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A cross-sectional study to assess knowledge, attitude and practice among healthcare workers regarding COVID-19 at a National Institute of North India

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Abstract

Background and Objectives. Healthcare workers (HCWs) are the frontline warriors of the battle against COVID-19 and are at high risk of exposure to SARS-CoV-2. Therefore, knowledge, attitude, and practice (KAP) among HCWs play a vital role in preventing and spreading COVID-19. Hence, the current study aimed to assess KAP among HCWs regarding COVID-19. **Methods**. This descriptive, cross-sectional study enrolled 171 HCWs of a national institute in North India. A self-administered questionnaire was used to assess KAP among HCWs regarding COVID-19. Descriptive statistical analysis was applied to compare and represent the level of association of KAP scores among HCWs. **Results**. Among HCWs (n=171), 106 (61.98%) were males, and 65 (38.01%) were females. Most (n=76; 44.44%) belonged to the 20-29 age group. The mean±S.D score of HCWs for knowledge, attitude, and practice were 42.76±2.14, 28.91±1.59 and 20.38±1.46, respectively. Excellent knowledge, attitude, and practice score were found in 66.1%, 69.1%, and 97.1% of HCWs, respectively. Knowledge score was maximum in resident doctors (44.09±1.13); however, multi-tasking staff (29.35±1.44), laboratory technicians (29.31±1.21), and ward boys (29.29±1.59) had better attitude scores. Nurses (28.44±1.69) and safaikaramacharis (28.11±1.96) had low attitude scores. The practice score of nurses and multi-tasking staff fared well than resident doctors. Knowledge and attitude scores were statistically associated with the profession and higher level of education. **Conclusion**. The study highlights that most HCWs have good KAP regarding COVID-19. Continuous dissemination of education on the prevention of the spread of COVID-19 is advised among HCWs to improve their knowledge. Hence, it will strengthen the health workforce in the battle against COVID-19.

Key word: *attitude, COVID-19, knowledge, healthcare workers, practice*

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Introduction

Coronaviruses (CoVs) cause pulmonary diseases in humans. Severe Acute Respiratory Syndrome (SARS) and Middle East Respiratory Syndrome (MERS) viruses belonging to the Coronaviridae family are responsible for severe and sometimes fatal pulmonary diseases (1). SARS-CoV was first identified in 2002-03 in a case of pneumonia in Guangdong, China, which later turned into life-threatening respiratory failure. Because of human-to-human transmission, the virus further infected about 8500 people, with a case fatality rate of 10% (2,3). Similarly, in 2012, the MERS-CoV epidemic appeared in Saudi Arabia, where people experienced symptoms similar to SARS-CoV but with a very high case fatality rate of 36%. It was mainly transmitted to humans from camels (4).

Similar cases of pneumonia were reported in Wuhan city, China, in December 2019. The virus was identified as a new type of Coronavirus (novel Coronavirus-2019), and the illness it caused was designated as COVID-19 (5). The World Health Organization (WHO) declared COVID-19 a public health emergency on January 30, 2020, and the outbreak was declared a pandemic on March 11, 2020. According to WHO, approximately 52 Crores confirmed cases of COVID-19 were reported globally, including an estimated 6.2 million deaths (6).

The total number of confirmed cases in India was approximately 4.3 Crores, and associated deaths were approximately 5.2 Lakh on May 25, 2022 (7,8). Human-to-human transmission occurs through direct contact and respiratory droplets (6,9). The incubation period of COVID-19 is 2–14 days (10,11), and the symptoms are fever, cough, breathlessness, fatigue & myalgia (12,13). Standard recommendations to prevent infection spread include maintaining hand hygiene, covering mouth and nose; when

coughing or sneezing, avoid close contact with anyone showing symptoms of respiratory illness (14).

During the pandemic, accelerated emergency vaccine development led to using different vaccine platforms such as inactivated, virus-like particles, viral vectors, mRNA, self-amplifying RNA, DNA, and live attenuated vaccines (15). In India, Covishield, Covaxin, Sputnik, Moderna, Johnson & Johnson, and ZyCoV-D have been given approval for emergency use. India began the administration of COVID-19 vaccines on January 16, 2021. As of May 23, 2022, India has administered over 192.5 crores, including the first and second doses of the currently-approved vaccines (16).

