# Original Article

# Knowledge, Attitude and Practices related to Coronavirus disease (COVID-19) among Healthcare Workers in selected hospitals in Sri Lanka

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**Key words:  Knowledge, attitude and practices, Health care workers, COVID-19, Sri Lanka**

## Abstract

Introduction

Good knowledge, a positive attitude and good practices are essential to deliver the necessary services to COVID-19 patients

Methods

A descriptive, cross-sectional study was conducted between June 2020 and September 2020 during the first wave of the COVID pandemic in Sri Lanka to assess knowledge, attitude and practices related to COVID-19 among 720 health care workers in 12 selected hospitals. Hospitals were selected from COVID-19 treatment centres (A), COVID-19 isolation centres (B)and other hospitals(C). Data were collected using a self-administered questionnaire.  Knowledge, attitude and practice was assess using 10, 15 and 16 questions, respectively. The knowledge score could range from 0 to 27, for attitude the total possible score was 60 and the practice score range was 0-16. The score obtained by each participant was expressed as a percentage of the total possible score.

Results

There were 651/720 (90.1%) respondents with 311 (48%) doctors and 340 (52%) nurses. The majority was female (n=433; 66.5%).  COVID-19 knowledge score was 74.6 with 69.4% of participants (71.5% doctors and 67.2% nurses) having good overall knowledge of COVID- 19. While >95% practiced preventive measures, overall practices were good in 85.9% of doctors and 86.7% of nurses. About 50% (68.5% doctors and 46.7% nurses) had a positive attitude toward COVID-19 patients. Good overall knowledge on COVID-19 (disease itself, transmission, and prevention) was associated with being a doctor. Good practices were associated with adequate knowledge, being married and being a doctor.

Conclusion

The knowledge of health care workers in Sri Lanka with regard to Coronavirus disease (COVID-19) is on par with other South Asian countries. They had good knowledge and displayed good practices and a positive attitude towards COVID-19 patients.

## Introduction

Coronavirus disease 2019 (COVID-19) which was declared a pandemic by the World Health Organization on March 11, 2020, has claimed over 5,680,741 lives globally as of 3rd February 2022 [1]. The first confirmed case of the virus in Sri Lanka was reported on January 27th, 2020, and the victim was a Chinese woman from Hubei Province, China. The second confirmed case of COVID-19 was reported on March 11, 2020 and was a Sri Lankan tour guide. Since then, the number of positive cases continued to rise slowly and by March 2020 Sri Lanka was considered a country with cluster transmission. The country experienced a moderate first wave with 3,380 cases from January to September 2020, a second wave that surged quickly with a daily case count at 900 until early February 2021, then experience the beginnings of a third wave with more than 1000 cases reported per day from the latter part of April 2021 and by December was facing another wave with more than 1000 cases per day, after a quiescent period [2].

Since health care workers (HCWs) are at the forefront of the pandemic response, they are at a higher risk of acquiring COVID-19 infection. The WHO reported 6643 deaths due to COVID-19 in HCWs between January 2020 and May 2021 and suggested that such deaths are probably under reported (1,2). Healthcare workers are seven times as likely to develop severe COVID-19 infection as those with 'non-essential' jobs [3].

Currently, there is no specific antiviral treatment for COVID-19, but several vaccines for prevention of the disease are available and in use. However, at the time we conducted the study, there were no preventive vaccines registered by the authorities for use. Hence, hygienic practices were important to mitigate the spread of the disease, and this remains so, even after full immunisation.

