

Coronavirus Pandemic

Knowledge, attitude and precautionary practices towards COVID-19 among healthcare professionals in Karachi, Pakistan

Sadia Shakeel^{1,2}, Hina Rehman³, Mohammad Azmi Hassali¹, Faraz Hashmi⁴

¹ *Discipline of Social and Administrative Pharmacy, School of Pharmaceutical Sciences, University Sains Malaysia, Penang, Malaysia*

² *Faculty of Pharmaceutical Sciences, Dow University of Health Sciences, Karachi, Pakistan*

³ *Institute of Pharmaceutical Sciences, Jinnah Sindh Medical University, Karachi, Pakistan*

⁴ *Sindh Medical College, Jinnah Sindh Medical University, Karachi, Pakistan*

Abstract

Introduction: With the increase in the incidence rate of COVID-19, healthcare professionals (HCPs) being at the frontline of the outbreak response are at higher risk of getting exposure and suffering from the infection. The present study aimed to evaluate the knowledge, attitude, and precautionary practices of HCPs towards COVID-19.

Methodology: The current study was a descriptive, cross-sectional, online study directed to the HCPs working in a metropolitan city of Karachi, during February 2020 and March 2020 using a self-administered questionnaire. A systematic random sampling approach was adopted.

Results: A total of 286 completed surveys were incorporated in the investigation with a response rate of 74.28%. The median (interquartile range, IQR) knowledge score was 18.79 (17.64-19.57). Physicians were found to be more knowledgeable (OR: 1.32, 95% CI: 0.17-4.26, $p = 0.003$) as compared to other HCPs. Similarly, the HCPs working in private work settings (OR: 1.94, 95% CI: 1.54-2.79, $p=0.001$), having more experience (OR = 1.82; 95% CI = 1.64-2.78; $p < 0.005$) were found to be more well-informed than HCPs working in public sector (OR = 0.81; 95% CI = 0.63–0.72; $p = 0.004$). The correlation between the knowledge and attitude of respondents was found to be significantly correlated (correlation coefficient: 0.13, $p < 0.005$).

Conclusions: The findings of the study revealed that HCPs were well conversant and have an optimistic attitude towards COVID-19. Further contemplates are required to evaluate the understanding of HCPs at a national level so that viable mediations could be planned to combat this pandemic.

Key words: COVID-19; Healthcare professionals; pandemic; Pakistan.

J Infect Dev Ctries 2020; 14(10):1117-1124. doi:10.3855/jidc.12714

(Received 26 March 2020 – Accepted 19 September 2020)

Copyright © 2020 Shakeel *et al.* This is an open-access article distributed under the Creative Commons Attribution License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

Introduction

Coronavirus disease (COVID-19) is a communicable disease caused by an unfamiliar strain that has not been earlier recognized in human beings. Recent evidence suggested that the virus is transferred among people through close contact and droplets when an infected person sneezes or coughs [1]. The World Health Organization (WHO) declared on 11 March 2020 COVID-19 a pandemic; indicating a massive number of confirmed cases of the disease all over the world and the continuous risk of further global spread [2]. Pakistan has the most vulnerable geographical location for this pandemic as it sandwiches between China; a country of origin and Iran [3]. Pakistan, the second worst-hit country in South Asia next to India, reported the initial two cases of COVID-19 in Karachi and Islamabad confirmed by the Pakistan Federal

Health Minister on 26 February 2020 [3]. The number of reported confirmed COVID-19 cases has now reached 30,334 and more than 659 related deaths have been reported [4]. Individuals most at risk of getting the infection are those who interact with or care for COVID-19 patients. Thousands of healthcare professionals (HCPs) are on the forefront to battle the pandemic which inevitably places them at high infection risk [5]. The hazards comprise of pathogenic exposure, lengthy operational hours, tiredness, work-related stress, stigma, and psychological and physical violence [6, 7]. WHO has developed technical guidance and likewise started online training sessions to increase vigilance about the prevention and control of HCPs and other individuals dealing with the infection to assure their safety [8]. Furthermore, the National Institute of Health (NIH), Islamabad, Pakistan published several

recommendations for HCPs intended to decrease the occupational spread of infection among HCPs. Steps have been taken to ensure that healthcare settings do not become the sources that amplify the virus’ spread, infecting healthcare staff and other patients, but a lack of personal protective equipment (PPE) and other health facilities have exposed HCPs to the risk of getting the disease in crowded hospitals. Greater than 440 health workers have been tested positive for COVID-19 and 8 health workers have expired in Pakistan so far, as per the latest data communicated by authorities [9]. The situation is creating legitimate anxiety among HCPs; though, educational campaigns have improved the awareness of HCPs towards prevention from COVID-19. However, it remains uncertain to what level this information can be put into practice and to which extent this practice could help in reducing the spread of infection [10]. Therefore, this investigation was directed to assess the knowledge, attitude, and precautionary practice of HCPs towards COVID-19 in Pakistan and to comprehend their insight for countering the risk.

