Original Article

Knowledge, Attitude, And Practices Regarding COVID-19 (Coronavirus) Infection Control and Prevention among Radiology Staff; a Perspective from Largest Private Tertiary Care Hospital in Pakistan

Shayan Sirat Maheen Anwar[1], Noman Khan[1], Anwar Ahmed[1], Muhammad Fazal Hussain Qureshi[2*], Muzna Shah[2]

1. *Department of Radiology, Aga Khan University Hospital, Karachi, Pakistan.*
2. *Department of Medicine, Dr. Ziauddin University Hospital, Karachi, Pakistan.*

How to cite this article: **Shayan Sirat Maheen Anwar, Noman Khan, Anwar Ahmed, Muhammad Fazal Hussain Qureshi, Muzna Shah. Knowledge, Attitude, And Practices Regarding COVID-19 (Coronavirus) Infection Control and Prevention among Radiology Staff; a Perspective from Largest Private Tertiary Care Hospital in Pakistan. Archives of Razi Institute. 2025;80(2):587-595.** DOI: 10.32592/ARI.2025.80.2.587

Article Info:
Received: 26 August 2023
Accepted: 25 February 2024
Published: 30 April 2025

Corresponding Author's E-Mail:
fazalhqureshi22@gmail.com
muhammad7877@zu.edu.pk

ABSTRACT

The global impact of the novel Coronavirus (SARS-CoV-2) on radiology practices has been significant. X-ray followed by Computed Tomography (CT) has become the gold standard of examination. In order to ensure the safety of patients with a confirmed case of the novel coronavirus, it is imperative that appropriate screening procedures, disinfection of equipment, and the use of personal protection equipment are implemented. The objective of the present survey was to assess the knowledge, attitudes, and practices of radiology staff with regard to the control and prevention of infection by the virus known as SARS-CoV-2, or to its most prevalent manifestation, the disease that has been termed "Coronavirus Disease 2019 (henceforth referred to as "Covid-19")". A cross-sectional, single-centre survey was conducted in the Radiology Department of Aga Khan University Hospital between 1 June 2020 and 1 July 2020. The researchers designed and administered a self-administered, validated questionnaire. Cronbach's Alpha was applied to measure the internal consistency and reliability; 0.8 was achieved for the Knowledge and Practice sections, respectively, while 0.7 was achieved for the Attitude section. The majority of participants (86%) demonstrated sufficient knowledge regarding the novel coronavirus. A significant association was identified between higher knowledge scores and seniority, as well as educational attainment, when compared to junior staff. The study revealed that a significant proportion of the participants, amounting to 75.4%, exhibited a favourable attitude towards the measures employed for the control and prevention of the novel strain of the Coronavirus. The investigation further established a correlation between the participants' educational attainment, their working hours, and their positive attitudes. The majority of female participants, senior members of the department, front-line workers, and individuals who work more than 50 hours per week exhibited a greater adherence to global guidelines compared to other groups. In conclusion, the knowledge, attitude, and practices of the majority of the radiology department's personnel were adequate and representative of safe practices. Junior staff demonstrated lower mean scores, indicating potential for enhancement through awareness sessions and fact-based dialogues.

Keywords: Radiology, Attitude, Knowledge, COVID, Practice.