Wu and McGoogan reported that, among the 72,314 COVID-19 cases reported to the Chinese Centre for Disease Control and Prevention (CCDC), 81% had absent or mild symptoms (mild pneumonia), 14% of cases were severe (hypoxia, dyspnoea and 50% lung involvement within 24-48 hours), 5% were critical (shock, respiratory failure, multi-organ dysfunction), and 2.3% of the critical cases were fatal [4]. Common symptoms are fever, cough, myalgia and fatigue. Less common symptoms include headache, sputum production, diarrhoea, malaise, shortness of breath/dyspnoea and respiratory distress. The most common serious manifestation of COVID-19 appears to be pneumonia [4]. On average, the COVID-19 case fatality rate (CFR) is about 2%–3% worldwide and higher than the previously reported level of 0.7%–1.3% [5]. Most of the fully vaccinated people are asymptomatic and case fatality remains low but needs further studies.

The factors associated with infections in HCWs in a healthcare setting, include late recognition or suspicion of COVID-19 in patients, working in a high-risk department, long working hours, sub-optimal adherence to infection prevention and control measures such as inappropriate hand hygiene practices and lack of or improper use of personal protective equipment (PPE) [6]. Other factors, such as inadequate or insufficient infection prevention and control (IPC) training for respiratory pathogens, , as well as long exposure

in areas of healthcare facilities where large numbers of COVID-19 patients were being cared for have also been documented [6].

In Sri Lanka, there are designated hospitals for COVID-19 treatment and for COVID-19 suspected patients [2]. All other hospitals triage the patients according to travel history, contact history and symptoms and suspected patients are transferred to COVID suspected centres [2].

The front-line HCWs who come into direct contact with the patients are putting themselves at risk of being exposed. Evidence from other countries has shown that adequate knowledge of IPC and the use of PPE could minimize the risk of being infected. Lack of knowledge, inadequate practices and poor attitudes to infected patients can lead to HCWs being exposed or getting infected. A positive attitude is essential to adopt best practices and deliver necessary services. Additionally, it is important that efforts are made to maintain the physical and mental health and wellbeing of HCWs.

Our main objective was to assess the knowledge, attitude and practices and associated factors related to the COVID-19 among healthcare workers in selected hospitals in Sri Lanka.

## Methods
### Study design and setting
This descriptive, cross-sectional study was conducted as a part of the public health response to the COVID-19 outbreak in Sri Lanka between June 2020 and September 2020, during the first wave of the COVID pandemic in Sri Lanka. In the initial phase, Sri Lanka had two types of treatment centres dedicated for COVID-19: COVID-19 treatment centres and COVID-19 isolation centres (DDG (MS1 / 23/ 2020, dated 12. 04.20). Non-COVID-19 healthcare institutions continued to cater to the population. For this study, we chose four hospitals from each of the above categories. In this regard, the secondary and tertiary healthcare institutions in Sri Lanka were categorized into:

**Group A**   COVID-19 treatment centres (This categorization was done based on a circular issued by the Ministry of Health Sri Lanka (Circular number DDG (MS1 / 23/ 2020, dated 12. 04.20)

**Group B**   COVID 19 isolation centres. (Circular number DDG (MS1 / 23/ 2020, dated 12. 04.20)

**Group C**   Hospitals in areas categorized as low risk areas for COVID transmission.

We randomly selected 4 hospitals from each Group (A, B, and C). University Hospital, Kotelawala Defence University (UHKDU) and the base hospitals at Welikanda, Homagama, and Mulleriyawa were the treatment centres that were selected under group A . Teaching Hospital, Ratnapura, Provincial General Hospital, Badulla, Provincial General Hospital, Kurunegala and Teaching Hospital, Jaffna were chosen as group B. Group C category consisted of base hospitals at Warakapola, Tangalle and Matale and the District General Hospital, Trincomalee (Figure 1).

For this study, a curative healthcare institution was considered a cluster. Permanent staff, doctors and nurses, from the above-mentioned hospitals who had more than two years of experience participated in the study.