In early March 2020, studies documented over 3300 confirmed healthcare workers cases in China met as high as 19% in the USA. Infection and mortality of Healthcare workers (HCWs) worldwide from COVID-19 are also very high. A global study found 152888 infections and 1413 deaths among HCWs. Infections were mainly in women (71.6%) and nurses (38.6%), but deaths were mainly in men (70.8%) and doctors (51.4%) (17). Gholami et al. (2020) reported that 51.7% HCWs were found to be infected with COVID-19 during the first six months of the COVID-19 pandemic, with a prevalence of hospitalization of 15.1% and mortality of 1.5% (18).

Guidelines for the prevention and control of COVID-19 for HCWs were published by the WHO and the Ministry of Health and Family Welfare (MoHFW, India) to strengthen further preventive strategies, including raising awareness and training healthcare workers in preparedness activities. The WHO and MoHFW (India) have initiated several online training sessions and materials on COVID-19 in various languages (6, 19).

HCWs are the frontline workers and their knowledge, attitude, and practice (KAP) regarding the COVID-19 pandemic plays an essential role in managing COVID-19. Although many researchers have studied COVID-19 among HCWs, studies from different parts of the world on KAPs in COVID-19 among HCWs are still needed. Therefore, we conducted this descriptive cross-sectional study to assess KAP among HCWs regarding the COVID-19 pandemic at a National Institute of North India.

Materials and methods

This descriptive cross-sectional study was conducted from August 2020 to July 2021 at the Department of Tuberculosis & Respiratory Diseases, National Institute of Tuberculosis and Respiratory Diseases (NITRD). The study included HCWs of the national institute of North India, such as safaikaramchari, multi-tasking staff (MTS), ward boys, laboratory technicians, pharmacists, nurses, and resident doctors. HCWs working in the institute aged between 20-60 years were included in the study. HCWs that refuse to participate were excluded from the study.

Ethics Statement. Approval for the study was obtained from the Institutional Ethics Committee (IEC). Confidentiality of the study participants' identities was maintained during the study. The participation was voluntary and non-compensated. All participants were explained in detail about the study and informed signed consent was taken from each participant.

Sample Size. The sample size was calculated by following the exact binomial confidence limit method:–

$$N = Z^2 \times (p) \times (1-p)/C^2 = (1.96)2 (0.8) (0.2) / (0.06)2 = 170.66$$

Where N = Sample size, Z = value corresponding to a given confidence level (1.96 for a confidence level of 95%-value commonly used); p = Percentage of the prevalence, expressed as a decimal (Prevalence of good KAP is 0.8 as in previous studies Bloom's cut-off of 80% was used to determine sufficient knowledge, positive attitude and good practice (20, 21)), C=Allowable absolute error expressed as a decimal (0.06), after considering six percent allowable standard error. By this formula, the sample size was 170.66. Therefore, we enrolled 171 participants in our study. Stratified random sampling was applied among different cadres of HCWs to have equitable distribution as maximum as possible.

Procedure. A self-administered questionnaire was used; it was developed after reviewing previously conducted research and visiting WHO websites for frequently asked questions (16, 22). The questionnaire had fifteen questions for knowledge (K1-K15), ten questions for attitude (A1-A10), and seven questions for practice (P1-P7) assessment. Each knowledge, attitude, and practice item had three options in natural order (Ordinal categorical data). A Likert-type scale was used to assess attitude and practice (23).

These questions for knowledge, attitude, and practice assessment were answered in the form of Yes, No, or I don't know. Correct answers had 3 points, while incorrect answers were allocated 1 point, and no opinion answer had 2 points. Eventually, the overall knowledge score ranged from 15 to 45. Individuals scoring less than 39 were categorized as having low knowledge, 39 to 40 as having moderate knowledge, and above 41 as enjoying high knowledge of COVID-19. The total attitude score ranged from 10 to 30. A score of under 26, 26 to 28, and above 28 was classified as low, moderate, and high attitudes towards COVID-19, respectively. The total practice score ranged from 07 to 21. Total scores of fewer than 13, 13 to 15, and above15 were classified as weak, moderate, and strong practices towards COVID-19, respectively (24).