1. Introduction

In December 2019, a novel coronavirus, now designated SARS-CoV-2, was identified in Wuhan, China, as the causative agent of acute atypical respiratory diseases. Due to its high degree of infectivity, the virus spread rapidly on a global scale. On 30 January 2020, the WHO declared the outbreak of the novel coronavirus a Public Health Emergency of International Concern (PHEIC).(1) The global response to the pandemic involved a number of significant changes.(2) Many countries introduced mask mandates, increased testing and contact tracing, enforced lockdowns and extended socio-economic support to citizens at an early stage of the pandemic. Following the development of the vaccines, many countries made them widely and freely available to the public. While these infection control measures were largely successful in preventing a rise in cases of the disease, some remained skeptical of their effectiveness. As has been the case in numerous other countries, Pakistan instigated a series of lockdowns with the aim of combating the rapid spread of infections caused by the novel coronavirus (6, 7). With the 4th wave of the pandemic now imminent, it is clear that the global health crisis is far from over. In the context of the ongoing pandemic, the success of efforts to combat the emergence of new strains of the virus is contingent on the strict adherence to infection control measures and the effective implementation of vaccinations. The standard testing method for the presence of the SARS-CoV-2 virus, which causes the disease known as "coronavirus disease 2019" (abbreviated to "covid-19"), is based on a process known as "reverse transcription polymerase chain reaction" (abbreviated to "RT-PCR"). However, it should be noted that a negative RT-PCR test cannot rule out a case of SARS-CoV-2 infection due to the fact that it is not very sensitive. Consequently, imaging with chest radiography and computed tomography (CT) has become a complementary examination (8, 9). CT is widely available, can be performed rapidly and has high sensitivity. Consequently, a significant number of medical facilities are utilising Computed Tomography (CT) for the screening, evaluation, and subsequent follow-up of patients afflicted with Coronavirus Disease 2019 (Covid-19) and who are exhibiting respiratory symptoms. Ground-glass opacities (GGO) with or without consolidation in the bilateral, peripheral and posterior lungs were initially described as the cardinal feature of pneumonia due to the novel coronavirus (nCoV) on CT imaging.[10] Further research has since led to the recognition of multiple additional findings, which are seen with variable frequency. These include interlobular septal thickening, crazy paving pattern, bronchial wall thickening, reverse halo sign and air bronchograms.(11-13) The global impact of the novel coronavirus (SARS-CoV-2) on radiology practices has been significant. In order to ensure the safety of patients with a confirmed case of the novel coronavirus (SARS-CoV-2) infection, it is imperative that appropriate screening procedures, disinfection of equipment, and the use of personal protective equipment (PPE) are implemented. Non-urgent imaging and interventional procedures may be rescheduled. The objective of the present survey was to evaluate the knowledge, attitudes and practices of radiology personnel with regard to the control and prevention of infection by the virus known as SARS-CoV-2, which is commonly referred to as "coronavirus".

2. Materials and Methods

2.1. Study Design and Subjects

A cross-sectional, single-center survey was conducted in the Radiology Department of Aga Khan University Hospital during the rapid rise period of the COVD-19 outbreak. The survey was used to assess the knowledge and understanding of the radiology department staff between 1 June 2020 and 1 July 2020, amid a national lockdown. The survey was administered online via Google Forms. The study was reviewed by the Institutional Ethical Review Committee of Aga Khan University Hospital, which subsequently determined that formal ethical approval was not required.

2.2. Inclusion and Exclusion Criteria

All personnel within the Radiology Department were deemed eligible for involvement in the study, encompassing medical staff such as physicians, nurses, pharmacists, laboratory technicians, as well as non-medical support staff, non-medical administrators, security personnel, maintenance staff, and housekeeping personnel. All participants provided written informed consent for inclusion in the study. The exclusion criteria encompassed all individuals who did not provide consent, those on leave due to having contracted the virus, and those with insufficient literacy to comprehend the questionnaire.

2.3. Questionnaire and Data Collection

A self-administered questionnaire, meticulously validated, was designed and administered to ascertain the extent of knowledge participants possessed regarding infection control and prevention measures. The questionnaire was anonymous, and no personally identifiable information was obtained. The structure of the document was comprised of four sections. The initial segment of the study focused on the demographic characteristics of the sample population, including age, gender, job title, the number of years worked in radiology, weekly working hours, and qualifications. The remaining three sections comprise the Knowledge, Attitude, and Practice categories. The knowledge section comprised 15 questions, each of which was assigned a value of 0.1 points. A cumulative score of 11 or above was deemed adequate. The third segment of the study consisted of seven questions designed to assess the attitudes of the sample population regarding the prevention and control of the novel strain of coronaviruses (SARS-CoV-2). Participants were awarded one point for each positive response, and a cumulative score of four or higher was deemed indicative of a positive attitude. The final section of the study comprised eight inquiries addressing the practices of the sample population concerning the prevention and