Based on the formula proposed by Lwanga and Lemeshow for calculation of sample sizes for cross sectional studies, the initial sample size calculated was 384, having considered a population with an expected prevalence of adequate knowledge and practices as 50%, each. This sample size was subsequently multiplied by the design effect set at 1.5 and adjusted for a non-response rate of 15%. The resulting sample size of 665 was then further increased to obtain integer division by selecting 60 participants, comprising 30 doctors and 30 nurses from each of the 12 hospitals. The final sample size was 720 (12x60). Doctors and nurses working in outpatient departments, emergency units and medical wards in each hospital where they directly come into contact with COVID cases and form a homogenous group formed a cluster. There were 12 such clusters. The reason for having 60 participants per cluster was to have adequate representation of doctors and nurses from a cluster made up of the three settings. HCWs doing administrative work and in non-COVID wards and departments were excluded from the study.
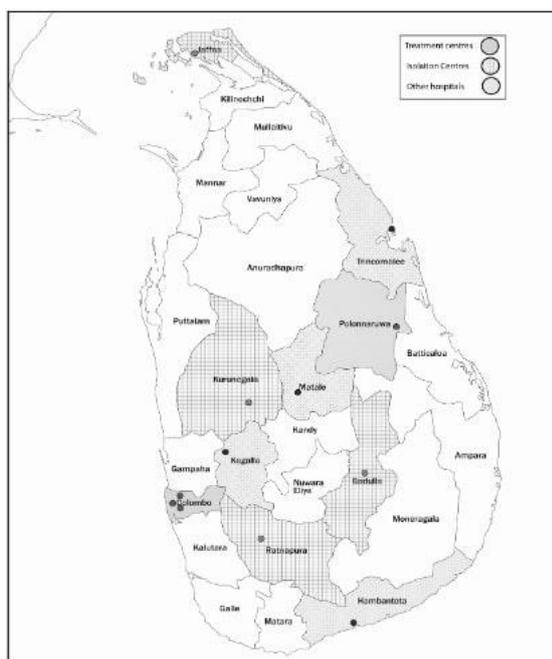


Figure 1: Distribution of hospitals

### Data collection

A self-administered, paper-based questionnaire was developed to collect information and distributed to all the participants at their workplaces. Information about the study was given with the questionnaire.

Face and content validity were assured by using items and findings related to the topic from previously published studies and by obtaining opinions from experts from the fields of clinical medicine, public health, microbiology and psychology. The questionnaire

consisted of four domains: socio demographic factors, practice related questions, attitudes on COVID-19 and knowledge on COVID-19. The questionnaire was developed in English and translated to Sinhala. A pilot study was done with 15 participants from hospitals other than the ones selected for the study. Four data collectors were trained by the investigators and data collection was conducted under the supervision of the investigators.

Ethics clearance was taken from the Ethics Review Committee of the Sri Lanka Medical Association. In addition, administrative permission was obtained from the Ministry of Health Sri Lanka and from the directors of the relevant hospitals prior to the study. Written informed consent from all participants were obtained.

## Statistical analysis

### Socio demographic factors

These data comprised of age, work experience, occupation, educational qualifications, family members at home, comorbidities and income.

### Analysis of Knowledge

The section on knowledge consisted of 10 questions. Six questions had yes, or no answers and four questions had multiple choice answers with 21 items. Correct answers were given a score of 1 and incorrect answers given 0. The total knowledge score could range from 0-27 marks. The score obtained by a participant was expressed as a percentage of the total possible score. The mean percentage score was selected as the cut off to indicate 'good knowledge'. This was based on six questions that were considered as assessing essential knowledge.

### Analysis of Attitudes

Attitude questions consisted of 15 questions, answered on five-point Likert scales with the options to strongly disagree, disagree, neither agree nor disagree, agree, and strongly agree. Each was scored 4 (strongly agreeing with a positive item or strongly disagreeing with a negative item), 3 (agreeing with a positive or disagreeing with a negative item), 1 (agreeing with negative item or disagreeing with a positive item or 0 (strongly agreeing with a negative item or strongly disagreeing with a positive item). Neither agree nor disagree was not given a score. The total possible score was 60 and the minimum was 0. The mean score was considered as the cut-off.

