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Knowledge of COVID-19 and it's Determinants among Healthcare Workers in Jeddah, Saudi Arabia

Hani Saleh Alharbi [1] *, Najlaa Ahmed Mandoura [2]

(1) *Covid-19: Preventive medicine Resident, preventive medicine program, Ministry of Health Jeddah, Saudia Arabia*
(2) *Consultant preventive medicine and public health, Preventive medicine program, Ministry of Health, Jeddah, Saudi Arabia*

*Corresponding author, *Email: dr.research333@gmail.com

Abstract

Introduction: Level of knowledge about COVID-19 could be an indicator of the ability of Saudi health staff to acquire and update new medical knowledge which is a critical need in emergency situations. This study aims to assess level and determinants of knowledge about COVID-19 among health care workers in Primary Healthcare centers.

Methods: This is a cross-sectional study included all healthcare workers who work in five primary healthcare centers located in Jeddah city. A validated version of questionnaire, designed from the interim guidance and information for health workers. 12 questions to assess HCWs' knowledge about COVID-19. A correct answer will be scored 1 point and a false/unknown answer will be scored 0 points. Due to the situation of health quarantine because of COVID-19 pandemic, the questionnaires were distributed to mobile phones of HCWs through online link.

Results: A total sample of 194 of health workers were included in this study, of them 57.2% were males and 83.9% were married. Regarding occupation, about 24% were medical doctors, either general practitioners or specialists, while 26.8% were nurses and 21.9% were pharmacists. The most common source of information was reported to be governmental publications. Regarding knowledge about COVID-19, the main score of knowledge was 10.2 ± 1.3 and when we dichotomized the health workers based on the number of correct answers, the percentage of those who had inadequate level of knowledge was 64.4%. Age, occupation, source of information, number of co-workers, timing of work shifts, and being a frontline health worker were significant predictors of knowledge about COVID-19.

Conclusions: The majority of health workers in primary health centers had inadequate level of basic knowledge about COVID-19. There is a need to plan and conduct interventions to improve knowledge about COVID-19, particularly targeting general practitioners.

Keywords: Knowledge, Awareness, Health workers, COVID-19, Transmission

Introduction

Coronavirus disease 2019 (COVID-19) caused by SASRS-CoV2 has spread in an exponential rate since December 2019, when it was first identified in Wuhan city, China. Tell now, more than 13,800,00 people were confirmed to have SARS-CoV2 with more than 580,000 reported deaths [1]. In 11 March 2020, the World Health Organization announced COVID-19 as a global pandemic. Since then, extreme unpreceded control measures were applied by most countries in the world including strict social distancing, closure of public gathering places, travelers quarantine, and intensive health education campaigns. Corona viruses are responsible of three known pandemics including severe acute respiratory syndrome coronavirus (SARS-CoV) in 2003 [2], the Middle East respiratory syndrome coronavirus (MERS-CoV) in 2013 [3], and finally the current pandemic of COVID-19. Only 15% of the infected people showed symptoms such as fever, fatigue, headache, dry cough, myalgia, dyspnea, and anosmia. Complications occur in a small percentage of patients (4%) and death is reported in 1.0 - 3.3% of the patients [4, 5].

SARS-CoV2 is a single-stranded RNA enveloped virus that belongs to beta Coronavirus family. Infection of SARS-CoV2 is transmitted mainly through droplets or aerosol that expelled by infected persons during coughing or talking. Other means of transmission include hand-surface transmission, fomites, and less commonly fecal-oral mode of transmission [6]. Thus, social distancing, hand hygiene, and wearing of masks were considered as effective measures to prevent virus transmission. The basic productive number of SARS-CoV2, which represents how many persons will be infected from one patient during its infectious period, ranged from 2-6.47 in most affected countries [7].