control of the novel strain of coronaviruses (SARS-CoV-2). These inquiries were documented on a five-point Likert scale, ranging from 1 (always) to 5 (never). Given the absence of extant scales that would have sufficed for this purpose, the research team undertook the construction and approval of a questionnaire to ensure its face validity. The material for the questionnaire was obtained from literature reviews and data available from the World Health Organization (WHO) and the National Institute of Health of Pakistan. The initial version of the questionnaire was developed by three authors. Subsequently, two researchers revised it to enhance its internal clarity and validity. Additionally, two professionals with expertise in epidemiology, infectious diseases, and public health reviewed it to ensure its validity and appropriateness, with the objective of minimizing bias. The study's reliability was determined by administering the test to a sample of 25 participants. To assess the internal consistency and reliability of the test, Cronbach's Alpha was employed. The results indicated that the Knowledge and Practice section achieved a value of 0.8, while the Attitude section attained a value of 0.7.

2.4. Data Analysis

The data was then subjected to analysis using the Statistical Package for the Social Sciences (SPSS) version 25. The mean with standard deviation was calculated for quantitative variables, while frequency and percentages were used for qualitative variables. The statistical software program, Chi-Square, was utilized to ascertain the relationships between the variables. A p-value of less than 0.05 was deemed to be statistically significant, with a confidence interval of 95%. In addition, the analysis employed both the one-way analysis of variance (ANOVA) and the Mann-Whitney test. These statistical procedures were implemented in accordance with the distribution of the data. A p-value of less than 0.05 was designated as significant.

3. Results

A total of 185 subjects completed the questionnaire, of which 162 were completely filled and used for data analysis (response rate: 87.5%). The majority of the sample population (61%) falls within the 35-45 age bracket, while 23% of the sample population is above the age of 50. The sample was comprised of 51.8% women and 48% men. The sample population was comprised of approximately one-third radiographers, while the remaining two-thirds consisted of nursing staff, radiologists, receptionists, janitors, and so forth. The majority of the sample population (51%) possesses a postgraduate qualification, with 35% having obtained a graduate degree and only 13% having a high school diploma (matriculation/intermediate). The majority of the population has accumulated more than ten years of experience working in radiology. A comprehensive overview of the participants' characteristics is provided in Table 1.

3.1. Knowledge

The majority of the participants (86%) demonstrated sufficient knowledge regarding the novel coronavirus, officially designated as SARS-CoV-2. A significant proportion of the sample population demonstrated awareness of the causative organism for SARS-CoV-2, with 94% of the subjects reporting familiarity with the virus. In comparison, 85% of the population demonstrated awareness of the mode and route of transmission. Furthermore, more than 90% of the population exhibited knowledge regarding the virus's primary signs and symptoms and its incubation period. However, it is noteworthy that only 81% of the participants were aware of symptoms other than the common fever and influenza. A survey revealed that only 88% of respondents were aware of the benefits of proper handwashing in disease prevention. A substantial proportion of the population, specifically 82%, is cognizant of the fact that the probability of contracting a severe case of COVDI increases in conjunction with the presence of comorbidities. The study revealed that 98% of the respondents expressed awareness of the efficacy of masks in preventing infection. However, only 33% were confident in the existence of a cure for COVDI, and only 72% demonstrated knowledge regarding the vaccines available. Tables 2 present a summary of the participants' knowledge regarding the novel strain of the Coronavirus known as SARS-CoV-2, which has been designated as "Covid-19". To ascertain the association between demographic characteristics and total knowledge score, the data underwent further analysis. The Mann-Whitney U test was employed to ascertain the relationship between gender and knowledge scores. However, no statistical significance was identified. It was observed that the mean score of females exceeded that of their male counterparts. A one-way analysis of variance (ANOVA) was employed to ascertain the correlation between mean knowledge scores and job category. A statistically significant association was identified with a p-value of less than 0.05. The mean score of senior professionals in terms of rank (radiologist, patient-facing staff) exceeded that of off radiographers and nurses. The investigation revealed no correlation between mean knowledge scores and the duration of employment in the field or the status of frontline health care workers. A significant association was identified between the level of education and the p-value, which was less than 0.05. Postgraduates exhibited a higher mean than workers who had obtained a bachelor's degree or an intermediate degree as their final qualification. A statistically significant association was also identified (p-value < 0.05) between the number of working hours and the mean knowledge score. Individuals who work more than 80 hours or fewer than 20 hours per week exhibit higher mean knowledge scores compared to those who work between 20 and 80 hours per week. The following table presents a summary of the participants' knowledge regarding the novel coronavirus (SARS-CoV-2) and its association with the participants' characteristics (Table 3).

