

# Knowledge, attitudes, anxiety, and preventive behaviours towards COVID-19 among health care providers in Yemen: an online cross-sectional survey

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## Research article

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# Abstract

**Background:** The current rapid prevalence of the novel coronavirus (COVID-19) pandemic over the world is associated with a considerable level of scared, anxiety, and panic among the public, in particular, healthcare providers (HCPs) as the most vulnerable group at risk for SARS-CoV-2 infection. To protect and enhance HCPs' capacity to carry out their duties in responding to COVID-19, healthcare authorities should keep them away from stress and anxiety and improve their knowledge, attitude, and practice towards COVID-19 to ensure their compliance with infection control precautions. Therefore, this study aimed to explore knowledge, attitudes, anxiety, and preventive behaviours among Yemeni HCPs towards COVID-19.

**Methods:** A descriptive, web-based-cross-sectional study was conducted among 1231 Yemeni HCPs. The COVID-19 related questionnaire was designed using Google forms. The responses were coded and analyzed using the software package (IBMSPPSS), version 22.0. Descriptive statistics and Pearson's correlation coefficient test were also used in this study. A *p*-value of < 0.05 levels with a 95% confidence interval was considered as statistically significant. The data collection started on 22<sup>nd</sup> April 2020, at 6 PM and closed on 26<sup>th</sup> April 2020 at 11 AM.

**Results:** The results indicated that out of 1231 of the HCPs participating in this study, 61.6% were male and 67% were in the age group of 20 to 30 years old with a mean of 29.29±6.75. Most of them (86%) had a bachelor's degree or above and had 10 years of working experience or less (88.1%). Besides, although 57.1% of the respondents obtained their information via social and news media and 60.0% had never attended lectures/discussions about COVID-19, the results revealed that the majority of respondents had an adequate level of knowledge, an optimistic attitude, moderate anxiety, and high performance in preventive behaviours (69.8%, 85.10%, 51.0% & 87.70%, respectively) toward the COVID-19 pandemic.

**Conclusion:** Although the Yemeni HCPs exhibited an adequate level of knowledge, an optimistic attitude, moderate anxiety, and high performance in preventive behaviours toward the COVID-19 pandemic, the results showed gaps in some themes, particularly in their knowledge and attitude on the COVID-19 pandemic which needs to be updated or refreshed.

## Background

On 12 December 2019, a cluster of pneumonia cases of unknown causes was reported in Wuhan, China [1]. Among the initial 41 cases were vendors and dealers working in the Huanan Seafood Market [2]. The World Health Organization (WHO) and the Chinese authorities identified the causative agent as a novel

coronavirus (SARS-CoV-2). The emerging disease was named coronavirus disease 2019 (COVID-19) [3]. At first, the SARS-CoV-2 has spread within China and then dramatically spread to other countries [4]. On March 11, 2020, the WHO has declared the outbreak of COVID-19 as a worldwide pandemic [5]. As of 12 September 2020, the virus-infected over 28,329,790 and caused 911,877 deaths in about 216 countries, areas, and territories around the world [6].

In Yemen, the actual battle to coping COVID-19 has started on 10<sup>th</sup> April 2020, as the first confirmed case was announced in Ash Shihr, the Hadramout province southern Yemen. On 29<sup>th</sup> April 2020, five more confirmed cases were registered in Aden city, the temporary capital of Yemen. Thereafter, the cases have started increased day by day and other cities were included. As of 12 September 2020, there have been 2,011 confirmed cases of COVID-19 in the Republic of Yemen including 583 deaths and 1,211 cases have recovered. However, the number of COVID-19 cases anticipated to be higher, particularly with the scarcity means of tracking the virus and lack of transparency in declaring the actual number of cases in North Yemen [6].

The exact dynamic for SARS-CoV-2 transmission has not been determined, yet, according to the WHO, the COVID-19 disease can be transmitted primarily via droplets and fomites during close unprotected contact between an infected person and a healthy person [7]. According to Centers for Disease Control and Prevention (CDC) recommendations, SARS-CoV-2 transmitted from a person to another mainly through close contact (within almost 6 feet) with an infected person via respiratory droplets during coughing or sneezing or when touching a surface or an object that is contaminated with the virus and touching one's eyes, nose or mouth [8]. In most infected patients, the SARS-CoV-2 resulting in none at all or a mild to moderate symptoms that are alleviated within a few weeks. However, it can cause severe respiratory syndrome or death, particularly in older people or patients with chronic health diseases [9].

Healthcare providers as the front line in coping with the COVID-19 pandemic are more susceptible to infection [10]. As of 27 July 2020, the WHO has estimated that up to 10% of all COVID-19 cases globally, which is nearly 1.5 million cases are among the HCPs. This infected number of HCPs is probably underestimated because there is no systematic reporting to the WHO yet [11]. Besides, information released by the international council of nurses (ICN), stated that up to June 2020, nearly 230,000 HCPs across the world acquired COVID-19 infection, and above 600 nurses have died [12].

