

# Knowledge, Attitude and Practice Among Health Care Workers Concerning COVID-19 at Primary Health Center – Ministry of National Guard- Health Affairs, Jeddah, Saudi Arabia

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## ABSTRACT

**Background:** The global outbreak of COVID-19, originating in late 2019 and caused by SARS-CoV-2, represents a highly transmissible respiratory infection. Health care workers (HCWs) have occupied a frontline position, simultaneously providing clinical care and implementing preventive protocols. Their knowledge, attitudes, and practices (KAP) are indispensable to the overall effectiveness of healthcare responses and safeguarding within clinical settings.

**Aim:** To investigate the KAP of HCWs toward COVID-19 at the Primary Health Center under the jurisdiction of the Ministry of National Guard-Health Affairs in Jeddah, Saudi Arabia.

**Subjects and Methods:** A descriptive cross-sectional study, utilizing a technique of random sampling was conducted in Primary health centers in the western regions and MNG- HA Jeddah Saudi Arabia during the period from the beginning of 2022 till the end of 2023 among 239 randomly chosen participants.

**Results:** The results revealed that HCWs generally have a high level of knowledge about COVID-19, with females, Saudis, and those working in the private sector as well as nurses, exhibiting significantly higher knowledge scores. While physicians scored higher in practice, indicating better adherence to preventive measures. Despite these differences, attitudes towards COVID-19 were generally positive across all groups. The study also found significant positive correlations between KAP scores, suggesting that increased knowledge leads to better attitudes and practices among HCWs.

**Conclusion:** The study concluded that Saudi healthcare workers generally had strong knowledge, positive attitudes, and effective practices regarding COVID-19. However, improvements are needed in vaccine knowledge, adherence to mask-wearing, and availability of protective equipment. These findings emphasize the critical role of structured training and ongoing support for HCWs.

**Keywords:** Knowledge, Attitude and Practice, Protective Equipment, Health Care Workers, COVID-19, Primary Health Center.

## INTRODUCTION

The global outbreak of COVID-19, caused by the SARS-CoV-2 virus, has posed unprecedented challenges to healthcare systems worldwide. As the frontline responders to this pandemic, healthcare workers (HCWs) are at a high risk of exposure and play a crucial role in controlling the spread of the virus. The ability of healthcare workers to effectively combat COVID-19 hinges on their knowledge, attitudes, and practices (KAP) related to the virus, as well as the measures and protocols in place within their healthcare settings [1]. Emerging diseases have arisen as a consequence of globalization, demographic expansion, and human intrusion into unfamiliar habitats, which facilitate exposure to new pathogens. HCWs during the COVID-19 pandemic have endured considerable risks, ranging from direct pathogen exposure and extended working hours to fatigue, burnout, mental health strain, stigmatization, and incidents of both psychological and physical violence [2].

The etiological agent of COVID-19 is severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), a beta coronavirus. Since its emergence in Wuhan, China, the virus has spread globally, with reported infections

surpassing 34 million and deaths exceeding one million as of October 2020 [3]. Respiratory droplets and close contact with infected individuals represent the principal routes of transmission. Common clinical features comprise fever, dry cough, breathing difficulty, and myalgia, whereas gastrointestinal disturbances and impairment of smell or taste are among the less frequently observed symptoms [4].

Clinical severity is heterogeneous across patients, yet advanced age and the presence of comorbid illnesses are consistently correlated with an elevated likelihood of severe disease [3]. By October 2020, therapeutic approaches centered mainly on supportive and symptomatic care, while hospitalization was indicated for more severe presentations. Concurrently, multiple investigational drugs were undergoing clinical evaluation, with mixed results regarding their effectiveness [5].

Once more, as of October 2020, no vaccine had been authorized for COVID-19; nonetheless, several candidates were being tested in clinical trials, with possible release anticipated by the end of that year [6]. Globally, HCWs are recognized as a high-risk group for acquiring the infection [7]. Nevertheless, adherence to

infection control measures, such as rigorous hand hygiene, maintenance of social distancing, and appropriate use of personal protective equipment (PPE), has demonstrated effectiveness in limiting the spread of infection [8].

Coronavirus disease swept globally in 2020, producing severe respiratory illness and considerable mortality. Its effects extended beyond health, heavily impacting business operations and public service delivery, and resulting in major societal costs. The responsibility for containing the pandemic primarily fell upon governments and HCWs. Accordingly, the KAP of HCWs emerged as critical factors in the treatment and isolation of COVID-19 cases and became the subject of focused examination [2].