Table 1. Demographic Characteristics of Sample Population.

Variable	N	%
Gender		
• Male	78	48.15
• Female	84	51.85
Job Category		
• Nursing Staff	15	9.26
• Radiographer	60	37.04
• Radiologist	27	16.67
• Patient facing staff	21	12.96
• Other	39	24.07
Years of Experience		
• <1 Year	12	7.41
• 1-5 Years	33	20.37
• >5 Years	27	16.67
• >10 Years	90	55.56
Front Line Health Care Worker		
• Yes	132	81.48
• No	18	11.11
• Maybe	12	7.41
Working hours per week		
• <20 hours	15	9.26
• 20-50 hours	80	49.38
• 50-80 hours	61	37.65
• >80 hours	06	3.70
Highest Level of Education		
• Matric/Intermediate	21	12.96
• Graduate	57	35.19
• Post-graduate	84	51.85

Table 2. Knowledge of Participants regarding COVID-19.

No	Variable	Correct		Incorrect	
		N	%	n	%
1.	Cause of COVID-19 disease?	153	94.4	09	5.6
2.	COVID-19 a water-borne disease?	141	87	21	13
3.	COVID-19 airborne disease?	138	85.2	24	14.8
4.	COVID-19 transmitted by close contact with an infected person?	156	96.3	06	3.7
5.	What is the time range between infection with COVID-19 and the onset of symptoms?	153	94.4	09	5.6
6.	Fever, cough, and shortness of breath are common symptoms of COVID-19?	151	93.2	11	6.8
7.	Myalgia (muscle aches), sore throat, and diarrhea are also possible symptoms of COVID-19?	132	81.5	30	18.5
8.	Patients with underlying chronic diseases are at a higher risk of infection?	144	88.9	18	11.1
9.	Washing hands with soap and water can help in the prevention of COVID-19 transmission?	144	88.9	18	11.1
10.	Wearing a face mask is an effective prevention strategy for COVID-19?	159	98.1	03	1.9
11.	At this moment, is there a cure for COVID-19?	54	33.3	108	66.7
12.	At this moment, is there a vaccine active against COVID-19?	117	72.2	45	27.8
13.	COVID-19 can be life-threatening?	135	83.3	27	16.7
14.	Where was the first case of COVID-19 recorded?	161	99.4	01	0.6
15.	The scale of Covid-19 disease burden is high?	156	96.3	06	3.7

Table 3. Total knowledge score and their relationship with characteristics of Sample Population.

Variable	Total Knowledge Score			
	Mean	**Median**	**Interquartile range**	**p-value**
Gender				
• Male	12.73	13.00	3.00	0.632*
• Female	13.11	13.00	1.50	
Job Category				
• Nursing Staff	11.80	13.00	4.00	0.000
• Radiographer	12.45	13.00	1.00	
• Radiologist	14.19	14.00	1.00	
• Patient facing staff	14.29	15.00	1.00	
• Other	12.49	13.00	2.00	
Years of Experience				
• <1 Year	13.75	14.50	2.50	0.161
• 1-5 Years	13.03	13.00	3.00	
• >5 Years	12.89	13.00	2.00	
• >10 Years	12.79	13.00	2.00	
Front Line Health Care Worker				
• Yes	12.86	13.00	2.00	0.474
• No	13.56	13.00	1.00	
• Maybe	12.50	12.50	3.50	
Working hours per week				
• <20 hours	14.00	14.00	0.00	0.002
• 20-50 hours	12.88	13.00	2.00	
• 50-80 hours	12.57	13.00	2.00	
• >80 hours	14.50	14.50	1.00	
Highest Level of Education				
• Matric/Intermediate	11.14	13.00	4.00	0.000
• Graduate	12.37	12.00	3.00	
• Post-graduate	13.75	14.00	1.50	