Methodology

The current descriptive cross-sectional study was directed to the HCPs including physicians, pharmacists, dentists, and other HCPs working in a metropolitan city of Karachi, during February 2020 and March 2020 using a self-administered questionnaire through Google Form online distribution. The respondents were considered eligible for the study if they were ready to provide their consent to contribute to the study. The ethical approval of this study was obtained from an independent ethical review board. Written consent was also obtained from each respondent before the study and they were assured about the confidentiality of their responses.

Sample Size calculation

Sufficient sample size stays a significant concern when conducting research, because of the unknown size of the target population. Moreover, for studies that are conducted online, the investigator may need to select more members to represent potential missing error, since the investigator does not influence the response of the HCPs [11]. The, “power study” technique was executed using a Web-based calculator for sample size calculation [12]. Furthermore, the adjustment in sample size was completed for non-response or missing values by the following formula:

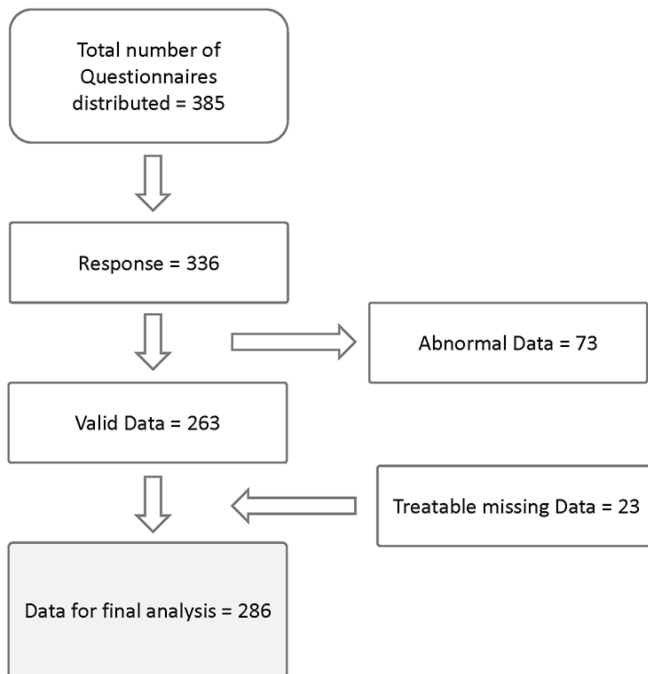
$$n_1 = n / (1 - d)$$

Where, *n* is the prerequisite sample size, *n₁* is adjusted sample size and *d* represents the potential non-response or missing rate. The sample size of 230 can accomplish greater than 90% power considering 30% non-response/ missing error rate and only 1% margin of error. A systematic random sampling approach was adopted.

Development of Questionnaire

Following a broad literature review on the topic, a preliminary draft of a questionnaire was prepared [13, 14]. The questionnaire consists a total of 35 items: the first section was concerned with the demographic information of the respondents including 5 questions; the second section included 21, 5 and 4 questions related to knowledge, attitude and precautionary practice of HCPs towards COVID-19, respectively. The knowledge domains include epidemiology, high risk group, disease transmission, incubation period and quarantine, symptoms, diagnosis and treatment [2,13]. The total knowledge score was calculated by adding up 21 questions (K-1 to K-21) evaluating the respondent’s knowledge, and every correct response was given 1 point and unanswered questions and incorrect responses were given 0 points. In the attitude section, all questionnaire items (A-1 to A-5) were recorded on a 5-point scale: 1 = strongly agree and 5 = strongly disagree. The 4 practice questions (P-1 to P-4) were included to evaluate the current practice of HCPs during

Figure 1. Data cleaning procedure.



the pandemic. The survey was piloted to assure face validity and that all the needed adjustments had been tended to.