The COVID-19 pandemic has burdened the healthcare sector while simultaneously straining social relationships, with fear of infection, isolation, and bereavement contributing to significant anxiety [9]. **Shaukat *et al.*** [10] reported that HCWs engaged in the care of COVID-19 patients experience heightened risks affecting both their physical and psychological health.

HCWs have been positioned at the frontline of defense during the COVID-19 pandemic. Insufficient knowledge and unfavorable attitudes among HCWs may adversely affect clinical practices, resulting in delays in case detection, compromised infection control, and further disease transmission. In Egypt, a descriptive cross-sectional study involving 407 HCWs employed a self-administered questionnaire to assess these domains. The mean accuracy rate was 80.4%, with an average knowledge score of  $18.5 \pm 2.7$  (out of 24). A positive correlation was observed between knowledge and attitude scores ( $r = 0.215$ ,  $p < 0.001$ ). Additionally, 83.1% of participants reported fear of contracting COVID-19, while 89.2% considered themselves at higher risk of infection compared with others [11].

Key reasons for heightened risk perception reported by HCWs were lack of access to PPE, fear of disease transmission to families, and experiences of social stigma. Knowledge levels were generally strong, especially among physicians, whereas allied health professionals demonstrated comparatively more positive attitudes. With risk perception markedly elevated among HCWs, it is essential for the government and the Egyptian Ministry of Health to address these contributing factors [11].

Evaluating the KAP of HCWs in relation to COVID-19 could be a valuable first step toward determining their educational needs and identifying possible drivers of misinformation [12]. For most participants, social media, particularly Telegram, constituted the leading source of COVID-19 information, followed by audiovisual outlets including radio and television. Despite the advantages of social media in rapidly

transmitting health messages, these platforms may simultaneously propagate misinformation, undermining public health responses, a challenge described by the WHO as “COVID-19 infodemics.” [13]. A descriptive cross-sectional investigation of 407 HCWs in Dubai, conducted through a self-administered questionnaire, found that participants accessing information from scientific platforms—particularly scientific articles—scored higher in knowledge, highlighting the validity of information sources. Consistent with this, their results indicated that HCWs with professional doctorate degrees had significantly greater mean knowledge scores compared with other groups [5]. Overall, the knowledge and practices of HCWs were largely appropriate, and participants demonstrated generally positive attitudes. Nonetheless, gaps persisted in relation to misinformation and quackeries surrounding COVID-19. Targeted educational interventions may represent the most effective strategy for addressing misconceptions and improper practices [14].

The Research and Development Blueprint Scientific Advisory Group, together with the global community, identified critical research gaps concerning COVID-19. To address these, the WHO recommended public health measures such as awareness creation and attitude change. Empirical studies consistently show that demographic, social, and technological influences affect KAP toward disease and its prevention [15].

Frontline exposure to confirmed and suspected cases places health care professionals at particularly high risk of COVID-19 infection. [12] The Ethiopian Ministry of Health has initiated training programs for HCWs at various levels, though coverage has remained limited. In parallel, the WHO and the Centers for Disease Control and Prevention (CDC) have promoted a multidisciplinary approach to COVID-19, with awareness creation as a central component. Conducting research on the knowledge, attitudes, practices, and associated factors of HCWs regarding COVID-19 and its prevention is pivotal in combating the disease, particularly in contexts where information is scarce [9]. Accordingly, this study was designed to assess the KAP of HCWs toward COVID-19 and related prevention strategies.

Evidence from early outbreak reports shows infection prevalence among HCWs of 1% in Tongji Hospital, Wuhan, China, compared with over 6% in two hospitals in southern Netherlands. In both the United States and Italy, prevalence among HCWs was documented between 7% and 11%. These data confirm COVID-19 as an occupational health threat, with HCWs across all professional categories experiencing infection rates surpassing those observed in the general population [16].

Overcrowding, environmental contamination, and lack of isolation facilities, are key contributors to transmission between HCWs, with the problem exacerbated by limited knowledge and suboptimal infection prevention practices. Although some studies have demonstrated adequate knowledge levels among HCWs, others revealed significant gaps and inappropriate behaviors. Inadequate knowledge not only predisposes to poor practice but also leads to risk overestimation, increased psychological distress, and compromised clinical judgment. KAP surveys remain an appropriate tool for assessing current programs and identifying effective behavioral change strategies [17].