For the context of the current study, the ongoing six years of war and civil conflicts have destroyed Yemen's infrastructure as only 51% of the country health facilities have been fully operating [13] and only 500 ventilators and two testing centres are available for a population of nearly 30 million. Moreover, the country is suffering from a limited testing capacity, a critical shortage in health care supplies including of basic protective measures, and little means of tracking the spread of SARS-CoV-2, particularly, with the similarity of symptoms of COVID-12 and other diseases that are already prevalent in Yemen [14]. All these factors make the country a uniquely dangerous environment to the catastrophic spread of the COVID-19 pandemic, which has raised the Yemeni HCPs' fear and anxiety more compared to their colleagues in other countries.

The rapid prevalence of the novel coronavirus (COVID-19) pandemic over the world was associated with a considerable level of scare, anxiety, and panic among the public, in particular, HCPs as the most vulnerable group at risk for SARS-CoV-2 infection [15]. Based on the WHO, the shortage of appropriate protective measures endangers HCPs over the world and represents a major cause of their concern [16]. Accordingly, availability and correct use of personal protective equipment (PPE) is essential to protect frontline HCPs during their coping with the COVID-19 pandemic. However, what is most important is their adherence to applying these PPE, which largely depends on their knowledge, attitudes, and practices towards COVID-19 [2]. Yemeni HCPs had been facing a double battle during the COVID-19 pandemic even before the COVID-19 pandemic as the WHO described Yemen by more than 50% below the basic health services coverage benchmark. Although there are a few skilled HCPs available in Yemen, they are vulnerable to it and have not received their salaries for nearly 5 years. Besides, only 10 medics for every 10,000 people are available and the number of nurses and midwives is not sufficient to fill this shortage. These issues are compounded by the brain drain for better opportunities abroad and the weakened medical health education [17]. To ensure the protection of the HCPs and safeguard Yemen of the COVID-19 outbreak, there is an urgent need to understand the HCP's awareness of COVID-19. Therefore, this study aims to assess the HCPs' knowledge, attitudes, anxiety, and preventive behaviours towards COVID-19.

## Methods

### Study area, study design, and study period

A descriptive, web-based cross-sectional survey was conducted among Yemeni HCPs from 22<sup>nd</sup> April 2020, 6 PM to 26<sup>th</sup> April 2020, at 11 AM. All HCPs who provide direct healthcare services to patients were invited to participate in our study.

### Study instrument

The questionnaire used in this study was adapted from previously published studies based on the authors' permission [2, 18]. The questionnaire consisted of 58 items concerning the respondents' knowledge, attitude, anxiety, and preventive behaviours toward COVID-19. It is contained five parts; Part (1) is concerned with socio-demographic characteristics such as age, sex, occupation, education level, years of work experience, and sources of COVID-19 related knowledge. Part (2) is concerned with the respondents' knowledge (21-items). Part (3) is concerned with the respondents' attitude (10-items). Part (4) is concerned with the respondents' anxiety (17-items). Part (5) is concerned with respondents' preventive behaviours (10-items).

### Scoring of knowledge, attitude, anxiety, and preventive behaviours

The scoring system used in this study was based on studies by Taghrir et al. [18] and Roy et al. [2]. The 21-items related to knowledge were assessed with "Yes" or "No" response. Each correct response was given a 1 score, while a 0 score was assigned to an incorrect response. The scores ranged between 0 (no

correct answer) and 21 (all answers are correct). A score of <11 was considered inadequate knowledge, and 11 to 16 scores were considered moderate knowledge, while a score of  $\geq 17$  was considered an adequate knowledge. Similarly, the 10-items concerned with respondents' attitudes were evaluated with a "Correct" or "Incorrect" response. The scores ranging from 0 to 7 was considered as a negative attitude, while the scores in the range of 8 to 10 were considered as a positive attitude. The 17-items related to anxiety were assessed via a 5-point Likert scale, in which the score of 1 to 5 was given from never to always. The total cumulative score ranged from 17 to 85. Scores from 17 to 50 were considered as low anxiety, and those scores in the range of 51 to 67 were considered moderate anxiety, while those ranging from 68 to 85 were considered high anxiety. The 10-items related to preventive behaviours were assessed with "Yes" or "No" response. A score of 0 to 7 was considered low performance and a score of 8 to 10 was considered as high-performance.

### **Validity and reliability**

Three experts in infectious disease and epidemiology (one specialist in infectious disease and two epidemiologists) have participated in the establishment of the content validity of the questionnaire items. The reliability of the questionnaire items was based on a pilot study that included 40 participants. The reliability was tested using Cronbach's alpha test. The results of the alpha were 0.79 for the knowledge part, 0.77 for the attitude part, 0.80 for the anxiety part, and 0.75 for the preventive behaviours part.

### **Data collection**

At the current moment, due to the COVID-19 outbreak and the specific preventive precautions recommended by the Ministry of Health and Population, an electronic web-based self-reported questionnaire was designed to follow such recommendations. The link was sent to the HCPs through emails, WhatsApp, Telegram, and other social media. HCPs who were living in the Republic of Yemen both males and females, who were at the age of 20 years or older, heard about the COVID-19 outbreak, and who signed the consent to participate were recruited for this study. Although participation was voluntary and the participants' information was not recorded anywhere on the questionnaire, the respondents were encouraged to forward the survey to other colleagues as possible.