Content Validity and Reliability Analysis

The questionnaire development was accomplished by five experts comprising three clinical pharmacists and two senior physicians. The content validity index (CVI) was intended by using the CVI calculation technique for knowledge, attitude and practice [15]. The I-CVI/Ave score for a knowledge domain was stated 0.76, for attitude 0.71 and practice 0.74. Furthermore, the reliability was confirmed by Cronbach's alpha and the values for knowledge, attitude and practice were found to be 0.8, 0.71 and 0.77, respectively.

Data Management

The data were check and cleaned for inadequate information and likewise for extreme values by an informal technique [16] (Figure 1). Since an online survey was the method of data collection, the missing cases were predictable; some of them were treated by using the last observation carried forward method [17] and some of them were omitted from the concluding analysis.

Statistical Analysis

The data obtained from the study were coded and entered into an Excel sheet to check for errors before they were transferred into the Statistical Package for Social Scientists (IBM SPSS version 24.0). Descriptive statistics and cross-tabulation were employed to describe the study variables, and frequencies with their resultant percentages are presented. Pearson Chi-square test (p value < 0.05) was employed to estimate the relationship between the dependent (knowledge and attitude), and independent variables (demographic characteristics of the respondents). One-way ANOVA analysis was carried out to evaluate the difference in mean attitude score by demographic characteristics. The Spearman correlation coefficient ($p < 0.05$) was applied to assess the relationship between knowledge, attitude and practice of respondents.

Results

Demographic characteristics

In the current research, 385 HCPs working in clinics/ hospitals, community pharmacies and academic institutes of Karachi were asked to participate in the study. Out of them, 336 HCPs show their willingness to participate after initial contact. Lastly, 286 completed

Table 1. Characteristics of study population.

Characteristics of study population	Frequency (%)
Gender	
Female	226 (79.02)
Male	60 (20.97)
Profession	
Physicians	38(13.28)
Pharmacists	154(53.84)
Dentists	26(9.09)
Others HCPs	68(23.77)
Organization	
Private sector	221(77.27)
Public sector	65(22.72)
Years of experience	
Less than 5 years	45 (15.73)
5 - 10 years	108 (37.76)
10 - 15 years	98 (34.26)
15 - 20 years	24 (8.39)
20 years and above	11 (3.84)

surveys were incorporated in the investigation with a response rate was 74.28%. Amongst them, 38 (13.28%) were physicians, 154 (53.84%) were pharmacists, 26 (9.09%) were dentists and 68 (23.77%) were other HCPs. A total of 60 (20.97%) males and 226(79.02%) females participated and majority, 221 (77.27%) was rendering their services in private sector. Mean age of the respondents was 36.32 ± 5.23 years with 206 (72.02%) having a working experience of 5-15 years (Table 1).

Respondents' knowledge towards COVID -19

The correct responses of 21 knowledge questions on the COVID-19 are illustrated in Table 2. The median (interquartile range, IQR) knowledge score was 18.79 (17.64-19.57), suggesting an overall 89.51% correct rate of knowledge assessment for COVID -19. The knowledge score was found to be statistically significant with the profession ($p = 0.001$) and experience ($p=0.004$) of respondents. However, no significant association was observed between gender of respondents ($p = 0.17$) and the knowledge score. Physicians were found to be more knowledgeable (OR: 1.32, 95% CI: 0.17-4.26, $p = 0.003$) as compared to other HCPs. Similarly, the HCPs working in private work settings (OR: 1.94, 95% CI: 1.54-2.79, $p = 0.001$), having more experience (OR = 1.82; 95% CI = 1.64-2.78; $p < 0.005$) were found to be more knowledgeable than HCPs working in public sector (OR = 0.81; 95% CI = 0.63–0.72; $p = 0.004$). The most reliable sources of information for the HCPs towards COVID-19 were mass media 191 (66.78%), medical literature 49 (17.13%) and other HCPs 23(8.04%) (Figure 2).

Table 2. Respondents' knowledge towards COVID -19.