So, the present work was conducted to assess HCWs' KAP toward COVID-19 at the Primary Health Center affiliated with the Ministry of National Guard–Health Affairs, Jeddah, Saudi Arabia.

## **SUBJECTS AND METHODS**

### **Study locality:**

The present study was carried out in Primary health centers in the western regions and MNG- HA Jeddah, Saudi Arabia at the beginning of 2022.

**Study period and duration:** From the beginning of 2022 to the end of 2023.

**Study design:** A descriptive cross- sectional study.

### **Study population:**

This cross-sectional study was carried out among HCWs during the COVID-19 pandemic at the Primary Health Center, Ministry of National Guard–Health Affairs (MNG-HA), Jeddah, within primary healthcare centers across the Kingdom of Saudi Arabia, using a random sampling technique.

### **Participants:**

This study targeted physicians, nurses, and allied health professionals (radiologists, laboratory specialists, pharmacists, social workers, epidemiologists), together with administrative staff such as directors, managers, and receptionists, representing the workforce of primary healthcare centers.

### **Sampling method:**

A convenient sample was taken from the identified study population from primary HCWs including primary health centers in western region and MNG- HA Jeddah, Saudi Arabia.

This study included 239 HCWs from three randomly selected primary health centers in the western region and the Ministry of National Guard–Health Affairs (MNG-HA), Jeddah, Saudi Arabia. Participants were randomly chosen from each center.

### **Pilot study:**

Prior to data collection, an external pilot study was conducted on 20 workers from the three primary health centers to evaluate the clarity of the questionnaire items and to estimate the time required for completion by each participant.

### **Study tools:**

– Grounded in an extensive literature review and in guidelines from the WHO and the Saudi Ministry of Health during the COVID-19 pandemic, the study tool was developed and subsequently validated. After drafting the initial questionnaire, validation steps included distribution to researchers and HCWs from multiple disciplines to obtain expert judgment on clarity and relevance. The questionnaire was organized to gather the following data:

- Personal and demographic data
- Occupational and job characteristics
- Knowledge assessment about Covid-19
- Practice assessment questions
- Attitude assessment

This questionnaire encompassed four parts: demographic characteristics, knowledge, attitude, and practice. Demographic variables included gender, nationality, occupation, type of facility, place of work, and worksite. Knowledge was measured through 12 questions addressing the etiology of COVID-19, its signs and symptoms, management, prevention, transmission, and risk factors. Response options were true, false, or I don't know; correct responses were awarded 1 point, while incorrect or uncertain responses were scored 0. Attitudes were assessed using 12 questions concerning fear of COVID-19, willingness to adopt preventive behaviors, participation on the frontlines, readiness for isolation when infected, and confidence in defeating the pandemic. A five-point Likert scale was used: strongly agree (1), agree (2), neutral (3), disagree (4), and strongly disagree (5). The possible total score ranged from 10 to 50, with higher averages indicating a positive attitude. The practice section contained five questions evaluating infection control practices during the pandemic, with responses classified as always, often, sometimes, occasionally, or never.

### **Ethical consideration:**

- **Study protocol was approved by Ethical Research Committee of Faculty of Medicine, Mansoura University, Egypt**
- **Ethical approval was obtained from the MNG-HA Jeddah, Saudi Arabia.**
- **Verbal consent was obtained from all participating HCWs.**

- The study complied with the ethical guidelines stipulated in the Declaration of Helsinki.

### Data Analysis:

Data entry and analysis were conducted using the Statistical Package for the Social Sciences (SPSS), version 23. Descriptive statistics—means, standard deviations, frequencies, and percentages—were generated to summarize the characteristics of the study sample. Independent t-tests were utilized to compare mean scores, while Pearson's correlation coefficient was applied to evaluate associations between variables. Significance level was set at  $p \leq 0.05$ .

## RESULTS

**Table (1): Socio-demographic characteristics of studied subjects**

Characteristics	No=239	%
<b>Gender</b>		
Males	126	52.7
Females	113	47.3
<b>Nationality:</b>		
Saudi	202	84.5
Non-Saudi	37	15.5
<b>Occupations:</b>		
Physician	71	29.7
Nurses	89	37.2
Technicians & health inspectors	52	21.8
Others	27	11.3
<b>Type of facility:</b>		
Public	213	89.1
Private	27	10.9
<b>Place of work:</b>		
PHC/ polyclinic	208	87.0
Hospital	27	11.3
Administration/ others	4	1.7
<b>Work site:</b>		
Outpatient	219	91.6
Inpatient	16	6.7
Emergency department	3	1.3
Other	1	0.4

No: Number, PHC: Primary Health Center.