### **Ethical consideration**

Approval of the Ethics Committee of Al-Razi University was obtained before conducting the study. The respondents had to confirm their willingness to participate voluntarily by answering a yes-no question on a written informed consent form before allowed completing the online self-report questionnaire.

### **Data analysis**

Statistical Package for Social Sciences (IBMSPSS), version 22.0 was used in the management and analysis of the collected data. Descriptive analyses using the mean values and standard deviations for continuous variables and the count and percentages for the dichotomous or categorical variables were used to describe the data. The relationship between the study variables was assessed using Pearson's

correlation coefficient test. A  $p$ -value of  $< 0.05$  levels (two-tailed) with a 95% confidence interval was reported as significant for correlation analysis.

## Results

### Healthcare providers' demographic characteristics

Table 1 reveals the respondents' socio-demographic data. As shown in Table 1, above half (61.6%) of the HCPs were male, and more than (67%) were in the age group of 20 to 30 years old and a mean of  $29.29 \pm 6.75$ . Concerning the occupation, 22.5% of the respondents were physicians followed by pharmacists (17.8%), laboratory (16.5%), and nurses (16.0%). 4.5% of them had a PhD and only 1.8% had Board. 88.1% of the respondents had 10 years of working experience or less. Regarding COVID-19 related information sources, social media were the main source for 31.0% of the respondents and news media for 26.1% of them. Around 99.0% of the respondents heard about novel COVID-19, whereas 60.0% of them never attended lectures or discussions of novel COVID-19.

### Healthcare providers' level of knowledge regarding the COVID-19 pandemic

Figure 1 describes the level of knowledge among healthcare providers regarding the COVID-19 pandemic. A 21-items followed with "True" or "False" choices, was used to assess the respondents' knowledge level regarding COVID-19. As shown in Figure 1, the most (69.80%) healthcare providers had an adequate knowledge level regarding the COVID-19 pandemic, while 29.70% of them had moderate knowledge, and only 0.60% had inadequate knowledge about the COVID-19 pandemic. The lowest percentages were related to the four statements that discussed the importance of wearing masks in the society, having to wear N95 mask only during intubation, suction, bronchoscopy, and cardiopulmonary resuscitation, the possibility to treat the disease by usual antiviral drugs and antibiotics as the first-line treatment, which scored (69.9%, 68.8%, 28.47%, and 27.3%), respectively.

### Healthcare providers' attitude toward COVID-19 pandemic

Figure 2 demonstrates the level of attitude toward the COVID-19 pandemic among Yemeni healthcare providers. The level of respondents' attitude toward the COVID-19 pandemic was assessed via ten-items followed with "Yes" or "No" choices. As shown in Figure 2, the findings indicating that the majority (85.10%) of the respondents had a positive attitude, while 14.90% of them had a negative attitude toward the COVID-19 pandemic. However, although the vast majority of the respondents exhibited a high level of optimistic attitude toward the COVID-19 pandemic, 75.1 % of them still thought that they would not get the disease, and almost 29.4% willing to move to other places within the country to be safe during the pandemic.

### Healthcare providers' anxiety toward COVID-19 pandemic

Figure 3 presents the level of anxiety among Yemeni healthcare providers toward the COVID-19 pandemic. The level of the respondents' anxiety was assessed via 17-items about COVID-19. Answers on

a 5-Likert scale were used, in which the score of 0 to 5 was given, from always to never. As shown in Figure 3, the findings indicating that nearly above half of the respondents had a moderate level of anxiety toward the COVID-19 pandemic, whereas 27.70% of them had a high level and 21.30% had a low level of anxiety toward COVID-19 pandemic.

### **Healthcare providers' self-reported preventive behaviours toward COVID-19 pandemic**

A ten-items followed by "Yes" or "No" responses, was used to assess the respondents' level of self-reported preventive behaviours towards COVID-19. Five items were to reduce public places use during daily life, one item was related to preventive behaviour when coughing/sneezing, two items were related to hand washing and surfaces disinfection frequently and one item was related to talking with family and friends regarding preventive measures of COVID-19. As shown in Figure 4, the vast majority (87.70%) of respondents exhibited sufficient preventive behaviours, while only 12.30% demonstrated low preventive behaviours. The lowest score (84.8%) was related to cancelled or postponed activities and events such as eating out, sports, and meetings with colleagues.

### **Association between the respondents' socio-demographic characteristics and their Knowledge, attitude, anxiety, and preventive behaviours**

Table 2 presents the association between the respondents' socio-demographic characteristics and their Knowledge, attitude, anxiety, and preventive behaviours towards the COVID-19 pandemic. As shown in table 2, there was only a significant positive correlation between the respondents' level of knowledge about COVID-19 and their occupation and educational level ( $p$ -value =0.016 & 0.001), respectively. There was only a significant positive correlation between the respondents' level of attitude toward COVID-19 and t occupation ( $p$ -value =0.018). Moreover, there was a significant positive association between the respondents' anxiety and their sex and educational level ( $p$ -value =0.014 & 0.004), respectively. Regarding the preventive behaviours towards COVID-19, there was a significant positive association between the respondents' level of performance and their sex, occupation, years of working experience, and educational level at  $p$ -value (0.010, 0.023, 0.011 & 0.001), respectively.

