)	13 (33.3)	0.65	0.29–1.41	0.273
Training of COVID-19					0.077 ¹
No	40 (49.4)	41 (50.6)	1		
Yes	72 (62.1)	44 (37.9)	0.59	0.33–1.06	0.078

¹P-value from chi-square tests.**Table 6.** Quantile regression estimation for the different quantiles of the respondents' brief COPE score ($n = 197$).

	0.10	0.50	0.90
Parameters			
Intercept	26	51	93.50
Age (years)			
20–29	17.75* (9.91, 25.59)	2.00 (-6.74, 10.74)	-1.50 (-12.36, 9.36)
30–39	21.25* (13.83, 28.67)	5.00 (-3.26, 13.26)	-6.00 (-16.27, 4.27)
≥40	Ref.	Ref.	Ref.
Gender			
Female	16.75* (11.98, 21.52)	13.00* (7.69, 18.31)	4.00 (-2.60, 10.60)
Male	Ref.	Ref.	Ref.
Occupation			
Physician	5.25 (-0.95, 11.45)	8.00* (1.09, 14.91)	8.00 (-0.59, 16.59)
Nurse	-6.50 (-13.57, 0.57)	3.00 (-4.87, 10.87)	-4.00 (-13.78, 5.78)
Pharmacist	5.75 (-2.49, 13.99)	13.00* (3.81, 22.19)	5.00 (-6.42, 16.42)
Others HCPs	Ref.	Ref.	Ref.
Experience			
<5	-2.50 (-9.86, 4.86)	13.00* (4.80, 21.20)	7.50 (-2.69, 17.69)
5–10	2.75 (-4.87, 10.37)	6.00 (-2.49, 14.49)	11.00* (0.45, 21.55)
>10	Ref.	Ref.	Ref.
Working area			
Quarantine	2.50 (-3.37, 8.37)	2.00 (-4.54, 8.54)	-9.50* (-17.63, -1.37)
Isolation	-7.50* (-14.52, -0.48)	-1.00 (-8.82, 6.82)	-13.50* (-23.22, -3.78)
ICU	13.50 (4.12, 22.88)	6.00 (-4.45, 16.45)	-2.50 (-15.49, 10.49)
Others	Ref.	Ref.	Ref.
Training of COVID-19			
No	6.50* (2.11, 10.89)	-1.00 (-5.89, 3.89)	-2.00 (-8.07, 4.07)
Yes	Ref.	Ref.	Ref.

*Significant P-value<0.05.

because of inaccessibility in getting contacted due to COVID-19 pandemic and civil war effects.

Our finding of anxiety and depression in both gender were found to be of minimal to none and mild category in the majority which is in line with other previous studies conducted in different Arab and Muslim countries around the globe [24–28]. Since Yemen is a religious country, HCPs have a positive religious attitude that may provide mental support to cope with the pandemic. Also, several communicable diseases such as cholera, diarrhea, dengue, and measles have massively reemerged as a result of weapons used during the years of war according to the geospatial patterns of the infected cases. Therefore, HCPs might have been familiar to work under such stressful conditions. The majority of HCPs (59%) were already trained regarding COVID-19 management in our study. This finding contrasts with the previous result of Yemen where a majority of the respondents had never attended such kind of training [29]. Such finding possibly highlights the need to direct more attention toward developing educational courses and programmers related to COVID-19 [30]. Regarding the difference in depression with respect to age, experience, and working areas; our result did not reveal any significance, meanwhile, a significant statistical difference in anxiety and depression scores was reported in occupation-wise comparison between physicians versus nurses. This may be due to the more knowledge of the intensive effect of COVID-19 by the physician as compared to the nurse which was previously revealed by a study in Yemen [29].

Our finding did not show any statistically significant association of the anxiety status with the socio-demographic factors of HCPs, which contrasts with the previous studies in China that had revealed almost twice the risk of anxiety in different working areas [30]. Some studies have compared the mental disorders experienced by HCPs in areas where the pandemic was widely experienced compared to other regions. Anxiety, fear, and depression were much higher in HCPs in those areas because the HCPs working there are always more susceptible to infection [30].

A stressor such as health of self/family/loved ones, transmission, containment, a measure taken by the authority, and effects on daily activities was found to vary from province to province. The highest measures taken by the authority were in provinces Abyan and Lahij meanwhile the status of the other remaining provinces was poor. This may be attributed to the poor healthcare facilities in Yemen to tackle such a pandemic, where majorities of healthcare centers are not provided with the proper preventive facilities [31].