The diagnosis of COVID-19 is guided by clinical features and radiological findings of ground glass appearance, but the result should be confirmed by RT-PCR with 66-80% sensitivity [8]. The management of the disease is mainly supportive including antipyretics and antitussive, in addition to oxygen supplementation and respiratory aid in complicated cases [9]. Protocols for the prevention, diagnosis, and treatment of COVID-19 was developed by National Health Commission (NHC) in China and they suggested a combination of protease inhibitors (lopinavir and ritonavir) with INF-α [10]. The available information about COVID-19 is still incomprehensive and knowledge about means of prevention and treatment are limited. However, the basic knowledge about infection transmission and prevention is essential for epidemic containment, especially among health workers. The proper updated knowledge about disease management is the cornerstone in reduction of morbidity and mortality. Level of knowledge about COVID-19 could be an indicator of the ability of Saudi health staff to acquire and update new medical knowledge which is a critical need in emergency situations. This study aims to assess level and determinants of knowledge about COVID-19 among health care workers in Primary Health Care centers.

Methods

This is a cross-sectional study included all healthcare workers who work in five primary healthcare centers located in Jeddah city. We included 194 health workers and we did power calculation to assess the adequacy of the collected sample size. We used G*power to calculate the power to detect a moderate effect size (0.30) by chi-square test at 5 degrees of freedom. We found a power of 0.92, which is enough to detect significant associations. A validated version of questionnaire, designed from the interim guidance and information for health workers published by the CDC, which previously used in China (22), was be used in the current study. The questionnaire is self-administered and consists of two sections of questions, section A about sociodemographic factors of the healthcare workers, and section B contains 12 questions to assess HCWs' knowledge about COVID-19. A correct answer will be scored 1 point and a false/unknown answer will be scored 0 points. The total knowledge score should be ranged from 0 to 12, with a higher score indicating a good knowledge of COVID-19. The Cronbach's alpha of the knowledge scale was estimated to be 0.71 in Chinese heath workers, indicating an acceptable internal consistency (11). Level of knowledge was bichromatized based on the mean score, so those above the mean were considered to have a good level

of knowledge, while those below the mean were considered to have inadequate level of knowledge. Due to the situation of health quarantine because of COVID-19 pandemic, the questionnaires were distributed to mobile phones of HCWs through online link and responses were collected automatically into excel sheet. Reminders were sent to the healthcare workers to motivate them to participate. Data were entered and analyzed by Statistical Package of Social Science SPSS, version 26. The descriptive statistics such as frequencies, percentages were calculated to summarize nominal and ordinal data, while mean, median and standard deviation or the range to describe numerical variables. Chi-squared test was applied to evaluate the association between the determinants and the outcome variables. Any P-value < 0.05 was considered as an indication for a statistically significant association or difference. The healthcare workers were called by the investigator to describe the aim and objectives of the study, and to asked them to provide a written consent after they already received all the important information. The study protocol was approved by the research committee of the Saudi program for Preventive Medicine in Jeddah and the Ethical Research Committee (IRB) of Health directorate in Jeddah.

Results

A total sample of 194 of health workers, from five different health centers in Jeddah city, were included in this study. More than half of the health workers (57.2%) were males and 83.9% were married. The majority of the respondents (67.9%) aged 31-50 years with mean age equals to 37.2±8.6. Regarding occupation, about 24% were medical doctors, either general practitioners or specialists, while 26.8% were nurses and 21.9% were pharmacists. The most common source of information was reported to be governmental publications by three quarters of the health workers, followed by social media and public media which accounted for 10.8% and 6.2% respectively (Table 1).

Table 2 demonstrates work-related characteristics among the health workers. About 64% of the health workers works in morning shifts and 61% had more than 10 co-workers at the same workplace. The majority reported that they work with both genders of

Table (1): Distribution of demographic characteristics among the health workers

Characteristics	Frequency	Percent (%)
Gender		
Male	111	57.2
Female	83	42.8
Age		
30	38	20.3
31-40	104	55.6
41-50	23	12.3
>50	22	11.8
Marital status		
Single	27	14.1
Married	161	83.9
Divorced	4	2.1
Occupation		
Medical practitioners	28	15.3
Nurses	49	26.8
Pharmacists	40	21.9
Radiology staff	13	7.1
Laboratory specialists	6	3.3
Managerial	31	16.9
Specialist	16	8.7
Source of information		
Governmental information	145	74.7
Public media	12	6.2
Research articles	6	3.1
Social media	21	10.8
Websites	5	2.6
Others	5	2.6

patients. Those who had previous training with COVID-19 and those who worked as frontline workers were accounted for 53.6% and 52.4% of the respondents. Regarding knowledge about COVID-19, the main score of knowledge was 10.2±1.3 and when we dichotomized the health workers based on the number of correct answers, the percentage of those who had inadequate level of knowledge was 64.4%.