### Analysis of Practices

The practices section consisted of 16 questions which required yes or no answers. Correct answers were given a score of 1 and incorrect answers given 0. The total possible score ranged from 0 to 16 and was expressed as a percentage of total possible score, which was 16. A pre-determined cut-off level, being the mean value of the individual percentage scores, was selected as an indicator of "adequate" practice. Six practices were considered as essential to prevent disease acquisition.

We used Software for Statistics and Data Sciences (STATA) Version 40 for data analysis and to calculate the means, standard deviation (SD), medians for continuous variables

and proportions and percentages for categorical values. Bivariate analyses were conducted, and the significance of association was tested using the chi-square test for nominal data. The level considered significant was a probability (p) value of 0.05 or less. The factors, which had a p-value of ≤0.25, and biologically plausible ones, despite having a p value of >0.25, were included in a multiple logistic regression analysis. Associations were expressed as odds ratios (OR) and their respective 95% confidence intervals (95% CI).

## Results

### Sociodemographic characteristics

A total of 651 (90.4 %) responded, with 224 (34.4%), 226 (37.4 %) and 201 (30.9 %) from COVID-19 treatment centres, COVID-19 isolation centres and non-COVID hospitals, respectively. Of the participants, 311(47.8%) were doctors and 340(52.2%) were nurses. There were 218(33.5%) males and 433(66.5%) females. Most of the participants were married 498(76.5%). The mean age was 44.3 years (SD of 25 years). A majority (n=310, 47.6%) were between 30-39 years of age. Majority (59.6%) had a Bachelors, Masters or a doctoral degree and the remainder had diplomas. Four hundred and forty (67.6%) had children and 143(22%) had family members above the age of 60 years with chronic illnesses.

**Table 1: Sociodemographic characteristics of the healthcare workers**

| Socio demographic characteristics | N(%) |
|---|---|
| **Job category n= 651** | |
| Doctors | 311(47.8) |
| Nurses | 340(52.2) |
| **Gender** | |
| Male | 218(33.5) |
| Female | 433(66.5) |
| **Age (years) mean (44.3+/-25)** | |
| 18-29 | 94(14.4) |
| 30-39 | 310(47.6) |
| 40-49 | 129(19.8) |
| 50-59 | 63(9.7) |
| 60-69 | 5(0.8) |
| Not stated | 50(7.7) |
| **Qualifications** | |
| Diploma in nursing | 258(39.6) |
| Bachelor's degree | 345(52.9) |
| Master's degree | 17(2.6) |
| Postgraduate (MD) | 26(3.9) |
| Not stated | 5(0.8) |
| **Marital statuses** | |
| Married | 498(76.5) |
| Unmarried | 143(21.9) |
| Not stated | 10(1.5) |

| | |
|---|---|
| **Monthly income** | |
| Rs. <50,000.00 | 60(9.2) |
| Rs. 50,001.00- Rs.10,000.00 | 277(42.5) |
| Rs. 10,001.00- Rs. 150,000.00 | 85(13.0) |
| Rs. 150,001.00- Rs. 200,000.00 | 131(20.1) |
| Rs >200,000.00 | 89 (13.7) |
| **Age distribution of family members** | |
| <5 years of age | 241(37.0) |
| 5-12 years of age | 199(30.6) |
| >60 years of age | 114(17.5) |
| With chronic illness | 29(4.5) |
| Not stated | 68(10.4) |
| **Hospital categories** | |
| COVID 19 Treatment centres | 224 (34.4) |
| COVID  19 isolation centres | 226 (34.7) |
| Other hospitals | 201(31.3) |