### **Correlation between respondents' knowledge, attitude, anxiety, and preventive behaviours scores**

Table 3 showed the correlations between healthcare providers' knowledge, attitude, anxiety and preventive behaviours scores. The correlation was divided into four levels based on the following criteria: weak = 0–0.25, fair = 0.25–0.5, good = 0.5– 0.75, and excellent = 0.75 or greater [19]. As illustrated in Table 3, there was a significant positive linear correlations between knowledge-attitude ( $r = 0.176, p < 0.001$ ), knowledge-anxiety ( $r = 0.136, p < 0.001$ ), knowledge-preventive behaviours ( $r = 0.320, p < 0.001$ ), attitude-anxiety ( $r = 0.078, p < 0.006$ ), attitude-preventive behaviours ( $r = 0.293, p < 0.001$ ) and anxiety-preventive behaviours ( $r = 0.284, p < 0.001$ ). The result indicates the relationship between knowledge, attitude, anxiety and preventive behaviours toward COVID-19 pandemic.

## **Discussion**

Since the first confirmed case has been announced in Yemen on 10<sup>th</sup> April 2020, in Ash Shihr, which is a port city in the Hadhramout province southern Yemen, extreme fear and anxiety extended to the other provinces from the possibility of COVID-19 outbreak. The HCPs as a front line, are the most vulnerable to catch COVID-19 than other people, particularly with a critical shortage in PPE due to the current war and civil conflict in the country [14]. At this critical moment, it is crucial to understand the HCPs' preparedness to cope with the COVID-19 outbreak. Accordingly, the current study aimed to explore the level of knowledge, attitudes, anxiety, and preventive behaviours among the Yemeni HCPs towards the COVID-19 pandemic.

Based on the findings, although the majority (60.0%) of respondents had never attended training courses of COVID-19, most (69.80%) of them had an adequate level of knowledge about COVID-19. However, these four statements on the importance of wearing masks in the society, having to wear N95 mask only during intubation, suction, bronchoscopy, and cardiopulmonary resuscitation, the possibility to treat the disease by usual antiviral drugs and antibiotics as the first-line treatment scored the lowest correct answers (69.9%, 68.8% 28.47% & 27.3%), respectively. This result probably highlights the need to focus more on some parts in future educational courses related to COVID-19. The adequate level of knowledge among the respondents could be attributed to their educational level as most of them (73.0%) had a bachelor's degree or higher like Master Degrees. Such an educated professional group could act to obtain knowledge about COVID-19 from different sources of information. In this regard, the result showed that only (20.0%) of HCPs obtained their information about COVID-19 from the official websites of the Ministry of Public Health and Population and the WHO. This indicates that health authorities should pay more attention to encourage HCPs to use official websites as an essential and credible source of information. Likewise, 57.1% of the HCPs appeared to use social media and news media as the main source of their information, which is a considerable concern. This is because using such media can misguide the HCPs by spreading numerous fabricate and unverified information.

It is worth noting that the respondents' level of knowledge was only statistically significantly different according to their age, occupation, and educational level. Our results are consistent with the result of a previous study [20] which reported that level of knowledge toward COVID-19 differs significantly across different age groups, educational levels, and levels of the profession. The results are also in line with the results of Giao et al. [9] and Saqlain et al. [21] concerning the difference in the level of respondents' anxiety based on their profession. Concerning the level of respondents' attitude, it significantly differed based on participants' occupations. This corroborates with a study of Giao et al. [9], which reported a significant association between respondents' attitude and their occupations. In contrast, the result seems in disagreement with the results of Saqlain et al.[21] and Rahman and Sathi [20], who stated that a positive attitude toward COVID-19 did not significantly vary across the different occupations. Likewise, the results revealed that the respondents' level of anxiety was significantly different based on their gender and educational levels. These results support results reported by Al-Hanawi et al. [22] that respondents' level of worry due to COVID-19 differs significantly across gender and educational level. The result also in line with a previous studies [23, 24] in China, which indicated that females have high levels of anxiety

compared to males. Similarly, the respondents' level of self-reported preventive behaviour significantly differed according to their sex, occupation, years of working experience, and educational level. These results are in agreement with the results of Rahman and Sathi [20] on the variation of respondents' preventive behaviour according to the different age groups, Al-Hanawi et al. [25] regarding the respondents' gender, Saqlain et al. [21] regarding the respondents' years of working experience and Khasawneh et al. [26] about the respondents' educational level.