Out of 239 studied subjects; 52.7% were males and 84.5% were Saudis. As regards their occupations; physicians were 29.7%, nurses were 37.2% and technician & health inspectors were 21.8 with 11.3% in other occupations.

The type of facilities was public in 89.1% and private in 10.9%. Polyclinic was the commonest place of work 87.0% and the commonest site was the outpatient 91.6%. **Table 1**

**Table (2): Knowledge response of health care workers about COVID-19**

Parameters	NO=239	(%)
<b>Correct knowledge about the agent</b>		
Don't know	16	6.7
Yes	223	93.3
<b>Close contact with infected person is most important</b>		
Don't know	15	6.3
Yes	224	93.7
<b>Most common symptoms of COVID-19</b>		
Fever	115	48.1
Cough	116	48.5
Shortness of breath	8	3.3
<b>Most common modes of transmission</b>		
Touching	193	80.8
Coughing-blood transmission	45	18.8
Shaking hands-mosquito bite	1	0.4
<b>Antibiotics are effective against COVID-19</b>		
No	120	50.2
Don't know	11	4.6
Yes	108	45.2
<b>Antivirals are effective against COVID-19</b>		
No	78	32.6
Don't know	10	4.2
Yes	151	63.2
<b>Flu vaccine is effective for COVID-19</b>		
No	83	34.7
Don't know	15	6.3
Yes	141	59
<b>Washing hands can reduce the risk if disease transmission:</b>		
Disagree	24	10
Agree	215	90
<b>Mask is recommended to be worn by every person all the time</b>		
No	9	3.8
Yes	230	96.2
<b>Health care workers should wear mask all the time at work</b>		
Disagree	215	90
Agree	24	10

No: Number, COVID-19: Coronavirus Disease 2019.

Table (2) showed that 93.3% of the studied health care workers gave correct knowledge about COVID-19. Most of them (93.7%) responded by "yes" as the contact with infected person is important for disease transmission. The studied subjects gave nearly average knowledge about disease symptoms, mode of transmission, antibiotics use, effectiveness of antiviral in treatment of COVID-19 cases, use of vaccine. Washing hands and wearing masks for prevention of disease was agreed in 90.0% and 96.7% of the studied subjects respectively.

**Table (3): Attitude response of health care workers toward COVID-19:**

Parameters	No=239	%
<b>Worrying about COVID-19 pandemic</b>		
No	12	5
Somewhat	20	8.4
Yes	207	86.6
<b>Worrying about dangers of disease</b>		
No	15	6.3
Yes	224	93.7
<b>Worrying about risk to my family and friends</b>		
No	11	4.6
Yes	228	95.4
<b>Worrying about social isolation</b>		
No	13	5.4
Yes	226	94.6
<b>Fear of getting disease during work</b>		
Strongly disagree	1	0.4
Disagree	2	0.8
Neutral	13	5.4
Agree	64	26.8
Strongly agree	159	66.5
<b>Fear of carrying infection from my work place to home</b>		
Disagree	3	1.3
Neutral	5	2.1
Agree	59	24.7
Strongly agree	172	72
<b>Thinking about information from MoH is sufficient</b>		
Disagree	3	1.3
Neutral	24	10
Agree	65	27.2
Strongly agree	147	61.5
<b>Obtaining protective equipment is difficult</b>		
Strongly disagree	83	34.7
Disagree	61	25.5
Neutral	34	14.2
Agree	41	17.2
Strongly agree	20	8.4
<b>My institute is well prepared for COVID-19 pandemic</b>		
Disagree	7	2.9
Neutral	23	9.6
Agree	65	27.2
Strongly agree	144	60.3
<b>In my opinion COVID-19 outbreak will</b>		
Disappear completely	79	33.1
Continue as small epidemics in different parts	116	48.5
Shrink to sporadic case	44	18.4
<b>I think disease burden is</b>		
Same as being reported	76	31.8
Over reported	79	33.1
Under reported	42	17.6
Don't know	42	17.6

No: Number, MoH: Ministry of Health, COVID-19: Coronavirus Disease 2019.