## Knowledge

The mean percentage COVID-19 knowledge score was 74.6 with 69.4% of participants (71.5% doctors, 67.2% nurses) having good overall knowledge of COVID-19. The majority 628(96.5%), (96.1% doctors, 96.7% nurses)stated that it is a viral infection; 95%(92.6% doctors, 97.3% nurses)  knew asymptomatic carriers can spread the infection; 90%(93% doctors, 86.5% nurses) knew it can be fatal, 93% (94%doctors, 93%nurses) thought social distancing was essential to prevent infection; 92%(91.8% doctors, 90.3% nurses) knew infection in hospitals could be reduced with active participation in infection control programs. At the same time, 17% (4.5% doctors, 28.5% nurses) believed that traveling within the country was safe during the outbreak. Almost 97% of doctors and nurses knew the main mode of transmission was respiratory droplets and 62.5% (65.6% doctors, 59.7% nurses) had knowledge about rare modes of COVID-19 transmission such as air-borne transmission and transmission through blood products. Eighty two percent (86.4% doctors, 76.8% nurses) had good knowledge on symptoms and signs such as cough, fever, shortness of breath, myalgia, and diarrhoea, 95% (96.1% doctors, 95.8% nurses) had good knowledge about preventive methods such as wearing a mask, washing hands, avoiding touching nose, eyes and mouth, and maintaining social distancing. Most of the participants 61.9% (66.5%doctors, 57.6% nurses) knew the incubation period was 1-14 days.  Only 31.5% (36.3% doctors, 27% nurses) of the participants knew that a contact period of 15 minutes or more within six feet of a COVID-19 patient was enough to be considered "exposed" [7]. However, most of the participants 79.1% (82% doctors, 75.9% nurses) knew that less than six feet distance was considered "exposed".  Majority of the doctors and nurses (>90%) had "good" knowledge (>70%).

## Attitude

Nearly half of the participants (68.5% doctors, 46.7% nurses) had a positive attitude toward COVID-19 patients with a score of ≥46. Nearly half the participants 46.2% (39.4% doctors, 53.7% nurses), worried that they would be exposed to COVID-19 infection, and that they would be infected with COVID-19 if exposed, 48.3% (42.6% doctors, 54.7% nurses). In addition, 46.1% (doctors 43.8% nurses 48.5%) felt they were not adequately protected even when wearing masks and around half (50% doctors, 50% nurses) worried that there was no specific treatment.

Additionally, 52.2% (49.8% doctors, 54.4% nurses) agreed and 15.9% (15.7% doctors, 16.2% nurses) strongly agreed that they would feel more protected if they were provided with N95 masks and other protective equipment. Nearly 75% of participants (77.1% doctors, 72.9% nurses) disagreed on providing minimum care to COVID-19 patients while 51.5% (61.2% doctors, 25.9% nurses) were not worried that they had to treat a COVID-19 patient. Sixty percent of participants agreed that that they would not worry much on being exposed if a vaccine was available. More than half of them (51.8% doctors, 38.8% nurses) were worried about being quarantined following exposure to a COVID-19 patient and 86.1% (88.1% doctors, 82.3% nurses) believed it was important to quarantine the exposed close contacts of a COVID-19 patient. Nearly 60% (75.3% doctors, 40.6% nurses) worried that they are at a higher risk of being exposed to COVID-19 as HCWs.