Data Collection Process. The questionnaire was given to HCWs, who filled in the responses in the researcher's presence. After the completion of responses, questionnaires were collected within fifteen minutes. The questionnaire was pretested on 20 HCWs who were excluded from the analysis; the internal consistency of the study questionnaire was assessed by calculating the Cronbach alpha.

Data Analysis. Once all necessary data were obtained, they were checked for completeness, and normal

distribution was assessed by using the skewness and kurtosis test. Data were coded and analyzed using Statistical Package for Social Sciences (SPSS) software version 20. The Chi-square test was used to compare qualitative variables between resident doctors and allied health workers. Comparison of knowledge scores between two groups was made using student t-test and ANOVA test for more than two groups. Pearson correlation was done to see a relation between knowledge and attitude scores. Multivariate linear regression analysis was used to measure the degree of association between independent and dependent variables. All analyses were two-sided, and a p-value <0.05 was considered statistically significant.

Results

Among the enrolled HCWs, the mean age was 31.28±12.65 (SD). The majority of the HCWs (n=76; 44.44%) belonged to the 20-29 age group, followed by 47 (27.48 %) belonged to the 30-39 age group, 28 (16.37 %) to 40-49 age group and 20 (11.69%) to above 50 years age group. Among the HCWs, 106 (61.98%) were male and 65 (38.01%) were female with male to female ratio of 1.63:1. Among the study participants, 63.74% (109) were married and 36.25% (62) were unmarried. The age and sex distribution among study participants are summarized below in Table 1.

The education of more than one-fourth of the Participants (27.5%) was either continuing post-graduation or postgraduates, 19.3% were University graduates, 17.5% had education up to intermediate, and 22.8% had high school education. Only 12.9 % had education less than in high school.

Table 1

Demographic Profile of study participants (n = 171).

Characteristics	Frequency (n=171)	Percentage (%)
Gender		
Male	106	62
Female	65	38
Age		
20-29	76	44.4
30-39	47	27.5
40-49	28	16.4
>50	20	11.7
Level of Education		
Postgraduate	47	27.5
University	33	19.3
Intermediate	30	17.5
High School Education	39	22.8
Less than high school education	22	12.9
Profession		
Resident Doctor	31	18.2
Nurse	47	27.5
Pharmacist	1	0.6
Laboratory Technician	22	12.9
Ward Boy	47	27.5
MTS	14	8.2
SafaiKaramchari	9	5.3

Table 2

Composite Level of KAP Score

Variables	Number of questions	Range of score	Total score (Mean ± SD*)	Level (%), n=171 Poor	Moderate	Excellent
Knowledge	15	32-45	42.76 ± 2.140	4(2.34%)	51(29.82%)	116(67.84%)
Attitude	10	22-30	28.91 ± 1.594	7(4.09%)	51(29.82%)	113(66.08%)
Practice	7	13-21	20.38 ± 1.468	0	6(3.51%)	165(96.49%)

*SD: Standard Deviation.

Among HCWs, 31(18.12%) were resident doctors, 47(27.48%) each were nurses & ward boys, 22(12.86%) were laboratory technicians, 14(8.2%) were MTS, 9(5.3%) were safaikaramchari and 1(0.58%) was pharmacist. Most of the HCWs used Television (n=48; 28.07%), Newspaper & television (n=42; 24.56%), MoHFW& WHO website (n=21; 12.28%), and social media (n=11; 6.43%) as the preferred main source of information on COVID-19.

The mean score for knowledge, attitude, and practice for COVID-19 were 42.76±2.14 (range =0-45), 28.91±1.59 (range =0-30), and 20.38±1.46 (range =0-21), respectively. The cut-off for excellent knowledge score, attitude score &practice score was above 41, 28, & 15, respectively. The knowledge score of 69.1%, attitude score of 66.1%, and practice score of 97.1% were excellent among HCWs (Table 2).

Knowledge score was maximum for resident doctors (44.09±1.13) compared to others. MTS (29.35±1.4), laboratory technicians (29.31±1.21), and ward boys (29.29±1.55) had better attitude scores than resident doctors (28.74±1.50). Nurses and safaikaramacharis had low attitude scores of 28.44±1.69 and 28.11±1.96, respectively (Table 3).