	Question statement	Correct answer (%)
Epidemiology		
K-1	COVID-19 was unknown before the recent outbreak began in 2019	267 (93.35)
K-2	The virus is a new strain that has not been previously identified in humans	281 (98.25)
K-3	COVID-19 is the same as Severe acute respiratory syndrome coronavirus (SARS-CoV)	228 (79.72)
K-4	The place of the recent outbreak of COVID-19	271 (94.75)
High-risk group		
K-5	Most people (about 80%) recover from the disease without needing special treatment	254 (88.81)
K-6	Those with underlying medical problems like high blood pressure, heart problems or diabetes, are more likely to develop serious illness	251 (87.76)
K-7	The age group having the highest probability of infection	279 (97.55)
Disease transmission		
K-8	The route of transmission of COVID-19	274 (95.80)
K-9	COVID-19 can be transmitted through the air	256 (89.51)
K-10	COVID-19 be caught from a person who has no symptoms	248 (86.71)
K-11	COVID-19 be caught from the feces of someone with the disease	231 (80.76)
K-12	An individual can catch COVID-19 from a pet	229 (80.06)
K-13	There is a reservoir of COVID-19	217 (75.87)
Incubation period and quarantine		
K-14	The incubation period of COVID-19	251 (87.76)
K-15	The duration of quarantine of COVID-19 suspected individual	258 (90.20)
Symptoms, diagnosis and treatment		
K-16	The vaccine, drug or treatment available for COVID-19	277 (96.85)
K-17	Clinical features of COVID-19	269 (94.05)
K-18	The measures for control of the COVID-19 outbreak	279 (97.55)
K-19	Personal protective equipment recommended by WHO	261 (91.25)
K-20	The investigation used for the diagnosis of COVID-19	237 (82.86)
K-21	Case management strategies available	249 (87.06)

Table 3. Respondents' attitude towards COVID-19.

	Attitude Statement	Strongly agree and Agree (%)	Strongly disagree and Disagree (%)	Neutral (%)	Gender	Prof.	Org.	Exp.
A-1	Do you think the disease is dangerous?	210 (73.42)	29 (10.13)	47 (16.43)	0.248	0.005*	0.428	0.002*
A-2	Do you think that the infection can be cured?	219 (76.57)	38 (13.28)	29 (10.13)	0.311	0.001*	0.003*	0.013*
A-3	Will you feel embarrassed to tell others if someone in your family will be diagnosed with this infection?	39 (13.63)	206 (72.02)	41 (14.33)	0.723	0.002*	0.001*	0.52
A-4	Do you think that people diagnosed with the infection are themselves responsible to cause their condition?	93 (32.51)	126 (44.05)	67 (23.42)	0.323	0.0001*	0.522	0.615
A-5	Do you think that someone who has completed quarantine or has been released from isolation pose a risk of infection to other people?	46 (16.08)	209 (73.07)	31 (10.83)	0.237	0.073	0.413	0.452

*p value considered statistically significant; Prof: Profession; Org: Organization; Exp: Experience.

Respondents’ attitude towards COVID-19

More than 70% of the respondents agreed that COVID -19 is a dangerous disease and stated that somebody who has completed the isolation and quarantine requirement or has been free from isolation does not transfer an infection risk to other individuals. More than 70% of the respondents stated that they would not feel embarrassed to tell others if someone in their family will be diagnosed with this infection. Only 32.51% blamed that people diagnosed with the infection are themselves responsible to cause their condition (Table 3).

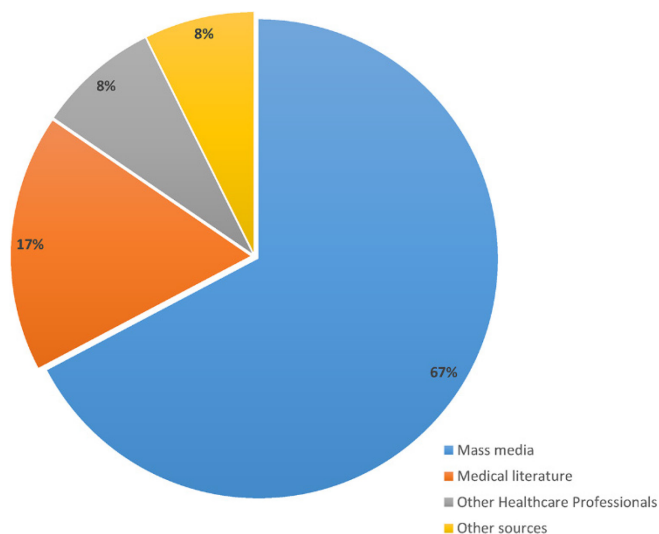
Respondents’ precautionary practices during COVID-19 pandemic

Around 95% of the respondents responded to use alcohol-based hand sanitizer before and after wearing gloves. More than 90% of the respondents worn a mask when leaving home. About 98% were likely to use PPE recommended by WHO to protect themselves when dealing with any patient or suspected individual. Around 34% of the respondents stated that they have gone to any crowded place other than their workplace in recent days. (Table 4) Likewise, it was also revealed that experienced respondents were more knowledgeable with optimistic attitude when compared to those who were comparatively fresh ($p = 0.004$). There was a significant difference observed in knowledge score (19.12 vs 17.53, $p = 0.012$) and practice (3.80 vs 2.12, $p = 0.003$) of HCPs having greater than 10 years of experience with those having lesser experience. The spearman correlation test showed a significant positive association between the knowledge and attitude of HCPs about COVID-19 ($r = 0.13, p < 0.005$).