Table (3) showed that the positive responses (yes) for the first four statements of the attitude tool were 86.6%, 93.7%, 95.4% and 94.7% respectively. The percentage of strongly agree for the following four statements were 66.5%, 72.0%, 61.5% and 8.4% respectively. For the last two statements, 48.5% of the studied personnel had an attitude that Covid\_19 would continue as small epidemics in different parts and 33.1% of them thought that the disease burden was over reported.

**Table (4): Practice of health care workers toward COVID-19**

Parameters	NO=239	(%)
<b>Cleaning hands with soap or alcohol-based rub</b>		
Occasionally	8	3.3
Sometimes	3	1.3
Often	12	5
Always	216	90.4
<b>Wearing surgical mask during my work</b>		
Never	12	5
Occasionally	3	1.3
Sometimes	20	8.4
Often	36	15.1
Always	168	70.3
<b>Advising all people seeking care when having symptoms of flu</b>		
No	15	6.3
Yes	224	93.7
<b>Educating patients about preventive measures for COVID-19</b>		
Never	8	3.3
Occasionally	8	3.3
Sometimes	23	9.6
Often	66	27.6
Always	134	56.1
<b>Feeling confident enough to educate patients about COVID-19</b>		
No	5	2.1
Somewhat	34	14.2
Yes	200	83.7

No: Number, COVID-19: Coronavirus Disease 2019.

Table (4) demonstrated that 90.4% of participants consistently practiced hand hygiene and 70.3% regularly wore masks. Advising others about COVID-19 was reported by 93.7%, while 56.1% always educated patients regarding preventive measures. Additionally, 83.7% of HCWs indicated that they felt confident in educating their patients about COVID-19.

**Table (5): Differences in knowledge, attitude and practice scores among studied group regarding gender, nationality and work sector:**

Parameters	Male (126)	Female (113)	Test of significance
	mean $\pm$ SD	mean $\pm$ SD	
Total knowledge score	24.6 $\pm$ 2.4	25.5 $\pm$ 2.9	t=2.6, p $\leq$ 0.05
Total attitude score	33.3 $\pm$ 2.8	33.2 $\pm$ 2.8	t= 0.3, p>0.05
Total practice score	17.3 $\pm$ 2.7	17.3 $\pm$ 2.3	t= 0.05, p>0.05
Parameters	Saudi (202)	Non-Saudi (37)	Test of significance
	mean $\pm$ SD	mean $\pm$ SD	
Total knowledge score	24.7 $\pm$ 2.7	26.5 $\pm$ 2.2	t=3.8, p $\leq$ 0.05
Total attitude score	33.2 $\pm$ 2.9	33.2 $\pm$ 2.03	t= 0.001, p >0.05
Total practice score	17.1 $\pm$ 2.6	18.4 $\pm$ 1.06	t= 2.9, p $\leq$ 0.05
Parameters	Public sector (213)	Private sector (26)	Test of significance
	mean $\pm$ SD	mean $\pm$ SD	
Total knowledge score	24.7 $\pm$ 2.7	27.1 $\pm$ 1.4	t=4.1, p $\leq$ 0.05
Total attitude score	33.2 $\pm$ 2.8	33.6 $\pm$ 2.1	t= 0.7, p >0.05
Total practice score	17.3 $\pm$ 2.5	17.4 $\pm$ 2.6	t= 0.3, p >0.05

SD: Standard Deviation, t: t-test, p: Probability value, \*: Significant p-value.

Table (5) showed that the average score of knowledge about Covid\_19 was significantly higher in females. While there was no significant difference between males and females as regard the average attitude and practice scores. Also, the average scores of knowledge and practice about Covid\_19 were significantly higher in Saudi HCWs. While, there the average attitude was nearly the same in Saudi and non-Saudi HCWs. The average score of knowledge about Covid\_19 was significantly higher among those working in private sector. While there was no significant difference between public and private as regard the average attitude and practice scores.