Regarding the respondents' attitude, the result showed that 85.10% of the respondents had optimistic attitudes towards COVID-19. Unfortunately, the findings showed that 75.1 % of them think that they will not get infected by the virus, and almost 29.4% of them are willing to move to other places inside the homeland to protect himself from the COVID-19 outbreak. This result means that most of the respondents are either confident to protect themselves or are not aware that COVID-19 is very contagious. Likewise, one-third of the respondents probably leave their work and go to other places for fear of infection, which resulted in extra healthcare providers' shortage and made the situation more serious. Accordingly, this information should be corrected as soon as possible via holding training courses about COVID-19 or disseminating such information through official websites. The high optimistic attitude in the current study could be explained by the limited cases reported in Yemen so far and the adequate level of knowledge that they obtained since the outbreak has started until this study was conducted. The result of Roy et al. [2] indicated that adequate awareness often leads to optimistic attitudes, which could positively affect the preparedness of the HCPs to meet pandemic issues. Besides, our study result showed a positive correlation between the respondents' knowledge and their attitude, which could support this speculation. Our findings are consistent with a study by Giao et al. [9], who found that healthcare workers had a high level of knowledge and a positive attitude towards the COVID-19 pandemic. These findings are also in line with the result of a cross-sectional study conducted among Saudi health college students [27]. The results revealed that more than half of the students had a positive attitude toward MERS-CoV.

Concerning the respondents' anxiety, the result indicated that nearly half (51.00%) of the respondents had a moderate level of anxiety and 27.70% of them had a high level of anxiety about the COVID-19 outbreak. According to Roy et al. [2], fear and anxiety among a given population are usually expected because of the intense impact of the pandemic, which could affect the mental well-being and influence their behaviour in the community. In this study, only 27.7% of the respondents exhibited a high level of anxiety about COVID-19. The low level of anxiety among the respondents could be attributed to the knowledge level that they have and because they are still in the first stage of the battle against the COVID-19 pandemic. Our result showed lower anxiety reported in studies conducted during the COVID-19 outbreak by Huang and Zhao [28] on Chinese healthcare workers and Nemati et al. [29] on Iranian nurses. Their results showed that the anxiety among healthcare workers was higher than that in other people. The high anxiety among the HCPs could be attributed to the uncontrolled nature of the pandemic and worries about being infected, particularly with the shortage of healthcare institutions and PPE.

Concerning the self-reported preventive behaviours, it was found that the majority (87.70%) of the respondents had a high-performance level of preventive behaviours toward COVID-19. Such high-

proactive behaviour toward COVID-19 could be attributed to the adequate level of knowledge among the respondents towards the COVID-19 outbreak. As shown by a previous study, those who had adequate knowledge exhibited optimistic attitudes and appropriate proactive practice toward COVID-19 [30]. Another study demonstrated that the level of good knowledge in a given population about COVID-19 is significantly reflected in their behaviour and attitude [2]. Our finding seems to be relatively lower than a study conducted during COVID-19 by Taghrir et al. [18] on Iranians' medical students as the researchers found that 94.2% of respondents had high performance in preventive behaviours toward COVID-19. According to the results of this study, it was found that females exhibited a higher-performance-level in preventive behaviours as compared to males. This probably indicates that the women in this study were more compliance in preventive behaviours toward COVID-19. This result is consistent with result of Taghrir et al. [18], that female demonstrated more precautionary behaviours than males.

Another key result was the positive linear correlation between knowledge-attitude, knowledge-anxiety, knowledge-preventive behaviours, attitude-anxiety, attitude-preventive behaviours, and anxiety-preventive behaviours. This result reaffirms the relationship between respondents' level of knowledge and their anxiety, attitude, and preventive measures toward the COVID-19 pandemic. Such a correlation could be explained by the Theory of Reasoned Action [31], which stated that a person's intention to carry out a specific behaviour is determined by their attitude toward this behaviour. Our findings are in line with other studies result [20, 30, 32] showing that having a good level of knowledge about COVID-19 correlated with optimistic attitudes and proper practices towards COVID-19. In contrast, our results are in disagreement with the result of Nemati et al. [29] who found that most Iranian nurses exhibited their anxiety about themselves and their families as a result of COVID-19 though their knowledge that they had about COVID-19 seemed sufficient. Lin et al. [24] found that the anxiety levels were not influenced by the level of knowledge of COVID-19. However, they found that higher levels of attitudes were highly associated with high levels of anxiety.

In a study conducted in Hong Kong by Leung et al, [33], the results revealed that the level of anxiety during the SARS outbreak was highly associated with behavioural responses such as facemask wearing. Another study by Roy et al. [2] revealed that people's anxiety was correlated with their behaviour. The results showed that under the effect of rumours, people modify their behaviour to an undesirable one. Reuben et al. [20] also reported a relationship between respondents' attitudes and their preventive behaviours. Regarding the association between the respondents' attitudes and their preventive behaviour, Rubin et al. [34] conducted a study during the swine flu outbreak. They reported a significant association between the respondents' attitude and their behaviour change (e.g. doing one or more avoidance behaviour).

The current study had several limitations that should be addressed for future research. First, the data was collected through a web-based survey because it was not possible to conduct a face-to-face survey among the Yemeni healthcare providers during this exceptional period. Therefore, the data obtained might less reliable, since there are less accountability and a lack of a trained interviewer. Also, the data collection was challenging owing to limited respondent availability and cooperation. Another limitation of

this study was its exclusiveness to healthcare providers. Therefore, further research should involve different community-population, and when possible used a community-based study design is recommended.