Knowledge about CIVID-19 among health workers, based on correct answers, is demonstrated in

Table (2): Distribution of the work-related characteristics among the health workers

Characteristics	Frequency	Percent (%)
Number of co-workers		
<5	19	10.1
5-10	55	29.1
>10	115	60.8
Gender of patients		
male	30	15.9
Female	17	9.0
Both	142	75.1
Work shift		
Morning	120	64.5
Evening	17	9.1
Night shift	26	14.0
24 hours	23	12.4
Previous training on COVID-19		
Yes	104	53.6
No	90	46.4
Frontline health worker		
Yes	100	52.4
No	91	47.6
Knowledge about COVID-19		
Inadequate knowledge	121	64.4
Good knowledge	67	35.6

table 3. The highest percentage of correct answers (98.5%) was in the responses of items 9 and 11 which were about need of preventive measures for children and young adults and the effectiveness of patient's isolation, respectively. The lowest percentage of knowledge was found in item 2 and 5 which were about difference between common cold and COVID-19 in terms of symptoms and the direct transmission of COVID-19 from wild animals.

Table 4 and 5 present association between health workers characteristics and knowledge about COVID-19. Gender and previous training in COVID-19 were not significant determinants of good knowledge about COVID-19. However, other factors such as age, occupation, source of information, number of co-workers, timing of work shifts, and being a frontline

health worker were significant predictors of knowledge about COVID-19. Consultants had the largest percentage (84.6%) of good knowledge in comparison to other job titles, while general practitioners had the lowest percentage of good knowledge (17.9%). Regarding source of information, all health workers who take information about COVID-19 from research articles had a good knowledge, followed by 60% of those who depend on website information. On another hand, all health workers who reported social or public media as a source of information had inadequate knowledge about COVID-19. All those who had night shift and 81% of those who was working 24 hours had inadequate level of knowledge in comparison to only 35.5% and 56% of those who work in the evening and morning wok shifts, respectively (p<0.001). About a half of frontline health workers had good knowledge in comparison to a fifth of non-frontline workers (p<0.001).

Using Spearman's correlation, there was a significant correlation between age and knowledge score (r=0.18, p=0.016). Moreover, a significant correlation was found between number of patients per week and knowledge score (r= 0.27, p=0.001).

Discussion

The pandemic of novel coronal virus has been a globally health problem that led to large morbidity and mortality among health workers. Despite huge educational campaigns and efforts that have been conducted at global and local levels, inadequate level of knowledge commonly reported either in general population or in health workers. Based on the clinical experience in Saudi Arabia, a considerable number of COVID-19 patients seeking help from pharmacies and primary healthcare centers. Health workers are the frontal-line in dealing with this pandemic and they are exposed for a high risk of catching the infection. We conducted a cross-sectional study that aimed to assess the basic knowledge about COVID-19 among health workers in primary health centers.

Regarding knowledge about COVID-19, the main score of knowledge was 10.2±1.3 and when we dichotomized the health workers based on the number of correct answers, the percentage of those who had

Table (3): Knowledge about CIVID-19 among health workers based on correct answers