**Table (6): Difference between different occupations at primary health center regarding knowledge, attitude and practice of COVID-19:**

Occupations	Total score		
	Knowledge (mean $\pm$ SD)	Attitude (mean $\pm$ SD)	Practice (mean $\pm$ SD)
Physicians/dentists (71)	24.37 $\pm$ 3.02	32.63 $\pm$ 2.07	18.28 $\pm$ 1.68
Nurse (89)	26.00 $\pm$ 2.33	33.87 $\pm$ 2.06	17.71 $\pm$ 1.77
Technologists/health inspector(52)	24.69 $\pm$ 2.20	33.90 $\pm$ 3.15	16.69 $\pm$ 2.60
Others (27)	24.29 $\pm$ 3.55	32.00 $\pm$ 4.73	14.70 $\pm$ 3.96
Significance test	F=6.427, P<0.001	F=5.532, P 0.001	F=18.176, P<0.001
Place of work	Total score		
	Knowledge (mean $\pm$ SD)	Attitude (mean $\pm$ SD)	Practice (mean $\pm$ SD)
PHC/ polyclinic (208)	24.76 $\pm$ 2.73	33.25 $\pm$ 2.95	17.20 $\pm$ 2.59
Hospital (27)	26.81 $\pm$ 2.08	33.63 $\pm$ 1.62	18.00 $\pm$ 1.94
Administration/ others (4)	27.25 $\pm$ 1.89	32.25 $\pm$ 1.71	18.75 $\pm$ 0.50
Significance test	F=8.526, P<0.001	F=0.212, P 0.810	F=1.871, P 0.156

SD: Standard Deviation, F: F-test (ANOVA), P: Probability value, PHC: Primary Health Center, \*: Significant p-value.



Table (6) showed that the average score of knowledge about Covid\_19 was significantly higher among nurses. While there, the average attitude score was significantly higher among nurses and technologists/health inspectors. In contrast average practice score was substantially higher among physicians. This table also showed that the average score of knowledge about Covid\_19 was significantly higher among administrative personnel those working in hospitals. While there, the average attitude and practice scores weren't significantly differed in relation to the place of work.

**Table (7): Correlations between total scores of knowledge, attitude and practice:**

Parameters	Total knowledge score	Total practice score
Total attitude score	$r=0.353$ , $p\leq0.001$	$r=0.252$ , $p\leq0.001$
Total practice score	$r=0.307$ , $p\leq0.001$	-----

r: Pearson correlation coefficient.

Table (7) showed that there was a significant positive mild correlation between knowledge, attitude and practice score. By means, with raising knowledge score among health care workers, their attitude and practice score were significantly raised.

## DISCUSSION

This work aimed to evaluate the KAP of HCWs in the context of the COVID-19 pandemic. Upon completing this study, we conclude that while HCWs demonstrated strong knowledge, their attitudes and practices varied based on multiple factors such as gender, workplace setting, and occupation. A comparative analysis with previous research highlights both strengths and gaps that can inform future public health interventions.

### Knowledge about COVID-19:

The findings of this study reveal that HCWs exhibited a high level of knowledge regarding COVID-19, with 93.3% demonstrating correct understanding of the virus. This aligns with previous studies conducted in India and the UAE, where healthcare professionals displayed similar levels of awareness [14]. However, while overall knowledge scores were high, discrepancies emerged in specific areas. For instance, only 59% of participants correctly identified the flu vaccine's effectiveness against COVID-19, indicating gaps in vaccine-related education. This suggests a need for targeted interventions that address these inconsistencies and promote continuous training.

A comparative analysis with a study from Egypt by **Abdel Wahed *et al.*** [18] demonstrated that Egyptian HCWs had an average knowledge score of 80.4%, slightly lower than the results obtained in our research. However, a common trend across both studies was the reliance on institutional training programs for COVID-19 knowledge dissemination. Similarly, findings from Ethiopia by **Jemal *et al.*** [13] showed that HCWs in low-resource settings struggled with misinformation, reinforcing the need for globally standardized COVID-19 education.

The role of misinformation in shaping knowledge about COVID-19 has been significant, particularly in regions where healthcare infrastructure is less developed. Studies indicate that while social media platforms served as valuable sources of information, they also contributed to the spread of misinformation, leading to confusion among HCWs [5]. Addressing this issue requires enhanced media literacy programs and improved institutional communication strategies to provide accurate and timely information.

Furthermore, knowledge disparities based on gender and occupations were evident. Female participants demonstrated higher overall knowledge scores compared to their male counterparts, which aligns with trends observed in a study conducted among medical staff in Chinese psychiatric hospitals regarding COVID-19 [10]. Additionally, physicians exhibited the highest knowledge levels, likely due to their extensive medical training, whereas support staff displayed knowledge gaps, underscoring the importance of role-specific training.