*Mann-Whitney U Test

3.2. Attitude

The study's findings indicated that a significant proportion of the participants exhibited a favorable attitude towards the measures employed for the control and prevention of the novel strain of the Coronavirus. Specifically, the analysis revealed that 75.4% of the subjects displayed a positive stance on the aforementioned measures. The majority of the participants (44.4%) reported feelings of fear regarding the novel coronavirus (henceforth referred to as "the virus"). A comparatively smaller proportion of participants (38.8%) expressed confidence in the virus being contained by the year 2021. Conversely, 57.7% of participants indicated uncertainty regarding the virus's containment prospects for the same period. The preponderance of trends exhibited a favorable disposition with respect to infection control. This was primarily attributable to the heightened awareness of the significance of quarantine, the merits of accurate temperature monitoring, and the deleterious consequences associated with travel during the period of the ongoing pandemic. A third of the population demonstrated a lack of awareness regarding the role of food in the prevention and control of infection. The attitudes of the participants in regard to the novel coronavirus (SARS-CoV-2) are summarized in Table 4. Subsequent subgroup analysis was conducted, and an analysis of variance (ANOVA) was employed, yielding a significant p-value of less than 0.05 between education level and working hours. The results of the study indicated that participants who had obtained a postgraduate degree exhibited a higher level of positive attitude, with a mean score of 6.5. In contrast, individuals who engaged in work activities ranging from 20 to 50 hours per week demonstrated a lower mean score of 4.2, which

Table 4. Attitude Sample Population.

Variable	Yes		No		Maybe	
	N	%	n	%	n	%
Are you afraid of COVID-19?	72	44.4	63	38.8	27	16.6
Do you believe the scale of COVID-19 is overestimated by the media?	48	29.6	69	42.5	45	27.7
Do you think COVID-19 can be brought under control in 2021?	63	38.8	06	3.70	93	57.4
Do you think that people suspected to have COVID-19 should be quarantined?	147	90.7	9	5.56	6	3.70
Do you believe there are some foods that can effectively cure or prevent COVID-19?	24	14.9	90	55.6	48	29.6
Do you think thermal surveillance/screening of passengers at air or sea ports is helpful in preventing the spread of COVID-19?	99	61.1	19	11.7	44	27.2
Do you think it is safe to visit a country with reported COVID-19?	03	1.85	141	87.0	18	11.1

was significantly lower than the mean score of 5.8 observed among those working less than 20 hours and the mean score of 6.2 among those working more than 50 hours.

3.3. Practice

A 5-point Likert scale was employed to document the responses of participants regarding their practices concerning infection control and prevention against COVD. The study found that the subjects exhibited a predominantly positive attitude and demonstrated adherence to proper practices. A study of public health practices revealed that 72% of the population adopted the practice of covering their mouth and nose during coughing and sneezing. A study of population behavior revealed that 96% of the population exhibited proper disposal behaviors for used tissues. Although the majority of the population adhered to the World Health Organization's (WHO) guidelines on hand hygiene, the proper use of personal protective equipment (PPE), mask wearing, and hand hygiene practices, there is a need for further emphasis on these measures to mitigate the spread of infection. The following table presents a summary of the participants' practices regarding the novel coronavirus (SARS-CoV-2) (Table 5). Subsequently, the chi-squared test was employed to ascertain the correlation between demographics and practices. As demonstrated in Table 5, a statistically significant p-value of less than 0.05 was identified for the majority of the practices and demographic variables.