## **Conclusion**

Our study showed that the majority of HCPs in Yemen had an adequate level of knowledge concerning COVID-19, but improve their knowledge about some theme such as situations required wearing N95 mask and the possibility of using usual antiviral drugs and antibiotics as the first-line in treating COVID-19 disease, still necessary. The moderate anxiety level in this study anticipated being increased, particularly if the prevalence curve of the COVID-19 outbreak elevated and the situation has gotten worse. Thus, implementing preventive and regulation strategies to control the emotional status among the HCPs are required. Generally, the WHO and the Ministry of Public Health and Population still must provide more updated information related to COVID-19 to warrant better control on the COVID-19 outbreak.

## **Declarations**

### **Ethical approval and consent to participate**

This study has obtained ethical approval from the Ethics Committee for Research of Al-Razi University. The participants gave their consent to participate voluntarily via answering a yes-no question in the online written informed consent form before they allowed to complete the questionnaire.

### **Consent to publish**

Not applicable

### **Availability of data and material**

Data are available from the corresponding author on a reasonable request.

### **Competing interests**

The authors declare that they have no competing interests.

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This study did not receive any form of grants or support.

### **Authors' contributions**

GGA, TAHA, and MSAA were involved in the idea and the study design. TAHA and MSAA were responsible for data collection. GGA supervised and TAHA performed data analysis. GGA has written up the

manuscript. All the authors contributed to the data interpretation, reviewing and drafting the manuscript, and approved the final manuscript.

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We would like to thank all healthcare providers who agreed to participate in this study and their support to roll out the link of the questionnaire to other colleagues to participate.

## Abbreviations

COVID-19: Coronavirus Disease 2019; SARS-CoV-2: Severe acute respiratory syndrome coronavirus 2; HCPs: Healthcare providers; WHO: World Health Organization; CDC: Centers for Disease Control and Prevention; IBMSPSS: Statistical Package for Social Sciences.

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## Tables

Table 1 Healthcare providers' demographic characteristics

Demographic characteristic		no(%)
<b>Age</b>	20-30	825 (67)
	31-40	313(25.4)
	41-50	79(6.4)
	51-60	14(1.1)
	Mean±SD	29.29±6.75
<b>Sex</b>	Male	758(61.6)
	Female	473 (38.4)
<b>Occupation</b>	Physician	277(22.5)
	Nurses	197(16.0)
	Laboratory	203(16.5)
	Anesthesia	55(4.5)
	Dentist	53(4.3)
	Medical Academicians	72(5.8)
	Pharmacist	219(17.8)
	Community	55(4.5)
	Midwifery	25(2.0)
	Physiotherapy	20(1.6)
	Nutrition	45(3.7)
	Radiology	10(0.8)
	<b>Education Level</b>	Diploma
Bachelors		899(73.0)
Master		82(6.7)
Ph.D		56(4.5)
Board		22(1.8)
<b>Experience Years</b>	0-10	1084(88.1)
	11-20	125(10.2)
	>20	22(1.8)
	Mean±SD	4.25±5.59
<b>Source of COVID-19 data</b>	News media	712(26.1)
	Social media	846(31.0)
	Ministry of health and WHO	545(20.0)
	Family and friend	302(11.1)
	Working Place	321(11.8)
<b>Heard about Novel COVID-19</b>	Yes	1231 (99.0)
<b>Attended lectures/discussions about novel COVID-19</b>	Yes	492(40.0)
	No	739(60.0)

Table 2: Association between the respondents' socio-demographic characteristics, Knowledge, attitude, anxiety and preventive behaviours