Association of knowledge (P<0.001) and attitude score (P=0.01) of HCWs with their profession were found to be statistically significant, whereas practice score with profession was statistically non-significant. On subgroup analysis, comparing resident doctors with respect to others, it was found that resident doctors' knowledge score was significantly higher than all other professionals except MTS. The attitude score of resident doctors did not differ significantly compared to other professionals. However, for practice, nurses and MTS fared well than resident doctors significantly, with P=0.01 and P=0.03, respectively (Table 3).

Table 3

Effect of Profession on KAP score

	Profession	Minimum	Maximum	Mean±SD*	P#	P$
Knowledge score	Resident Doctor	41	45	44.09±1.13		NA
	Nurse	39	45	43.34±1.63		0.002
	Pharmacist	43	43	43		NA
	laboratory technician	36	45	42.50±2.17	<0.001	0.002
	Ward Boy	36	45	41.53±1.92		<.0001
	MTS	41	45	43.85±1.29		0.53
	SafaiKaramchari	32	45	40.44±3.84		<.0001
Attitude score	Resident Doctor	24	30	28.74±1.50		NA
	NURSE	24	30	28.44±1.69		0.21
	Pharmacist	30	30	30		NA
	Laboratory Technician	25	30	29.31±1.21	0.01	0.06
	Ward Boy	22	30	29.29±1.55		0.06
	MTS	26	30	29.35±1.44		0.2
	SafaiKaramchari	24	30	28.11±1.96		0.3
Practice score	Resident Doctor	13	21	19.83±2.20		NA
	Nurse	16	21	20.70±.85		0.01
	Pharmacist	21	21	21		NA
	laboratory technician	14	21	20.13±1.80	0.09	0.3
	Ward Boy	14	21	20.34±1.37		0.1
	MTS	20	21	20.92±.267		0.03
	SafaiKaramchari	18	21	20.44±1.13		0.13

*****SD: Standard Deviation. #P<0.05 was considered to indicate significance (ANOVA Test applied).*

$P<0.05 was considered to indicate significance (T-test applied). Bold values show significant differences.

Knowledge and attitude scores of HCWs were statistically significantly associated with a higher level of education (P<0.001) & (P=0.02), respectively. However, the practice score was not associated with the level of education. Age and marital status did not affect KAP scores (Table 4).

Table 4

Effect of Age, Marital status, and level of Education on KAP Score

Characteristics		N (%)	Knowledge (Mean±SD*)	P#	Attitude (Mean±SD*)	P#	Practice (Mean±SD*)	P#
Age Group (Years)	20-29	76 (44.4)	42.68±2.11		28.93±1.73		20.37±1.41	
	30-39	47 (27.5)	43.26±1.76		29.11±1.37		20.28±1.87	
	40-49	28 (16.4)	42.82±2.70		28.50±1.73		20.43±1.16	
	≥ 50	20 (11.7)	42.30±2.43	0.33	28.95±1.31	0.45	20.60±0.94	0.87
Marital Status	Married	109 (64)	42.73±2.22		28.85±1.49		20.39±1.45	
	Unmarried	62 (36)	42.96±2.08	0.5	29.01±1.76	0.52	20.35±1.50	0.86
Level of Education	Postgraduate	47 (27.5)	43.85±1.25		28.49±1.76		20.21±1.74	
	University	33 (19.3)	43.09±1.40		29.18±1.10		20.42±1.45	
	Intermediate	30 (17.5)	42.77±1.97		28.50±1.87		20.47±0.93	
	High School Education	39 (22.8)	42.31±2.27	<0.001	29.49±1.25	0.02	20.44±1.68	0.92
	Less than high school education	22 (12.9)	41.18±3.36		28.95±1.67		20.45±1.05	

*****SD: Standard Deviation. #P values were calculated using a student t-test between two groups and an ANOVA test for more than two groups. P<0.05 was considered to indicate significance. Bold values show significant differences.*

Superscripts

Multivariate linear regression reaffirms that knowledge and attitude scores were significantly associated with profession (P <0.001 and P=0.04) and level of education (P value <0.001and P=0.01), respectively. Gender was associated with practice scores (P=0.03) (Table 5).