Discussion

Our investigation provided a snapshot of Pakistani HCPs’ knowledge, attitude, and practice related to COVID-19. To the best of our knowledge, no such study has been reported till to-date, and ours is the first study on this subject among the HCPs working in

Figure 2. Respondents’ reliable sources of information for COVID-19.



Pakistan. The response rate of the current study was 74.28% which is in the acceptable limit of online surveys for representing the target population [18]. The present findings depicting the good knowledge of COVID-19 in respondents was expected since the study was led during the beginning period of the pandemic. A similar level of knowledge among medical staff was observed in another study reporting 89.51% of the respondents had extensive knowledge of COVID-19 [19]. However, Olum *et al.* reported lower knowledge among healthcare workers [20]. The outcomes of the current study revealed that the knowledge of respondents about the epidemiology of COVID-19 was satisfactory; however, some of the respondents were not sure when they were asked about the similarity of COVID-19 and SARS. It is obvious that each of these infections appears to influence people in an unexpected way, so it is hard to extrapolate from SARS to COVID-19. Accordingly, it was much simpler to isolate and contact tracing with SARS, since the infection was self-evident. However, it is more difficult to trace individuals affected by COVID-19 until they presented

Table 4. Respondents’ precautionary practices following COVID-19 pandemic.

Practice Statement	Yes (%)	No (%)	Gender	Profession	Organization	Experience
P-1 In recent pandemic, did you use personal protective equipment recommended by WHO?	278 (97.20)	8 (2.79)	0.142	0.012*	0.002*	0.013*
P-2 Did you use alcohol-based hand sanitizer before and after wearing gloves?	271 (94.75)	15 (5.24)	0.021*	0.0001*	0.014*	0.362
P-3 In recent days, do you have a habit of wearing a mask when leaving home?	258 (90.20)	28 (9.79)	0.063	0.041*	0.005*	0.002*
P-4 In recent days, have you gone to any crowded place other than your work place?	97 (33.91)	189 (66.08)	0.003*	0.052	0.214	0.043*

*p value considered statistically significant.

the symptoms of the disease, and there are many mild or asymptomatic reported cases of COVID-19 [21].

More than 85% of the respondents knew that most persons who fall sick with COVID-19 will suffer from mild to moderate symptoms and get well without any special treatment. They recognized that the older persons and individuals with pre-existing medical conditions including diabetes, heart disease, asthma appear to be more at risk to become severely ill with the virus, similar findings have been reported in the literature [22]. Research has shown that 8 out of 10 mortalities in the US were reported in adults who are 65 years older [23]. In China, only 2.1% belonged to the age of < 20 years, and no demises were observed among those < 10 years of age among the confirmed COVID-19 patients as of 11 February 2020 [24]. A similar trend was observed for the European Region having the largest percentage of older persons. There have been overall 151,797 mortalities in Europe since the first recorded European death due to the COVID-19 on 15 February 2020 in France [25]. It was observed that major deaths were reported in those older than 60 years. It has also been revealed that major deaths were reported in persons who were having at least one underlying co-morbidity, particularly diabetes, hypertension and cardiovascular diseases, or any other chronic underlying conditions [26].

More than 95% of the respondents knew the route of transmission of COVID-19. The infection is likely to communicate mostly from one person to another or by the respiratory droplets exhaled when infected individual coughs or sneezes [27]. More than 85% of the respondents knew that COVID-19 can be caught from a person who has no symptoms. A similar pattern of knowledge towards COVID-19 symptoms, mode of transmission, and infection controls was reported in another study [28]. In some cases, the communication of disease spread might not be predictable before individuals indicate the symptoms [29]. The knowledge score was found to be statistically significant with the profession ($p = 0.001$); since the current research involves physicians, pharmacists, dentists as well as other HCPs who might not be much conversant with the COVID-19 attributes. The majority of the respondents had acquired awareness about COVID-19 from mass communication sources. Another study reported that the main sources of COVID-19 information were social media and the Ministry of Health website [30]. This outcome is supported by another study which indicated that respondents' leading source of knowledge was Television for such kinds of infections [31]. However, caution must be taken when utilizing the web to pick up

health facts due to the information over-burden. It is hard to decide the authenticity of the information source since anyone can be easily misinformed. Hence, emphasis should be given on the advancement of evaluation skills among HCPs for the extraction of information from the web. The Ministry of Health website should likewise be updated regularly and HCPs must be urged to visit the official site to look for information with respect to COVID-19 [32].