4. Discussion

The Knowledge, Attitude, and Practice (KAP) theory is a theoretical framework that delineates the process of human behavioral change into three distinct phases: the acquisition of knowledge, the formation of attitudes and beliefs, and the development of behavior. (14) According to the KAP theory, the process of behavioral change encompasses the acquisition of knowledge, the generation of attitudes, and the formation of behavior. Consequently, the objective of this study was to survey potential vulnerabilities in behavioral change. While polymerase chain reaction (PCR) remains the prevailing diagnostic instrument, imaging has emerged as a pivotal modality for diagnosis, prognostication, and postoperative monitoring of complications. Consequently, medical imaging providers have become indispensable to the global healthcare teams managing patients with the novel coronavirus. The findings of the study indicated that the majority of the participants demonstrated a satisfactory level of knowledge regarding the etiology, transmission, symptoms, and signs of the novel pathogen, severe acute respiratory syndrome corona virus 2 (SARS-CoV-2), commonly referred to as the "coronavirus." One potential explanation for this observation is that the surveyed population was predominantly comprised of individuals who were employed at the private tertiary care hospital. Consequently, they were in direct contact with infected individuals and were tasked with preventing further transmission of the disease. As demonstrated in our previous research, knowledge is a fundamental element that can significantly contribute to the enhancement of preventive behaviors. Moreover, other studies have previously reported analogous associations when conducting KAP surveys on the subject of the novel coronavirus (SARS-CoV-2) (15, 16). A surprising finding was the similarity observed in the attitudes and practices of the two groups. Despite the pervasive and distressing news reports, the majority of participants exhibited a positive attitude, with 75.4% demonstrating this disposition. Furthermore, post-graduates and individuals who had worked between 20 and 50 hours exhibited higher positive attitude scores compared to other groups. The predominant rationale for this phenomenon is likely attributable to the accumulation of experience derived from prolonged engagement in professional activities and educational pursuits. A comparable trend was exhibited in a study conducted in Jordan among healthcare providers (18). The optimal work schedule is one that ranges from 20 to 50 hours per week. This allows for sufficient time to read the latest literature and improve one's practices. In contrast, healthcare providers who are overworked and unable to read about new trends in the field may not have the

Table 5. Practices and their relationship with characteristics of Sample Population.

Variable	Always	Often	Sometime	Rarely	Never	Gender	Job	Experience	Frontline	Hours/ week	Education
						p-value					
I cover my nose and mouth with a tissue during sneezing or coughing	117	33	12	-	-	0.000*	0.057	0.045*	0.001*	0.000*	0.016*
I throw the used tissue in the trash bin.	156	6	-	-	-	0.016*	0.000*	0.116	0.000*	0.094	0.055
I always change work clothes, first thing at home and wash them separately.	105	21	15	3	18	0.119	0.010*	0.003*	0.026*	0.000*	0.000*
I avoid touching my face (eyes, nose or mouth) with contaminated hands	111	24	21	3	3	0.000*	0.000*	0.000*	0.454	0.000*	0.000*
I use soap and water to wash my hands quickly after coughing or sneezing or touching contaminated objects such as a tissue	99	39	21	3	-	0.004*	0.000*	0.000*	0.000*	0.000*	0.042*
I use a face mask in the crowds and when I visit healthcare settings nowadays	156	3	3	-	-	0.035*	0.226	0.546	0.841	0.232	0.079
I apply WHO's "My 5 moments for hand hygiene" before touching a patient, before aseptic procedure, after touching a patient, after exposure to bodily fluid, and after touching a patient's surroundings.	126	27	6	3	-	0.008*	0.004*	0.133	0.000*	0.000*	0.626
During interaction with non- COVID-19 patients, I observe any PPE according to protocol.	102	42	9	6	3	0.001*	0.000*	0.000*	0.000*	0.001*	0.003*

*****Significant p values.

opportunity to do so. Seventy-two percent of the population covered their mouth and nose, while 96% properly disposed of their used tissues, demonstrating adherence to standard general practices. Furthermore, the proper technique for hand hygiene, the donning of appropriate personal protective equipment (PPE), the wearing of a mask, and the avoidance of touching the face and nose with contaminated hands were observed. These results are consistent with those from other surveys conducted globally. In contrast, other regions with sufficient knowledge did not exhibit the same degree of enthusiasm for these practices. Another notable trend observed in our study was that female subjects demonstrated higher mean scores in terms of knowledge, attitude, and practice when compared to their male counterparts. This observation may be attributed to the heightened concern among females regarding the potential spread of the disease within their families. This finding aligns with the results of a study conducted in India, which also reported a similar trend (22). The scope of this study is constrained to the domain of SARS-CoV-2 infection. Due to its high degree of contemporary relevance, the general public has been exposed to a substantial amount of information and practices related to the virus. However, a study conducted