Demographic characteristic		Knowledge	Attitudes	Anxiety	Preventive behaviors
Sex	Male	17.18±1.99	8.62±1.24	59.33±12.53	9.02±1.70
	Female	16.96±2.00	8.66±1.28	61.10±12.08	9.27±1.51
	<b>p value</b>	<b>0.058</b>	<b>0.585</b>	<b>0.014</b>	<b>0.010</b>
Age (years)	18-30	17.22±1.83	8.63±1.28	60.58±12.39	9.11±1.61
	31-40	16.77±2.42	8.63±1.16	59.13±13.02	9.06±1.86
	41-50	17.17±1.79	8.68±1.30	57.88±10.01	9.30±1.06
	51-60	16.57±0.75	9.07±1.20	58.64±6.60	9.85±0.36
	<b>p value</b>	<b>0.005</b>	<b>0.622</b>	<b>0.120</b>	<b>0.246</b>
Occupation	Physician	17.23±1.50	8.79±1.31	59.674±11.22	9.36±1.28
	Nurses	16.77±2.73	8.63±1.28	60.34±12.28	8.95±1.77
	Laboratory	17.14±2.34	8.68±1.06	61.24±13.86	8.97±1.91
	Anesthesia	17.20±2.04	8.56±0.83	62.20±11.14	9.52±0.79
	Dentist	16.60±1.81	8.56±1.46	59.73±11.97	9.57±0.79
	Academics	17.08±1.45	8.93±1.12	59.38±12.49	8.97±1.56
	Pharmacist	17.35±1.75	8.47±1.22	59.29±12.43	9.04±1.81
	Community	17.01±1.52	8.20±1.71	56.72±13.78	8.72±2.11
	Midwifery	16.44±2.38	8.36±1.38	56.20±10.70	9.32±1.06
	Physiotherapy	17.00±1.62	8.80±1.10	59.75±13.36	9.05±1.27
	Nutrition	17.00±1.39	8.82±1.09	63.22±12.46	8.97±2.05
	Radiology	18.70±1.41	8.20±1.03	62.80±10.65	9.40±1.26
	<b>p value</b>	<b>0.016</b>	<b>0.018</b>	<b>0.191</b>	<b>0.023</b>
Years of working experience	≤10	17.11±2.04	8.64±1.25	60.23±12.71	9.06±1.70
	11-20	16.96±1.72	8.56±1.24	58.88±9.03	9.51±0.95
	>20	17.22±1.34	9.05±1.21	55.59±11.53	9.45±1.22
	<b>p value</b>	<b>0.705</b>	<b>0.256</b>	<b>0.123</b>	<b>0.011</b>
Educational Level	Diploma	17.02±2.95	8.59±1.38	58.77±12.54	8.95±1.79
	Bachelors	17.19±1.70	8.66±1.22	60.47±12.40	9.11±1.61
	Master	17.21±1.39	8.64±1.07	59.56±10.70	9.62±0.76
	Ph.D.	15.85±3.13	8.39±1.55	55.12±13.63	8.62±2.40
	Board	16.77±1.34	8.63±1.17	65.09±8.81	9.90±0.42
	<b>p value</b>	<b>0.001</b>	<b>0.593</b>	<b>0.004</b>	<b>0.001</b>

Table 3 Correlation between respondents' knowledge, attitude, anxiety and preventive behaviours scores

Variable	Correlation coefficient	P-value
Knowledge-Attitude	0.156	0.000**
Knowledge-Anxiety	0.136	0.000**
Knowledge-Preventive behaviors	0.320	0.000**
Attitude-Anxiety	0.078	0.006**
Attitude-Preventive behaviors	0.293	0.000**
Anxiety-Preventive behaviors	0.284	0.000**

\*\* . Correlation is significant at the 0.01 level (2-tailed).

\*. Correlation is significant at the 0.05 level (2-tailed).

## Figures

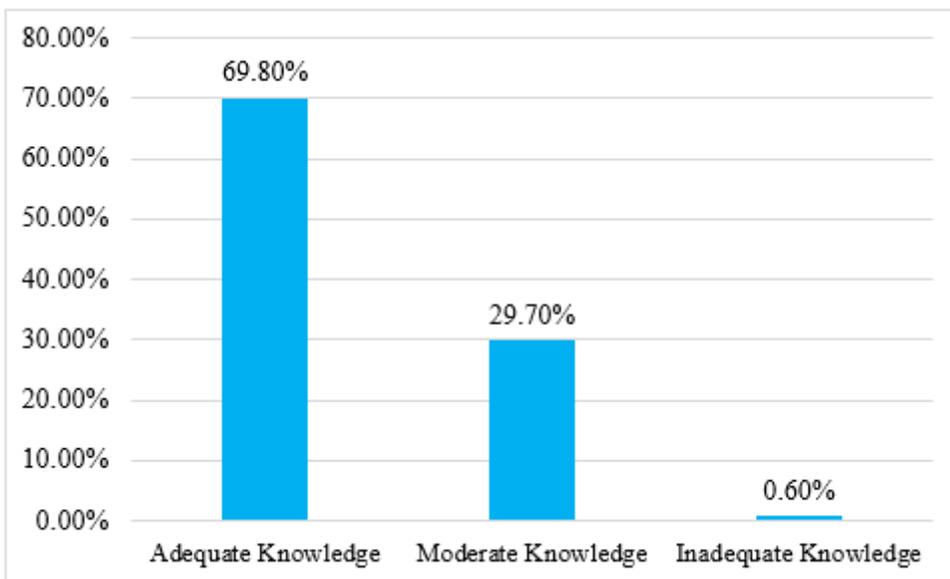
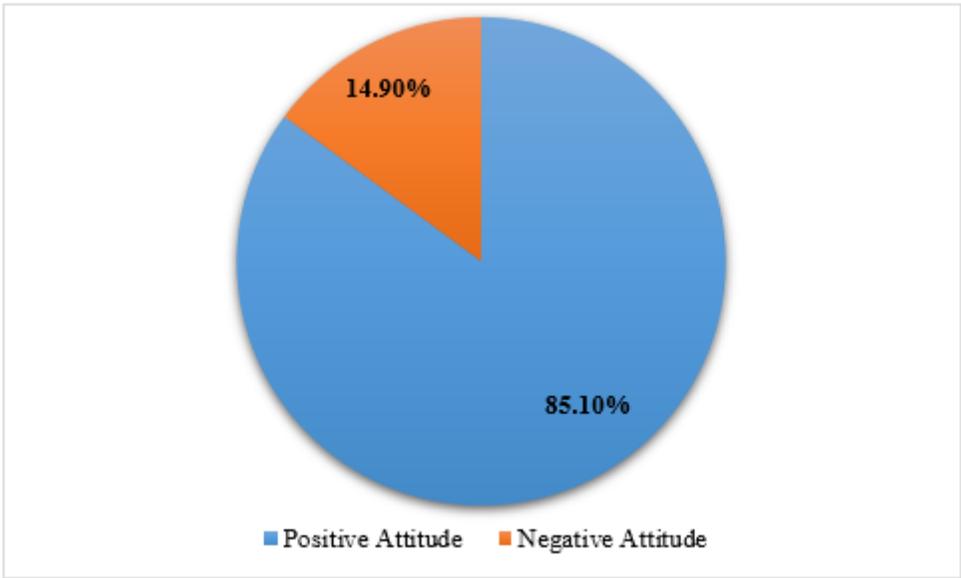