Knowledge is the precursor to attitude and ultimately behavioral change. The vast majority of the respondents had an optimistic approach towards the disease and the majority (76.5%) stated that the infection can be cured. However, the percentage was smaller than a Chinese study, in which 90% of respondents were hopeful about the successful control of COVID-19 [33]. The flare-up of COVID-19 can prompt social stigma toward individuals who are susceptible or individuals discharged from COVID-19 isolate despite the fact that they are not viewed as a hazard for spreading the infection to other people [34]. In the current study, more than 70% negated that somebody who has complete the isolation and quarantine requirement or has been free from isolation can transfer infection to other individuals. Only 32.51% blamed that people diagnosed with the infection are themselves responsible to cause their condition. Their attitude of accusing the patient for their condition might be due to the fact that common people in Pakistan is not taking the issue seriously. There is a lack of preventive practices taken by the public in spite of strong self-quarantine recommendation by the government; the COVID-19 cases in Pakistan are consistently expanding [4]. In the current study, about 98% of healthcare workers who participated in the study were likely to use PPE, as recommended by WHO to protect themselves when dealing with any patient or suspected individual. Health worker rights include the expectation that employers in health facilities provide information, instruction, and training on occupational safety and health, including; refresher training on infection prevention and control (IPC) and the use, putting on, taking off and disposal of PPE. The Pakistani National Institute of Health (NIH) has played its role in disseminating the protocols with respect to COVID-19, likewise, it has launched a public awareness campaign through the Ministry of Health official websites and other ways of mass communication [35]. These includes the utilization of PPE and facemasks, the treatment of suspected cases, test collection and transport through infection transport medium, and sufficient hand and body cleanliness, and so on [36].

The recommendations put emphasis that HCPs should accept the responsibility to make sure that all essential preventive and protective measures are taken to reduce occupational safety and health risks. They should follow established occupational safety and health procedures, avoid exposing others to health and safety risks and participate in employer-provided occupational safety and health training [37]. However, in real scenario the shortages of PPE in the country are leaving doctors, pharmacists, nurses, and other frontline workers dangerously ill-equipped to care for COVID-19 patients, since there is a limited access to supplies such as gloves, medical masks, respirators, goggles, face shields, gowns, and aprons in the health care settings [38]. Without secure supply chains, the risk to healthcare workers to be affected from the infection is obvious. It is not possible to stop COVID-19 without protecting health workers first. The government must act quickly to boost supply, develop incentives for industry to ramp up production, ease export restrictions, and put measures in place to stop speculation and hoarding [39].

The present study depicted the positive relationship among knowledge, attitude, and practice of HCPs with COVID-19. Taking this into account, it could be expected that HCPs with a progressively more positive approach towards COVID-19 are motivated to look for additional information towards the infection. The explanation of this association could be clarified by the hypothesis of Reasoned Action [40]. Though, future examinations would be required to build up a deeper understanding of what stimulates both the knowledge and the attitude of the HCPs.

Conclusions

HCPs in the current study showed an optimistic attitude and were knowledgeable about COVID-19, yet there is a scope to improve in particular knowledge areas including the possible diagnosis and management of infection. The study recommends establishing extensive health education campaigns for HCPs to fill the gap between the existing and the requisite advanced knowledge by emphasizing on less conversant areas. Likewise, the current priority for governments given the virus outbreak requires supportive health policies and strengthening frontline services for a pandemic response.

Authors' Contributions

SS Conception and designing, analyzed the data and drafted the manuscript. HR collect the data for the study and participated in the interpretation of data and critical review of

the manuscript. AH and FH led the study design and revised the manuscript critically for important intellectual content. All authors read and approved the final manuscript.