### Attitudes toward COVID-19:

HCWs' attitudes toward COVID-19 in our study were generally positive. The majority acknowledged the severity of the virus and expressed concern over workplace exposure. Interestingly, while 66.5% of participants strongly agreed that the fear of infection affected their daily work, a significant portion also expressed confidence in their institutions' preparedness. This was consistent with findings from a UAE-based study, where 50.5% of HCWs expressed fear of carrying the virus home, yet 55.1% trusted their workplace's infection control measures [19].

However, variations in attitudes were observed based on job roles and workplace settings. Nurses and health inspectors exhibited more positive attitudes compared to physicians, potentially due to their direct involvement in patient care. A contrasting multicenter study from Ethiopia reported that a majority of HCWs felt unprepared due to inadequate PPE access and insufficient hospital protocols [13]. These discrepancies suggest that institutional preparedness plays a pivotal role in shaping HCWs' perceptions and confidence.



The psychological impact of COVID-19 also influenced attitudes. A systematic review <sup>[20]</sup> found that HCWs globally reported anxiety and stress due to fear of transmission and high patient loads. Our findings reinforce this trend, as many participants expressed mental distress and the need for better psychological support structures within their institutions. Prolonged stress and anxiety not only affect personal well-being but can also lead to decreased job performance and burnout. Addressing these issues requires a proactive approach, including mental health training, resilience-building workshops, and peer support programs <sup>[21]</sup>.

### Practices Related to COVID-19:

A crucial aspect of this study was assessing HCWs' adherence to safety measures. While 90.4% reported regular hand hygiene and 93.7% advised patients on flu symptoms, mask-wearing compliance remained suboptimal at 70.3%. This finding is lower than that reported in a similar study conducted in Iran during the First Wave of the Pandemic, where 97.2% of HCWs consistently wore masks while interacting with patients <sup>[22]</sup>.

A deeper look into occupational differences highlights that physicians had the highest adherence to safety protocols, a finding consistent with previous research conducted among HCWs in Three Sub-Saharan African Countries <sup>[23]</sup>. Conversely, support staff and HCWs in administrative roles exhibited lower compliance rates, underscoring the importance of inclusive training initiatives that target all staff members, irrespective of job designation.

A notable concern is the impact of pandemic fatigue on adherence to protective measures. Studies have shown that prolonged exposure to crisis conditions leads to decreased compliance with safety protocols over time <sup>[12]</sup>. This highlights the need for continuous reinforcement of best practices and periodic refresher training for HCWs. In regions where institutional policies included regular monitoring and feedback mechanisms, adherence levels remained significantly higher <sup>[15]</sup>.

### STUDY LIMITATIONS

Because the study followed a cross-sectional design, causation cannot be inferred. Longitudinal studies are warranted to establish causal relationships. Moreover, the dependence on self-reported responses from healthcare workers presents the possibility of response bias, particularly social desirability bias, whereby participants may report what is deemed acceptable instead of their true perspectives or practices.

### CONCLUSION AND RECOMMENDATIONS

This study revealed that Saudi HCWs had a solid foundation of knowledge about COVID-19, along with generally positive attitudes and practices. Female HCWs demonstrated a higher average knowledge score compared to their male counterparts. However, there was no substantial variation in the average attitude and practice scores between genders. Similarly, Saudi HCWs showed higher average knowledge and practice scores compared to non-Saudi HCWs, with no significant difference in attitude scores. HCWs working in the private sector exhibited higher knowledge scores than those in the public sector, although their attitudes and practices didn't significantly differ.

Nurses and technologists/health inspectors showed significantly higher attitude scores, while physicians exhibited higher practice scores. The place of work also influenced knowledge scores, with administrative personnel and those working in hospitals having higher scores. The study showed that there was a significant mild correlation between knowledge, attitude and practice.

Overall, a positive correlation existed between knowledge, attitude, and practice scores, indicating that an increase in knowledge was associated with better attitudes and practices among HCWs. Nonetheless, there were critical areas requiring improvement, particularly in the realms of vaccine knowledge, adherence to mask-wearing, and availability of protective equipment. Our findings underscored the critical role of knowledge in shaping HCWs' responses to the COVID-19 pandemic. While overall awareness levels were high, targeted improvements in vaccine-related education, PPE accessibility, and mental health support are necessary to optimize pandemic preparedness. Future research should explore long-term behavioral changes among HCWs to assess the sustainability of current interventions.

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