in Yemen revealed that radiologists exhibited remarkably deficient knowledge, attitudes, and practices in the context of infection control and prevention. This is considered to be one of the most significant limitations of the study. Another study was conducted in a well-funded private sector tertiary care hospital. In contrast, the condition in government hospitals may differ due to excessive patient load, unfavorable working hours, inadequate monetary support, and poor training. However, due to limited resources, the scope of our study is limited. (24, 25) We would like to encourage people working in this domain to work in line with a comparative study. In summary, the majority of individuals employed in the radiology department exhibited sufficient knowledge, favorable attitudes, and appropriate practices, indicative of safe operational procedures. The mean scores of junior staff remained lower than expected, indicating the potential for enhancement through the implementation of awareness sessions and fact-based discussions.

Acknowledgment
Expressions of gratitude are extended to the Department of Radiology at Aga Khan University Hospital for their invaluable support and active involvement in this study.

Authors' Contribution
SSMA conceptualized the study and assisted in the preparation of the manuscript. NK, AA conducted the literature search and formulated the questionnaire. MFHQ and MS were instrumental in the collection of data and the initial composition of the manuscript. The final version of the manuscript was formally endorsed by all authors.

Ethics
The study was exempted by the institutional Ethical Review Committee of Aga Khan University Hospital. (Reference Number: 2021-5831-16943)

Conflict of Interest
The research group has no financial or personal conflicts of interest to disclose.

Funding
The present document has not received financial support from any agency, pharmaceutical company, or non-governmental organization.

Data Availability
The data that support the findings of this study are available on request from the corresponding author.

References

1. Jee Y. WHO International Health Regulations Emergency Committee for the COVID-19 outbreak. Epidemiology and health. 2020;42:e2020013.
2. Caulkins J, Grass D, Feichtinger G, Hartl R, Kort PM, Prskawetz A, et al. How long should the COVID-19 lockdown continue? PloS one. 2020;15(12):e0243413.
3. G. D. The Coronavirus relief fund (CARES Act, Title V): Background and state and local allocations. . Washington: ; 2020.
4. Wright A, Chawla G, Chen L, Farmer A. Tracking Mask Mandates during the COVID-19 Pandemic. Becker Friedman Institute for Research In Economics; 2020.
5. Guy GP, Jr., Massetti GM, Sauber-Schatz E. Mask Mandates, On-Premises Dining, and COVID-19. Jama. 2021;325(21):2199-200.
6. Chandir S, Siddiqi DA, Setayesh H, Khan AJ. Impact of COVID-19 lockdown on routine immunisation in Karachi, Pakistan. The Lancet Global health. 2020;8(9):e1118-e20.
7. Saeed U, Sherdil K, Ashraf U, Mohey-Ud-Din G, Younas I, Butt HJ, et al. Identification of potential lockdown areas during COVID-19 transmission in Punjab, Pakistan. Public health. 2021;190:42-51.
8. Wan YL, Schoepf UJ, Wu CC, Giovagnoli DP, Wu MT, Hsu HH, et al. Preparedness and Best Practice in Radiology Department for COVID-19 and Other Future Pandemics of Severe Acute Respiratory Infection. Journal of thoracic imaging. 2020;35(4):239-45.
9. Ng MY, Lee EYP, Yang J, Yang F, Li X, Wang H, et al. Imaging Profile of the COVID-19 Infection: Radiologic Findings and Literature Review. Radiology Cardiothoracic imaging. 2020;2(1):e200034.
10. Chung M, Bernheim A, Mei X, Zhang N, Huang M, Zeng X, et al. CT Imaging Features of 2019 Novel Coronavirus (2019-nCoV). Radiology. 2020;295(1):202-7.
11. Wu J, Wu X, Zeng W, Guo D, Fang Z, Chen L, et al. Chest CT Findings in Patients With Coronavirus Disease 2019 and Its Relationship With Clinical Features. Investigative radiology. 2020;55(5):257-61.
12. Shi H, Han X, Jiang N, Cao Y, Alwalid O, Gu J, et al. Radiological findings from 81 patients with COVID-19 pneumonia in Wuhan, China: a descriptive study. The Lancet Infectious diseases. 2020;20(4):425-34.
13. Li K, Wu J, Wu F, Guo D, Chen L, Fang Z, et al. The Clinical and Chest CT Features Associated With Severe and Critical COVID-19 Pneumonia. Investigative radiology. 2020;55(6):327-31.
14. The KAP Survey Model (Knowledge, Attitudes, and Practices) 2014. [Internet]. 2011 [cited December 2, 2022]. Available from: https://www.spring-nutrition.org/publications/tool-summaries/kap-survey-model-knowledge-attitudes-and-practices.
15. Papagiannis D, Malli F, Raptis DG, Papathanasiou IV, Fradelos EC, Daniil Z, et al. Assessment of Knowledge, Attitudes, and Practices towards New Coronavirus (SARS-CoV-2) of Health Care Professionals in Greece before the Outbreak Period. 2020;17(14):4925.
16. Afzal MS, Khan A, Qureshi UUR, Saleem S, Saqib MAN, Shabbir RMK, et al. Community-Based Assessment of Knowledge, Attitude, Practices and Risk Factors Regarding COVID-19 Among Pakistanis Residents During a Recent