**Table 2: Attitude to COVID-19 among healthcare workers**

| Attitude (n=651) | Strongly Disagree N(%) | Disagree N(%) | Neither agree nor disagree N(%) | Agree N(%) | Strongly Agree N(%) | Not Answered N(%) |
|---|---|---|---|---|---|---|
| | | | | | | |
| I worry that I will be exposed to a COVID 19 infection. | 60(9.22) | 116(17.8) | 89(13.7) | 301(46.2) | 74(11.4) | 11(1.7) |
| I have fears that if I am exposed to a COVID 19 patient that I will be infected | 47(7.22) | 136(17.8) | 77(11.8) | 315(48.3) | 63(9.7) | 13(2.0) |
| I do not feel adequately protected by wearing a mask? | 36(5.5) | 156(23.9) | 77(11.8) | 300(46.1) | 64(9.8) | 18(2.8) |
| I feel that even if we do not have COVID 19 cases I should be given a N95 mask | 100(15.4) | 249(38.2) | 56(8.6) | 156(23.9) | 60(9.2) | 30(4.6) |
| If I am provided with N95 mask and other protection I feel safe | 32(4.9) | 82(12.6) | 74(11.4) | 340(52.2) | 104(15.9) | 19(2.9) |
| I agree that it is correct to give minimum care to a non-COVID patient? | 204(31.3) | 284(43.6) | 46(7.0) | 66(10.1) | 23(3.5) | 28(4.3) |
| I am worried of getting the COVID 19 as there is no specific treatment option | 49(7.5) | 81(12.4) | 92(14.1) | 325(49.9) | 79(12.1) | 25(3.8) |
| I am worried, If I have to treat a COVID-19 patient | 122(18.4) | 217(33.3) | 103(15.8) | 146(22.4) | 33(5.0) | 30(4.6) |
| If a vaccine is available, I would not be much worried about being exposed. | 44(6.7) | 159(24.4) | 115(36.9) | 240(36.9) | 66(10.1) | 27(4.1) |
| I don't have a trust that the government may be able to control the outbreak | 71(10.9) | 257(39.5) | 167(25.6) | 109(16.7) | 22(3.4) | 25(3.8) |
| I am worried to being quarantined following exposure to a COVID19 patient | 62(9.5) | 186(28.6) | 63(9.68) | 244(37.5) | 60(9.2) | 36(5.5) |
| It is important to quarantine the exposed person who has close contact with a COVID-19 patient | 8(1.2) | 26(3.9) | 32(4.9) | 272(41.8) | 289(44.4) | 24(3.7) |

| | | | | | |
|---|---|---|---|---|---|
| I feel that I am more likely to infect with COVID-19 as I am a healthcare worker | 57(8.8) | 115(17.7) | 77(11.8) | 285(43.8) | 87(13.3) | 30(4.6) |
| I don't feel that the available PPE are adequate in the country | 44(6.8) | 133(20.4) | 113(17.4) | 228(35.0) | 96(14.7) | 37(5.6) |
| I have faith in the triage system operating in the OPD | 38(5.8) | 124(19.0) | 128(19.6) | 270(41.5) | 51(7.8) | 40(6.1) |

## Practices

With regards to preventive measures, 96.5% (95.8%doctors, 97% nurses) practiced social distancing, 98.3% (97.4% doctors, 99.1% nurses) reported that they wear masks, 98.3% (97.4% doctors, 97.9% nurses) adhered to frequent hand washing and used hand sanitizer and 94.2% (91.6% doctors, 96.5% nurses) avoided touching their face, mouth, and eyes. While >95% practiced essential preventive measures, overall practices were good in 85.9% doctors and 86.7% nurses. Eighty one percent (doctors 77.8%, nurses 83.2%) reported that they had maintained minimum contact with patients (Table 3).

Considering healthcare delivery to non-COVID-19 and COVID-19 suspected patients, the doctors and nurses did not report reluctance in measuring blood-pressure, auscultating and palpating, and administering oral and intravenous drugs. Sixty two percent of them reported that they had changed their daily practices due to COVID 19.

There was no significant difference between patient care practices for those suspected to have COVID-19 and non-COVID-19 patients (p>0.05).