References

1. Shereen MA, Khan S, Kazmi A, Bashir N, Siddique R (2020) COVID-19 infection: origin, transmission, and characteristics of human coronaviruses. *J Adv Res* 24: 91-98.
2. Cucinotta D, Vanelli M (2020) WHO declares COVID-19 a pandemic. *Acta Biomed* 91: 157-160.
3. Saqlain M, Munir MM, Ahmed A, Tahir AH, Kamran S (2020) Is Pakistan prepared to tackle the coronavirus epidemic? *Drugs Ther Perspect* 1–2.
4. Nafees M, Khan F (2020) Pakistan's Response to COVID-19 Pandemic and Efficacy of Quarantine and Partial Lockdown: A Review. *Electron J Gen Med* 17: em240
5. Remuzzi A, Remuzzi G (2020) COVID-19 and Italy: what next? *The Lancet* 395:1225-1228.
6. Adams JG, Walls RM (2020) Supporting the health care workforce during the COVID-19 global epidemic. *JAMA* 323: 1439-1440
7. Bai Y, Yao L, Wei T, Tian F, Jin DY, Chen L, Wang M (2020) Presumed asymptomatic carrier transmission of COVID-19. *JAMA* 323: 1406-1407.
8. Huang C, Wang Y, Li X, Ren L, Zhao J, Hu Y, Zhang L, Fan G, Xu J, Gu X, Cheng Z (2020) Clinical features of patients infected with 2019 novel coronavirus in Wuhan, China. *The Lancet* 395: 497-506
9. Javed B, Sarwer A, Soto EB, Mashwani Z-u-R (2020) Is Pakistan on track to have COVID-19 transmission and mortality rates similar to those of Italy, Iran or the USA? *Drugs Ther Perspect* 15: 1–5.
10. Chirico F, Nucera G, Magnavita N (2020) COVID-19: Protecting Healthcare Workers is a priority. *Infect Control Hosp Epidemiol* 41: 1117.
11. Sakpal T (2010) Sample size estimation in clinical trial. *Perspect Clin Res* 1: 67–69.
12. Turner BO, Paul EJ, Miller MB, Barbey AK (2018) Small sample sizes reduce the replicability of task-based fMRI studies. *Commun Biol* 7:1-0.
13. Sohrabi C, Alsafi Z, O'Neill N, Khan M, Kerwan A, Al-Jabir A, Iosifidis C, Agha R (2020) World Health Organization declares global emergency: A review of the 2019 novel coronavirus (COVID-19). *Int J Surg* 76: 71–76.
14. Kannan S, Ali PSS, Sheeza A, Hemalatha K (2020) COVID-19 (Novel Coronavirus 2019)–recent trends. *Eur Rev Med Pharmacol Sci* 24: 2006-2011
15. Yusoff MSB (2019) ABC of Content Validation and Content Validity Index Calculation. *Educ Med J* 11: 49–54.
16. Osborne JW (2013) Best practices in data cleaning: A complete guide to everything you need to do before and after collecting your data: Sage 10: 37-43
17. Lang T (2007) Documenting research in scientific articles: Guidelines for authors: 3. Reporting multivariate analyses. *Chest* 131: 628-632.
18. Johnson TP, Wislar JS (2012) Response rates and nonresponse errors in surveys. *JAMA* 307: 1805-1806.
19. Shi Y, Wang J, Yang Y, Wang Z, Wang G, Hashimoto K, Zhang K, Liu H (2020) Knowledge and attitudes of medical staff in Chinese psychiatric hospitals regarding COVID-19. *Brain Behav Immun* 4: 100064.