Our finding highlighted the importance to provide adequate psychological support to HCPs, as well as implementing preventive measures to control the

stressor among HCPs. Such findings correlate with the findings from Si et al. (2020) in China [4]. The general preparedness and capability to tackle COVID-19 were reported as very poor by the majority of HCPs in our study, which corresponds with the various studies conducted in Yemen by different researchers that demonstrated the fragile healthcare system of Yemen and difficulty in coping with the scenario by HCPs working therein [31–33].

Comparing coping behaviors in Yemeni HCPs towards COVID-19, a statistically significant difference was notified between the level of performance of participants with their occupation and level of experience which correlates with the previous finding in Yemen where occupation-wise differences among HCPs from knowledge to preventive practices were reported [29]. The younger individuals had statistically significant differences with the older ones in terms of Brief COPE scores which is contrary to the findings of a study conducted in Japan [34]. Eisenberg et al. (2012) described two major elements of the coping strategies, namely 'avoidant coping' and 'approach coping' [35]. Avoidant coping was designated by the subscales of denial, behavioral disengagement, substance use, self-blame, venting, and self-distraction. Besides other subscales, religion and humor were regarded as adaptive coping. Similarly, approach coping was described by the subscales of active coping, positive reframing, acceptance, planning, informational support, and seeking emotional. Based on the avoidant, approach, and adaptive coping strategies; we assessed the type of wellness resources as a coping strategy in such COVID-19 adversity. We found adaptive coping strategies based on faith-based religion were practiced by the majority of the respondents, which is in contrast with a study conducted in New York by Shechter which reported physical activities as the most common coping strategy [36]. However, the findings are in line with the results from other different studies conducted in Pakistan and Malaysia [24,37,38]. Higher coping skills were observed in HCPs with lower experiences. The reason might be due to unawareness of potential consequences that could happen or the higher proportion of younger aged respondents in this study. Those working in quarantine and isolation demonstrated lower coping skills than those working in other areas of hospitals/clinics for which fear of COVID-19 due to regular contact with the COVID patients and loss of hope may contribute as reasons. The training on COVID-19 had no effect on the coping skills of HCPs in this study which demands the effective training, frequent monitoring, and provision of welfare to the HCPs from governing bodies. Coping skills were found higher in pharmacists followed by physicians than other professionals. The results from a study conducted in Pakistan among HCPs can be comparable to this study where

nurses demonstrated higher scores on coping strategies on different parameters than other HCPs [24].

HCPs are highly exposed professionals in such pandemics and are prone to psychological stress. It is very difficult for countries with low-income economies and affected by ongoing civil wars like Yemen to manage the different types of disasters at a time. The findings from the current study demand the formation and implementation of effective plans and policies, the conduction of regular training and exercises, and the strengthening of emergency preparedness services to contain such pandemics from policy-making bodies. Also, it imposes on addressing the proper welfare aspects of HCPs so that they can utilize the time and knowledge appropriately for the service of mankind for a better health-care system which has a direct impact on nation-building.

4.1. Limitations

There were certain limitations in our study. Firstly, very few HCPs as respondents were available from some provinces due to the adverse scenario caused by COVID-19 as well as by the internal catastrophe of conflict. Secondly, the inherent selection bias cannot be ignored due to the exploratory kind of study. However, our finding has investigated the psychological impact, source of stress, and coping strategies of HCPs on COVID-19 from different healthcare institutions in various provinces of Yemen.

5. Conclusion

This study investigated the level of anxiety, stress, depression, and the coping behavior thereof in HCPs in Yemen. COVID-19 pandemic has caused a mild impact on the mental health status of Yemeni HCPs. The most frequently adopted coping strategies in most provinces in Yemen were faith-based religion. Our findings indicate the requirement of adequate plans and policies from administrative to clinical and welfare viewpoints in preparedness and preventive behaviors from the regulatory body that alleviates the psychological stress of such professionals for the efficient provision of better healthcare services throughout the nation.

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Authors' contribution

NMAM: Conceptualization, Methodology, Data collection, Data curation, and Writing – Original draft preparation. **SK:** Conceptualization, Methodology, Formal analysis, and

Writing- Reviewing and editing. **MS:** Design, Resources, Supervision, and Writing-Reviewing and editing. **MAAMA:** Data collection, Visualization, and Writing- original draft preparation. **MMSK:** Data collection, Visualization, and Writing- original draft preparation. **PPP and MAJA:** Data curation, Formal analysis, and Validation. **GKY:** Data curation, Formal analysis, and Writing-Reviewing and editing.

Availability of data and materials

The data sets generated and/or analyzed during the current study are available from the corresponding author upon reasonable request.


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