**Table 3: Practices by healthcare workers to prevent self-exposure and in patent care**

| | Yes N(%) | No N(%) | Not answered N(%) | Total N(%) |
|---|---|---|---|---|
| **Practices adopted to prevent exposure to Covid19 infection** | | | | |
| Social distancing | 628(96.5) | 13(2.0) | 10(1.5) | 651(100.0) |
| Wearing a mask | 640(98.3) | 5(0.8) | 6(0.9) | 651(100.0) |
| Frequent and correct hand washing with soap and water or using hand sanitizer | 636(97.7) | 9(1.4) | 6(0.9) | 651(100.0) |
| Not touching face mouth and eyes | 613(94.2) | 31(4.8) | 7(1.1) | 651(100.0) |
| Minimum contact with patients | 525(80.6) | 109(16.7) | 17(2.6) | 651(100.0) |
| **Measures you take during Covid19 patient care** | | | | |
| **Would you measure blood pressure?** | | | | |
| Suspected COVID-19 patient | 567(87.1) | 84(12.90 | - | 651(100.0) |
| Non-COVID-19 patient | 610(93.7) | 41(6.3) | - | 651(100.0) |
| **Would you auscultate?** | | | | |

| Suspected COVID-19 patient | 497(76.4) | 154(23.7) | - | 651(100.0) |
|---|---|---|---|---|
| Non-COVID-19 patient | 554(85.1) | 97(14.9) | - | 651(100.0) |
| **Would you Palpate abdomen?** | | | | |
| Suspected COVID-19 patient | 508(78.1) | 143(22.0) | - | 651(100.0) |
| Non-COVID-19 patient | 560(86.0) | 91(14) | - | 651(100.0) |
| **Would you administer oral drugs?** | | | | |
| Suspected COVID-19 patient | 566(87.0) | 85(13.1) | - | 651(100.0) |
| Non-COVID-19 patient | 577(88.6) | 74(11.4) | - | 651(100.0) |
| **Would you administer Intravenous drugs?** | | | | |
| Suspected COVID-19 patient | 551(84.6) | 100(15.4) | - | 651(100.0) |
| Non-COVID-19 patient | 578(88.8) | 73(11.2) | - | 651(100.0) |

## Associated factors

Based on the multivariate analysis, a good overall knowledge on COVID-19 was significantly associated with being a doctor (OR=1.12; 95%CI: 1.007-1.3) [Table 4]. Good practices were significantly associated with adequate knowledge (OR=2.12; 95% CI:1.5-3.0), being married (OR=1.4; 95% CI:1.02-2.0) and being a doctor (OR=1.2; 95% CI:1.1-1.24). Being a doctor was associated with positive attitude (OR=1.1; 95% CI:1.700-1.2). There was no significance difference in knowledge, attitude and practices among HCW working in the three categories of hospitals i.e., COVID-19 treatment centres, COVID-19 isolation centres and non-COVID-19 healthcare institutions.

**Table 4: Factors significantly associated with good knowledge, good practices, and positive attitudes among healthcare workers**

| Variable | Unadjusted | | Adjusted | |
|---|---|---|---|---|
| | OR | 95%CI | OR | 95% CI |
| **Adequate knowledge** | | | | |
| Occupation as a doctor | 1.1 | 1.005-1.2 | 1.12* | 1.007, 1.3 |
| **Good Practices** | | | | |
| Adequate knowledge | 2.02 | 1.4, 2.8 | 2.12** | 1.5, 3.03 |
| Being married | 1.3 | 0.9, 1.8 | 1.4** | 1.02, 2.0 |
| Occupation as a doctor | 1.2 | 0.8, 1.2 | 1.2** | 1.1, 1.24 |
| **Good Attitudes** | | | | |
| Occupation as a doctor | 1.1 | 1.007-1.2 | 1.1 *** | 1.009,1.3 |

*Adjusted for hospital category, occupation, age, sex, monthly income, marital status, number of family members, education qualifications

** Adjusted for knowledge, hospital category, occupation, age, sex, monthly income, marital status, number of family members, education qualifications

*** Adjusted for knowledge, hospital category, occupation, age, sex, monthly income, marital status, number of family members, education qualification

## Discussion

HCWs are at the forefront of COVID-19 management. To our knowledge, this is the first multicentre study conducted to assess knowledge attitude and practices among HCWs on COVID-19 in Sri Lanka. Participants of our study had an average age of 44.3 (+/-25) years with a male to female ratio of 1:2.