Outbreak: A Cross-Sectional Survey. Journal of community health. 2021;46(3):476-86.
17. Gupta C, Gupta R, Kumari R, Gupta RK, Bhagat P, Mir MT, et al. Public knowledge, attitudes, and practices toward COVID-19: An online cross-sectional study in the Union territory of Jammu and Kashmir. 2021;10(3):1155-60.
18. Amro FM, Rayan AH, Eshah NF, MS AL. Knowledge, Attitude, and Practices Concerning Covid-19 Preventive Measures Among Healthcare Providers in Jordan. SAGE open nursing. 2022;8:23779608221106422.
19. Bernstrøm VH, Alves DE, Ellingsen D, Ingelsrud MH. Healthy working time arrangements for healthcare personnel and patients: a systematic literature review. BMC Health Services Research. 2019;19(1):193.
20. Zhong BL, Luo W, Li HM, Zhang QQ, Liu XG, Li WT, et al. 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. International journal of biological sciences. 2020;16(10):1745-52.
21. Chai CS, Ng DL, Chua WJ, Tung YZ, Sindeh W, Ibrahim MA, et al. Knowledge, Attitude, and Practices Among the General Population During the Later Stage of the COVID-19 Pandemic in Malaysia: A Cross-Sectional Study. Risk management and healthcare policy. 2022;15:389-401.
22. Singh PK, Anvikar A, Sinha A. COVID-19 related knowledge, attitudes, and practices in Indian Population: An online national cross-sectional survey. PLOS ONE. 2022;17(3):e0264752.
23. Naji AT, Abu-hadi T, Abu-hadi Ba, Al-Yemeni Sa, Al-dhobhani R, Mohy Al-deen Ba, et al. Assessment of Knowledge, Attitude, and Practice Toward Infection Prevention and Control Among Diagnostic Radiographers in Yemen. Journal of Radiology Nursing. 2022.
24. Iman Taghizadeh F, Homeira K, Mohamadreza M, Mahin T, Seyedmahrokh AM. Knowledge, Attitude, and Practice toward Prevention of COVID-19 Among Nursing and Midwifery Students: A cross-sectional Study in Gorgan, Northern Iran. Sudan Journal of Medical Sciences (SJMS). 2022;17(3).
25. Kamacooko O, Kitonsa J, Bahemuka UM, Kibengo FM, Wajja A, Basajja V, et al. Knowledge, Attitudes, and Practices Regarding COVID-19 among Healthcare Workers in Uganda: A Cross-Sectional Survey. 2021;18(13):7004.