Practice sore of female HCWs was significantly associated with their knowledge. In this study, we found a positive correlation between knowledge and attitude score, and a significantly positive correlation was found (Figure 1).

Table 5

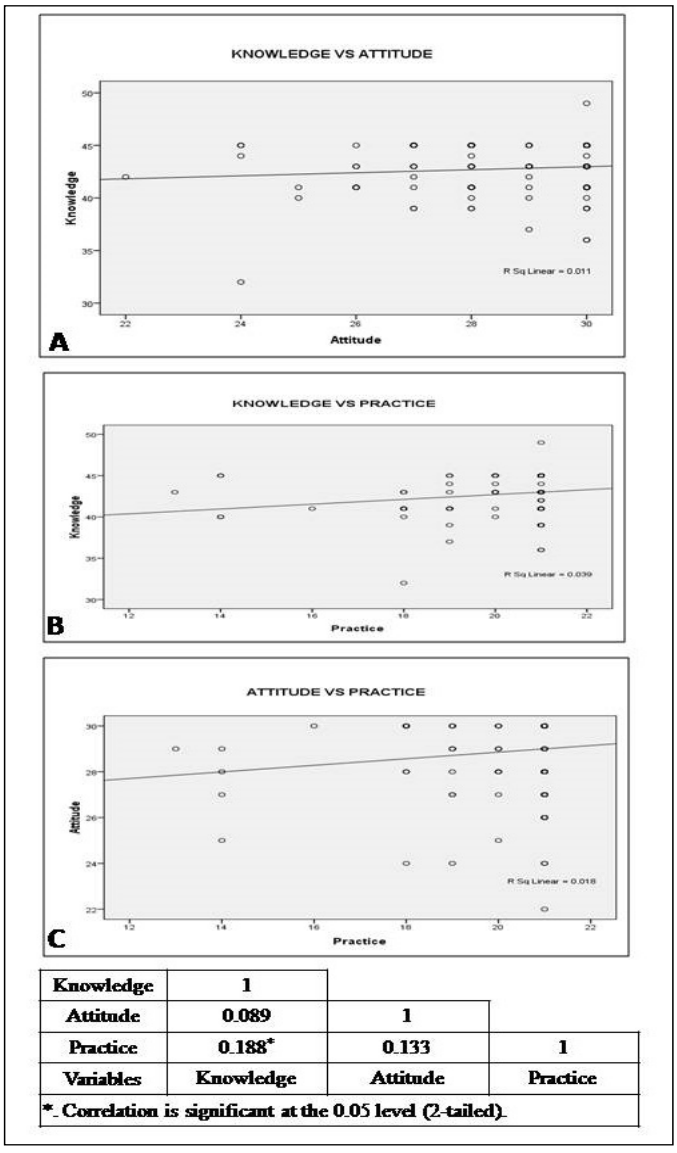
Multivariate linear regression of demographic characteristics with KAP

Variables	Knowledge		Attitude		Practice	
	Unstandardized coefficient (95% CI)#	P*	Unstandardized coefficient (95% CI)#	P*	Unstandardized coefficient (95% CI)#	P*
Age (Year)	-0.016 (-.090 to .059)	0.67	-0.03 (-.130 to .071)	0.56	0.039 (-.072 to .150)	0.48
Gender (Male/Female)	-0.017 (-.052 to .017)	0.32	-0.021 (-.068 to .025)	0.37	0.055 (.004 to .106)	0.03
Professions	-0.389 (-.538 to -.239)	<0.001	0.207 (.005 to .409)	0.04	0.178 (-.044 to .400)	0.11
Marital Status (Married/Unmarried)	0.012 (-.023 to .046)	0.5	0.014 (-.032 to .061)	0.54	-0.01 (-.061 to .042)	0.7
Level of Education	-0.273 (-.364 to -.182)	<0.001	0.154 (.031 to .276)	0.01	0.111 (-.024 to .247)	0.1

*P<0.05 was considered to indicate significance. Bold values show significant differences.
#CI: Confidence Interval.