In our study, about 78.8% of HCWs had good knowledge on the transmission of COVID-19. Comparatively, 93.3% of Pakistani HCWs, 99.5% of Bangladeshi HCWs, 66.5% of South Indian HCWs, 68.6% of Nepalese HCWs, and over 80% of HCWs in Thailand had good knowledge about COVID-19 transmission. All (100%) of Thai HCWs were aware of droplet transmission compared to 96.5% of Sri Lankan HCWs and 75.6% of Nepalese HCWs. COVID-19 symptom awareness was 81.9% among HCWs in this study, 80% in Thai HCWs, 96.8% among Nepalese HCWs and 84% among Pakistani HCWs [8-13]. Ninety three percent of our HCWs were aware of all preventive measures while more than 80% of Pakistani HCWs were aware of preventive measures (9). But in the case of knowledge about the incubation period, and the minimum distance and duration of contact with COVID-19 patients to be considered as exposed (quarantine criteria), 37%, 68.5% and 21% of our participants were unaware, respectively. In an Indian study 58.8% were unaware of the incubation period and 50% of them unaware of quarantine criteria.

Most of the Pakistani participants who were physicians, nurses or pharmacists knew the signs and symptoms (84%) and risk factors (72%) associated with COVID-19 (8). They also agreed that COVID-19 can be prevented by wearing a mask (88.3%), washing hands (81.7%), isolating the infected patient (95%), restricting travel to infected areas (85.6%), and avoiding contact with the nose, eyes, and mouth (97.3%) (12). Similarly, a majority of this study's participants believe that infection can be prevented by wearing a mask (98.3%), washing hands (97.7%), isolating the infected patient (86.6%), and avoiding contact with the nose, eyes, and mouth (94.2%). Knowledge among health care professionals was varied but almost more than half of the study samples demonstrated adequate levels of knowledge in each country.

Many of this study's participants had a positive attitude towards preventive measures, such as using PPE, but only 50% of them had a positive attitude towards caring for COVID-19 patients. There was similar data among Pakistani HCWs on preventive measures. South Indians HCWs had positive attitudes towards preventive measures and PPE but few had positive attitudes towards patient's care. The Thai study demonstrated positive attitudes towards personnel protection as well as patient care. In Bangladesh, 88.8% had positive attitudes toward COVID 19 patients. In contrast, Nepalese HCWs had a negative attitude regarding the caring of COVID 19 patients but positive attitudes towards preventive methods.

The level of overall knowledge of COVID-19 among HCWs were 69.4%, 99.5%, 98.6%, 90.7%, 63.5% in Sri Lanka, Bangladesh, Nepal, Pakistan, and South India, respectively. Regarding positive attitudes, about 50% of Sri Lankan HCWs, 88.85% of Bangladeshi

HCWs, 90% of Pakistani HCWs displayed positive attitudes, while 59.3% of Nepalese HCWs displayed negative attitudes towards COVID-19. Comparison of preventive practices towards COVID-19, showed that 95%, 51.7%, 98.5%, 100%, and 74.9% of Sri Lankan, Bangladesh, Nepalese, Pakistani and South Indian HCWs respectively had good practices.

Our study results provide confidence in terms of HCWs' knowledge regarding the transmission and preventive measures of COVID-19 which is a good sign in the present situation. Their practices towards patients' care and self-protection were on par with other South Asian countries and their attitudes are appreciable. Significantly more doctors had good knowledge, practices and a positive attitude when compared with the nurses. Both groups had good practices towards COVID-19 patients' care.

## Conclusions and Recommendations
Although overall knowledge and practices were satisfactory among HCWs, there are few areas that need to be improved which is crucial in the rapid rise period of the pandemic. The need to build a positive attitude among all health care workers toward preventive strategies and patient care is a must.
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### Data availability
Hard copies and electronic data are available on request

### Disclosure
The authors report no conflict of interest for this work

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