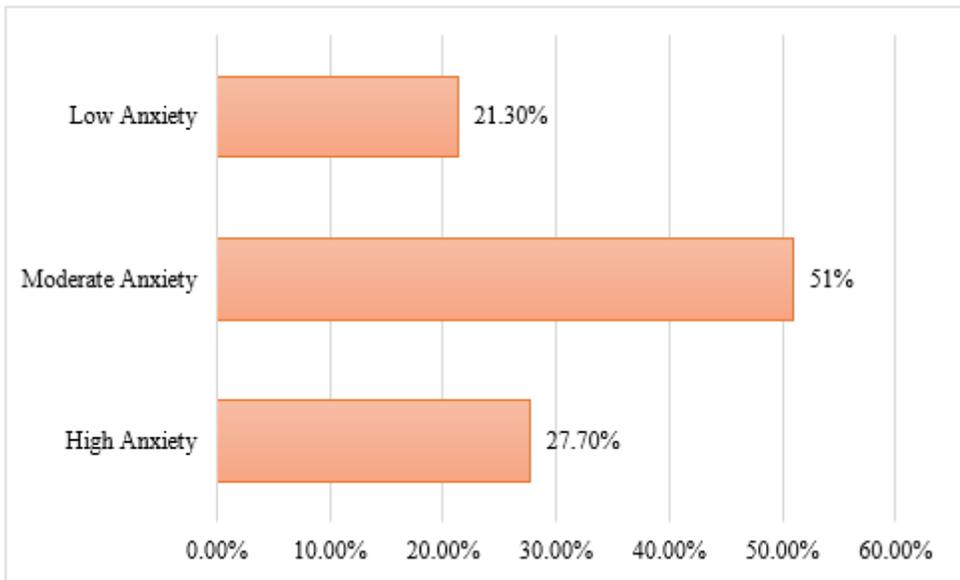
Figure 1

Healthcare providers' level of knowledge on COVID-19 pandemic



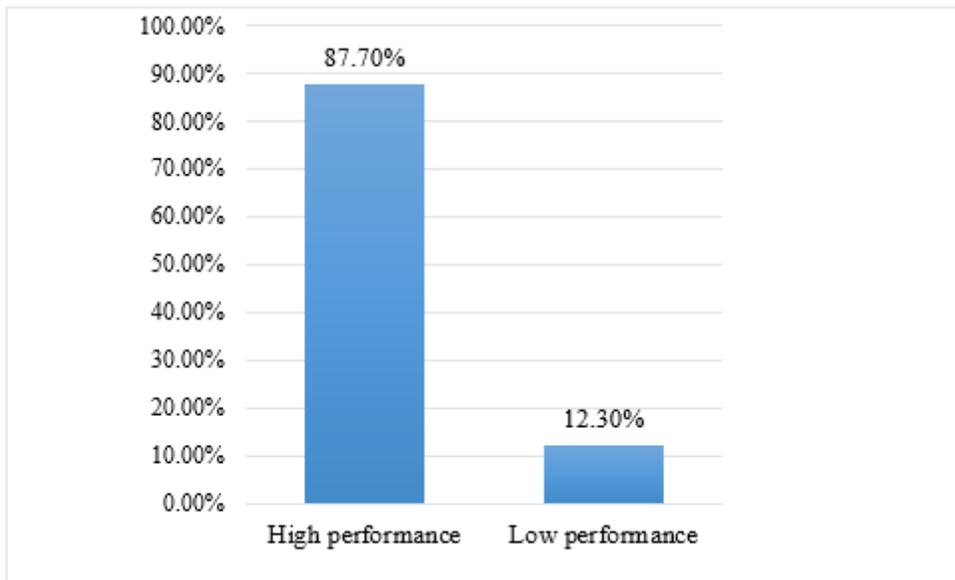
**Figure 2**

Healthcare providers' attitude toward COVID-19 pandemic



**Figure 3**

Healthcare providers' anxiety of COVID-19 pandemic



**Figure 4**

Healthcare providers' preventive behaviours toward COVID-19 pandemic