Question	Frequency	Percentage
K1. The main clinical symptoms of COVID-19 are fever, fatigue, dry cough, and myalgia.		
Correct answers	188	96.9
Incorrect answers	6	3.1
K2. Unlike the common cold, stuffy nose, runny nose, and sneezing are less common in persons infected with the COVID-19 virus.		
Correct answers	119	62.3
Incorrect answers	72	37.7
K3. There currently is no effective cure for COVID-2019, but early symptomatic and supportive treatment can help most patients recover from the infection.		
Correct answers	173	90.6
Incorrect answers	18	9.4
K4. Not all persons with COVID-2019 will develop to severe cases. Only those who are elderly, have chronic illnesses, and are obese are more likely to be severe cases.		
Correct answers	145	74.7
Incorrect answers	49	25.3
K5. Eating or contacting wild animals would result in the infection by the COVID-19 virus.		
Correct answers	136	70.1
Incorrect answers	58	29.9
K6. Persons with COVID-2019 cannot infect the virus to others when a fever is not present.		
Correct answers	166	86.9
Incorrect answers	25	13.1
K7. The COVID-19 virus spreads via respiratory droplets of infected individuals.		
Correct answers	179	93.7
Incorrect answers	12	6.3
K8. Ordinary residents can wear general medical masks to prevent the infection by the COVID-19 virus.		
Correct answers	159	82.0
Incorrect answers	35	18.0
K9. It is not necessary for children and young adults to take measures to prevent the infection by the COVID-19 virus.		
Correct answers	191	98.5
Incorrect answers	3	1.5
K10. To prevent the infection by COVID-19, individuals should avoid going to crowded places such as train stations and avoid taking public transportations.		
Correct answers	177	91.2
Incorrect answers	17	8.8
K11. Isolation and treatment of people who are infected with the COVID-19 virus are effective ways to reduce the spread of the virus.		
Correct answers	191	98.5
Incorrect answers	3	1.5
K12. People who have contact with someone infected with the COVID-19 virus should be immediately isolated in a proper place. In general, the observation period is 14 days.		
Correct answers	152	79.6
Incorrect answers	39	20.4

inadequate level of knowledge was 64.4%. Since it is a basic knowledge assessment, we considered answering less than 10/12 questions correctly is inadequate level of knowledge. In Saudi Arabia, more than 478,000 of cases and 7,700 deaths were reported till May 2021 [11]. There are few studies aimed to assess the level of knowledge about COVID-19 among health staff in Saudi Arabia.

A cross-sectional study included dentists in Qassim university found good level of knowledge about COVID-19 symptoms, means of transmission. However, knowledge was inadequate about specific protective measures for dental staff [12]. Similarly, in Jordan, dentists were found aware about COVID-19 symptoms, transmission, and general preventive measures. However, they had inadequate knowledge about extra-precautions recommended to protect dental team [13].

An online survey included health workers, in Saudi Arabia, from primary healthcare center reported a lower knowledge than we found across many questions of knowledge assessment. They found only

Table (4): Association between respondents' characteristics and knowledge about COVID-19

Factor	Knowledge about COVID-19		Chi-square	P value
	Inadequate knowledge	Good Knowledge		
Gender				
Male	70	39	0.02	0.962
	64.2%	35.8%		
Female	51	28		
	64.6%	35.4%		
Age group				
30	26	12	12.9	0.005*
	68.4%	31.6%		
31-40	70	28		
	71.4%	28.6%		
41-50	16	7		
	69.6%	30.4%		
>50	7	15		
	31.8%	68.2%		
Occupation				
Medical practitioners	23	5	30.8	<0.001*
	82.1%	17.9%		
Nurses	38	11		
	77.6%	22.4%		
Pharmacists	25	15		
	62.5%	37.5%		
Radiology staff	10	3		
	76.9%	23.1%		
Laboratory specialists	3	3		
	50.0%	50.0%		
Managerial	12	19		
	38.7%	61.3%		
Specialist	2	11		
	15.4%	84.6%		
Source oof information				
Governmental information	81	58	35.4	<0.001*
	58.3%	41.7%		
Public media	12	0		
	100.0%	0.0%		
Research articles	0	6		
	0.0%	100.0%		
Social media	21	0		
	100.0%	0.0%		
Websites	2	3		
	40.0%	60.0%		
Others	5	0		
	100.0%	0.0%		

45.5% knew about the causative agent of COVID-19 and 63% knew that antibiotic have no essential role in the management of the disease. About one third though that wearing of surgical masks is not suitable for COVID-19 prevention [14] .

A higher level of knowledge was found in Indian healthcare workers and medical students, as two thirds reported correct answers to questions about COVID-19 and a fourth of them responded incorrectly to questions about medical triage, respiratory problems, isolation room requirements [15]. However, the variability in the assessment tools, type of questions and method of score calculation could explain a large portion of variation in knowledge between different studies [16].