Figure 1

Correlation scatters among knowledge, attitude, and practice of HCWs. A: Knowledge vs. Attitude, B: Knowledge vs. Practice, C: Attitude vs. Practice



Knowledge	**1**		
Attitude	**0.089**	**1**	
Practice	**0.188***	**0.133**	**1**
Variables	**Knowledge**	**Attitude**	**Practice**

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

Discussion

HCWs are the frontline warriors in the battle against COVID-19. They are exposed to occupational hazards, including exposure to SARS-CoV-2, stigma and discrimination in society, heavy workload, and prolonged use of personal protective equipment (PPE) (World Health Organisation 2020c). A poor understanding of the disease among HCWs results in delayed identification and treatment and may lead to a greater risk of spreading the disease. As an essential part of the health care system, HCWs' KAP plays a vital role in preventing and spreading COVID-19.

In our study, the mean score for KAP regarding COVID-19 was more than 95%, suggesting HCWs had moderate knowledge, an optimistic attitude, and practice scores. Similarly, Ahmed F. et al. (25) reported that among HCWs, 83.7% had good knowledge, 78.9% had a positive attitude, and 77.6% had good practice scores. Furthermore, these results are consistent with previous studies, which reported that around 90%-95% of HCWs had good knowledge, positive attitudes, and adequate practice scores toward the COVID-19 infection (23, 26, 27).

In this study, knowledge score was associated with a higher level of education and profession (P<0.001) and was found to be statistically highly significant. The mean knowledge score was maximum for resident doctors (44.09) compared to others. These results agree with the results of Mushi A. et al. (28), who reported that good knowledge scores were significantly associated with higher educational level, physician occupation, and age >49 years old. A study by Almohammed A. et al. (29) reported that poor knowledge was associated with low education. However, a study by Tamang N.et al. (30) found that the factors affecting knowledge are age, gender, level of education, marital status, profession, work experience, source of information, infection prevention and control (IPC) training, and online course(p<0.05). The factors significantly associated with

adequate knowledge were male gender, nurse, doctor, and IPC training.

In this study, the attitude score was statistically significantly associated with profession (P=0.01) and education level (P=0.02). This study's attitude score agrees with the results from earlier studies. A study by Almohammed A. et al. (29) found that the participants from the nursing profession demonstrated a less favorable attitude. Among nurses, a master's degree is related to more positive attitudes. Ahmed F. et al. (25) found among HCWs that a positive attitude was predicted by sound knowledge and female gender. In another study, Hussain I. et al. (23) found that attitudes toward COVID-19 significantly differed with age, marital status, profession, hospital, and residential place.

Similarly, Haghighi F. et al. (29), found male gender was correlated with more correct attitudes. Tamang N.et al. (30) found that positive attitudes were significantly associated with online courses related to COVID-19. Conversely, Basnet S. et al. (32) found that the HCWs with a clinical experience level of one to five years or more were significantly associated with a negative attitude.

In this study, practice score was not associated with profession and level of education. Nurses and MTS had significantly better practice scores than resident doctors. Practice score among female HCWs was significantly correlated with their knowledge. Similar results were shown by Maheshwari S. et al. (33), that gender had a significant impact on practice scores ($P < 0.05$). Pham A. et al. (34) found that the female participants, and the receiving of information from the official websites, reported a significantly higher level of good practice. Haghighi F. et al. (31) found that 2 - 5 years of work experience was associated with better practice among nurses. Conversely, in another study Almohammed A. et al. (29), found males were more likely to practice most of the time appropriately.

In a study, Tamang N. et al. (30) reported that profession, education of master's degree or above, and online courses are statistically significantly associated with practice scores ($p < 0.05$). In another study, Hussain I. et al. (23) found a significant difference in practice scores across the participants' age, educational level, hospital, and residence. In a study by Ronald Olum et al. (21), they found factors associated with good practices were an age of 40 years or more and holding a diploma. Ahmed F. et al. (25) found among HCWs that practice was associated with good knowledge of COVID-19.

In this study, we found a positive correlation between knowledge and attitude and a significantly positive correlation between knowledge and practice ($r=0.188$, $p=0.01$). These results are consistent with the results of a previous study by Wahed et al. (35), which found a positive correlation between knowledge and attitude scores ($r=0.215$, $p<0.001$). Other researchers found a significant association between knowledge, attitude, and practice, corroborating with the studies (25, 30), which found that the knowledge score was significantly associated with both attitude and practice scores.