20. Olum R, Chekwech G, Wekha G, Nassozi DR, Bongomin F (2020) Coronavirus Disease-2019: Knowledge, Attitude, and Practices of Health Care Workers at Makerere University Teaching Hospitals, Uganda. *Front Public Health* 8: 181.
21. Xu Z, Shi L, Wang Y, Zhang J, Huang L, Zhang C, Liu S, Zhao P, Liu H, Zhu L, Tai Y (2020) Pathological findings of COVID-19 associated with acute respiratory distress syndrome. *Lancet Respir Med* 8: 420-422.
22. Driggin E, Madhavan MV, Bikdeli B, Chuich T, Laracy J, Biondi-Zoccai G, Brown TS, Der Nigoghossian C, Zidar DA, Haythe J, Brodie D (2020) Cardiovascular Considerations for Patients, Health Care Workers, and Health Systems During the COVID-19 Pandemic. *J Am Coll Cardiol* 75: 2352-2371.
23. Dong E, Du H, Gardner L (2020) An interactive web-based dashboard to track COVID-19 in real time. *Lancet Infect Dis* 20: 533-534
24. Jin H, Lu L, Liu J, Cui M (2020) Novel coronavirus pneumonia emergency in Zhuhai: impact and challenges. *J Hos Infect* 104: 452-453.
25. Spiteri G, Fielding J, Diercke M, Campese C, Enouf V, Gaymard A, Bella A, Sognamiglio P, Moros MJ, Riutort AN, Demina YV (2020) First cases of coronavirus disease 2019 (COVID-19) in the WHO European Region, 24 January to 21 February 2020. *Euro Surveill* 25:2000178.
26. Saglietto A, D'Ascenzo F, Zoccai GB, De Ferrari GM (2020) COVID-19 in Europe: the Italian lesson. *The Lancet* 395: 1110-1111.
27. Rothan HA, Byrareddy SN (2020) The epidemiology and pathogenesis of coronavirus disease (COVID-19) outbreak. *J Autoimmun* 109: 102433.
28. Khader Y, Al Nsour M, Al-Batayneh OB, Saadeh R, Bashier H, Alfaqih M, Al-Azzam S (2020) Dentists' Awareness, Perception, and Attitude Regarding COVID-19 and Infection Control: Cross-Sectional Study Among Jordanian Dentists. *JMIR Public Health Surveill* 6: e18798.
29. Velavan TP, Meyer CG (2020) The COVID-19 epidemic. *Trop Med Int Health* 25: 278-280.
30. Giao H, Han NTN, Van Khanh T, Ngan VK, Van Tam V, Le An P (2020) Knowledge and attitude toward COVID-19 among healthcare workers at District 2 Hospital, Ho Chi Minh City. *Asian Pac J Trop Med* 13: 260-265
31. Brug J, Aro AR, Oenema A, De Zwart O, Richardus JH, Bishop GD (2004) SARS risk perception, knowledge, precautions, and information sources, the Netherlands. *Emerg Infect Dis* 10: 1486-1489.
32. Bragazzi NL, Mansour M, Bonsignore A, Ciliberti R (2020) The role of hospital and community pharmacists in the management of COVID-19: Towards an expanded definition of the roles, responsibilities, and duties of the pharmacist. *Pharmacy* 8:140.
33. Zhong BL, Luo W, Li HM, Zhang QQ, Liu XG, Li WT, Li Y (2020) Knowledge, attitudes, and practices towards COVID-19 among Chinese residents during the rapid rise period of the COVID-19 outbreak: a quick online cross-sectional survey. *Int J Biol Sci* 16: 1745-1752.
34. Roberto KJ, Johnson AF, Rauhaus BM (2020) Stigmatization and prejudice during the COVID-19 pandemic. *Adm Theory Praxis* 24: 1-5.
35. Mukhtar S (2020) Preparedness and proactive infection control measures of Pakistan during COVID-19 pandemic outbreak. *Res Social Adm Pharm [Epub ahead of print]*.
36. Badar N, Salman M, Aamir UB, Ansari J, Ranjha MA, Khan MA, Ikram A, Nisar N, Mushtaq N, Mirza HA (2020) Evolutionary analysis of influenza A (H1N1) pdm09 during the pandemic and post-pandemic period in Pakistan. *J Infect Public Health* 13: 407-413.
37. Matricardi PM, Dal Negro RW, Nisini R (2020) The first, holistic immunological model of COVID-19: implications for prevention, diagnosis, and public health measures. *Pediatr Allergy Immunol* 31: 454-470.
38. Howard J, Huang A, Li Z, Tufekci Z, Zdimal V, Westhuizen H, Von Delft A, Price A, Fridman L, Tang L, Tang V, Watson G.L, Bax C.E, Shaikh R, Questier F, Hernandez D, Chu L.F, Ramirez C.M, Rimoin A.W (2020) Face Masks Against COVID-19: An Evidence Review. Preprints 2020040203
39. Jiménez-Pavón D, Carbonell-Baeza A, Lavie CJ (2020) Physical exercise as therapy to fight against the mental and physical consequences of COVID-19 quarantine: Special focus in older people. *Prog Cardiovasc Dis* 63: 386-388.
40. Haines A, de Barros EF, Berlin A, Heymann DL, Harris MJ (2020) National UK programme of community health workers for COVID-19 response. *Lancet* 395: 1173-1175.

Corresponding author

Dr. Sadia Shakeel
 Postdoctoral Fellow, Discipline of Social and Administrative
 Pharmacy, School of Pharmaceutical Sciences
 University Sains Malaysia
 11800 USM, Pulau Pinang, Malaysia
 Tel: 01118859609
 E-mail: sadiashakeel@usm.my, sadia.shakeel@duhs.edu.pk

Conflict of interests: No conflict of interests is declared.