Level of knowledge reported in this study is much lower than that reported in other countries such as China, where knowledge about COVID-19 was inadequate in only 11% of health workers [17]. Similarly, results of a survey study in Pakistan showed that only 20% of health workers have poor knowledge [18]. However, health workers knowledge was poor in Iran where About 43% of nurses had poor knowledge about sources, transmission, clinical features, management and prognostic outcomes [19].

In the present study, the most common source of information was reported to be governmental publications by three quarters of the health workers, followed by social media and public media which accounted for 10.8% and 6.2% respectively. Similar findings reported in online survey that conducted in Saudi Arabia, where governmental source of information was the commonest and reported by 97.4% of the health workers [14]. In Iran, the majority of nurses reported that main source of information about COVID-19 was guidelines of Ministry of Health and World Health Organization [7]. In the present study, all health workers who take information about COVID-19 from research articles had a good knowledge, followed by 60% of those who depend on website information. This could be explained by a good quality of information provided through research articles as well as the audience of research articles are usually those who are highly qualified and more acknowledgeable. We found all health workers who reported social or public media as a source of information had inadequate knowledge about COVID-19. This supports the argument that social media plays

a negative role and disseminate misconceptions during the pandemic [20].

The positive correlation between old age and knowledge about COVID-19 could be attributed to degree of specialty, since senior health professionals are expected to have more knowledge about medical conditions. Moreover, as it well-known that old age had a higher risk of COVID-19 complications, feeling of fear might increase the need to read and be more knowledgeable about novel corona infection [21].

Consultants, in the present study, had the largest percentage (84.6%) of good knowledge in comparison to other health professionals, while general practitioners had the lowest percentage of good knowledge (17.9%). This could be explained by findings of an online survey among Saudi population where physicians were found to had good knowledge regarding certain questions but they had poor knowledge regarding others [14]. Thus, the total score of knowledge could vary widely based on the questions used to assess the knowledge.

In the present study, all those who had night shift and the majority of those who was working 24 hours had inadequate level of knowledge in comparison to those who work in the evening and morning wok shifts, respectively. Many reasons could be behind this difference such as lack of time for reading, less opportunity in training, slow professional development, and more stress and anxiety that accompanied night shifts [22].

We found that 52.4% of the included health workers were frontline COVID-19 health workers and about a half of them had a significantly better knowledge in comparison to a fifth of non-frontline workers. Frontline health workers were found more knowledgeable about COVID-19 in several studies [23-25]. Health workers at frontlines for COVID-19 are expected to be more proactive and more aware about COVID-19 transmission, risk factors, treatment and prevention.

Limitations of this study include lack of standardized assessment tool of knowledge about COVID-19. Although we targeted workers in certain health workers, questionnaires were sent to them through online link which reduce the validity of the responses.

Conclusions

The majority of health workers in primary health centers had inadequate level of basic knowledge about COVID-19. The most common source of information was reported to be governmental publications and all health workers who reported social or public media as a source of information had inadequate knowledge about COVID-19. Gender and previous training in COVID-19 were not significant determinants of good knowledge about COVID-19. However, other factors such as age, occupation, source of information, number of co-workers, timing of work shifts, and being a frontline health worker were significant predictors of knowledge about COVID-19. There is a need to plan and conduct interventions to improve knowledge about COVID-19, particularly targeting general practitioners.

Conflict of interests

The authors declared no conflict of interests.

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Table (5): Association between work-related factors and knowledge about COVID-19

Job characteristics	Knowledge about COVID-19		Chi-square	P value
	Inadequate knowledge	Good Knowledge		
Number of co-workers				
<5	11	8	7.4	0.024*
	57.9%	42.1%		
5-10	43	12		
	78.2%	21.8%		
>10	62	47		
	56.9%	43.1%		
Work shifts				
Morning	66	51	22.9	<0.001*
	56.4%	43.6%		
Evening	6	11		
	35.3%	64.7%		
Night shift	21	5		
	80.8%	19.2%		
24 hours	20	0		
	100.0%	0.0%		
Previous training on COVID-19				
Yes	67	31	1.4	0.231
	68.4%	31.6%		
No	54	36		
	60.0%	40.0%		
Frontline health worker				
Yes	50	47	14.5	<0.001*
	51.5%	48.5%		
No	69	19		
	78.4%	21.6%		