Attitude score was significantly associated with practice score. In another study, Pham A. et al. (34) in Vietnam found that those with sufficient knowledge and a positive attitude towards COVID-19 were more likely to have good preventive practices. Asdaq S. et al. (36) found that the attitude score increased significantly with an improvement in knowledge. Besides, there was a greater association between attitudes and practices. A significant enhancement in the practice score of the professionals was noted with an increase in knowledge score, an indicator of a positive correlation between practice and knowledge scores.

In this study, the primary source of knowledge and information among HCWs was Television (n=48; 28.1%), followed by Newspaper & television (n=42; 24.6%), MoHFW (n=21; 12.3%), WHO website & social media (n=11; 6.4%). Similar results are shown by Kaihan Y. et al. (37), who found Mass media as the primary source of knowledge and information on COVID-19. This corroborates with a study by Abhisek S. et al. (38), which showed that more than three fourth (82.1%) of the participants reported their primary source of knowledge was news media, while only less than half of the participants (44.9%) reported government official websites. In another study, Albahri A.et al. (39) found that official health organizations were the primary source of information for 91.5% (161/176) of participants, and only 38.1% (67/176) reported using scientific journals as one of their sources.

Few other studies found social media as the primary source of information. Khasawneh A. et al. (40) found medical students used primarily social media (83.4%) and online search engines (84.8%) as their preferred source of information on COVID-19 and relied less on medical search engines (64.1%). Huynh G. et al. (41) found that HCWs predominantly used social media to inform themselves about COVID-19 (91.1%). Alrubaiee G. et al. (42) found that 57.1% of the respondents obtained their information via social networks and news media, and a further 60.0% had never attended lectures/ discussions about COVID-19.

Limitations of the study. HCWs may have good practice scores in our specialty hospital institute. This may lead to excellent to good practice scores. Stratified random sampling was applied among the different cadre of HCWs to have equitable distribution as maximum as possible to reduce selection bias. In this study, the data presented were partly dependent on the participants' honesty, recall ability, and self-reported, which could have resulted in recall bias. In most cross-sectional questionnaire-based studies, inherent recall bias is expected. The actual practice section of the HCWs is different from the practice score of the study, as the participants report them. Thus, to provide further depth in this section, the observing and auditing approach of the participants is needed. No previously validated tools assessing KAP about COVID-19 among HCWs in hospitals have determined a cut-off point for adequate or excellent knowledge, positive attitude, and an appropriate level of

practice at the time of the study; therefore, they predefined a cut-off point for the study purposes.

The uniqueness of the study. MTS had a good knowledge score and no significant difference in knowledge compared to resident doctors. MTS, laboratory technicians, and ward boys had better attitude scores rather resident doctors. Nurses and safaikaramacharis had low attitude scores. Other than resident doctors had better practice scores. Nurses and MTS fared well than resident doctors significantly (P value 0.01 and 0.03, respectively). Practice score was not significantly associated with profession and level of education. Correlation studies show a positive correlation between knowledge and attitude and a significantly positive correlation between knowledge and practice.

Conclusion

This study revealed that most of the HCWs in our institute had good knowledge, positive attitudes, and appropriate practices regarding COVID-19 during the second and third waves of COVID-19 in India. We found that among HCWs, the primary source of knowledge on COVID-19 was news media such as television and newspapers. Knowledge and attitude scores were statistically significantly associated with profession and level of education. To improve their knowledge, continuous professional education on the prevention of the spread of COVID-19 is advised among HCWs in India. Hence, it will strengthen the health workforce in the battle against COVID-19.

Conflict of interest

There are no conflicts of interest.

Source of Funding

None.

Author Contribution Statement

The authors confirm their contribution to the paper: study conception and design: MK, SKM; data collection: MK; analysis and interpretation of results- MSD, MK, SKM; draft manuscript preparation: MSD, SG. All authors reviewed the results and approved the final version of the manuscript. All authors agreed to be responsible for all aspects of the work to ensure the accuracy and integrity of the published manuscript..

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