



RESEARCH ARTICLE

Knowledge, Attitudes, and Practices Towards COVID-19 Infection among Oral Healthcare Workers at a Tertiary Dental Hospital in Sri Lanka

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ABSTRACT

Oral healthcare workers are at a higher risk of contracting COVID-19 due to the nature of their work. Therefore, the present study aimed to assess the knowledge, attitudes, and practices towards COVID-19 among all categories of oral healthcare workers (OHCWs) at a tertiary dental hospital in Sri Lanka. This was a descriptive cross-sectional study conducted towards the end of COVID-19 pandemic in December 2022. A self-administered questionnaire was used as the study instrument. The knowledge, attitudes and practices were categorised as poor- <60%, moderate- 61-80%, excellent ->80% according to the score. The mean knowledge score, attitude score and practice score of OHCWs regarding COVID-19 infection was 6.7 (SD1.5), 35.5 (SD 3.7), and 13.6 (SD 2.8) respectively. Only 6.4% of the participants had excellent level of knowledge and it was significantly associated with the sex, OHCW category, and having children less than 10 years. Only 1.7% of participants exhibited excellent attitudes, and 75.5% of participants showed excellent practices. The practice score was significantly associated with sex, OHCW category, and marital status. OHCWs in a tertiary dental hospital, Sri Lanka had a moderate level of knowledge and attitude but excellent practices towards the COVID-19 infection. Continuous in-service training programs should be conducted among all OHCWs to improve the level of knowledge and attitudes as well as to maintain good practices for any future pandemic situations.

Keywords: Oral healthcare worker; Knowledge; Attitude; Practices; COVID-19; Sri Lanka

1 INTRODUCTION

The highly contagious nature of the Covid-19 virus has presented significant challenges to the public and healthcare personnel. Healthcare workers are at an increased risk of contracting the virus.^(1,2) This is primarily because COVID-19 is mainly transmitted through respiratory droplets and contact. Risk of transmission is higher in situations where protective measures like masks are not utilized, or where people are less than one meter apart. Since dental procedures often generate aerosols, they further increase the risk of transmission of virus. Therefore, oral healthcare workers are considered to be having increased risk of contracting and transmitting the virus.^(3,4)

A study conducted in Mexico focusing on dentists' knowledge, attitudes, and practices towards COVID-19 prevention found that the dentists, in general, possess a

high level of knowledge on SARS-CoV-2 transmission routes and infection control measures to protect themselves and their patients. However, the research identified that some of their practices were not fully in compliance with the recommended guidelines for infection control in dental healthcare settings. Despite the dentists' knowledge, there are still significant concerns regarding the possibility of contracting COVID-19.⁽³⁾

A recent survey conducted in China revealed that healthcare workers possess satisfactory knowledge about COVID-19, with 89% of them demonstrating adequate understanding of the disease. However, a considerable majority (85%) expressed concerns about contracting the virus themselves while on the job. The study also found that healthcare workers' attitudes and practices towards COVID-19 were influenced by various factors, such as job category and work experience, with doctors exhibiting

higher knowledge levels than nurses and paramedics.⁽⁵⁾ According to study conducted among healthcare workers in Ethiopia, it was observed that while most healthcare workers had good knowledge about COVID-19, their prevention practices were relatively lower. Factors such as a shortage of personal protective equipment, high workload, co-morbidities, limited knowledge, and restricted access to infection prevention training and guidelines were identified as constraints that limited their prevention practices.⁽⁶⁾ A study conducted in India has found that dental health professionals require regular educational activities and training programs on infection prevention practices, particularly regarding COVID-19, not only to improve their own practice but also to be better equipped to support the healthcare sector in case of a demanding situation.⁽⁷⁾

Sri Lanka has successfully controlled several COVID 19 waves. To continue providing oral health services to the public, it is highly necessary to assess the levels of knowledge, attitude and practices related to prevention of COVID 19 infection among this group of people who are at a higher risk in contamination of COVID 19. There are around 700 government out-patient department dental clinics as well as several specialized dental clinics in Sri Lanka. Dental clinics have been functioning throughout this pandemic period according to the guidelines developed by relevant authorities in the Ministry of Health, Sri Lanka and also adhering to institutional level guidelines. The present study aimed to assess the knowledge, attitudes, and practices towards COVID 19 among all categories of OHCWs at a tertiary dental hospital in Sri Lanka.

2 METHODS

This was a descriptive cross-sectional study among all categories of OHCWs at tertiary dental hospital in Sri Lanka. The study was conducted towards the end of the COVID-19 pandemic between 01st of December 2022 to 15th of December 2022. The investigators of the current research and any staff member who was on long-term leave such as maternity leave was excluded from the sample. Self-administered questionnaire was prepared using already used questionnaires in literature which contained socio demographic data, questions related knowledge, attitudes, and practices in prevention of COVID 19. Face validity, content validity and consensual validity were assessed. Questionnaire was pretested among sub sample of 15 health care staff personnel in another dental hospital in Sri Lanka. Relevant changes on wording and phrasing were done accordingly to maximize the understanding.

The knowledge section of the questionnaire consisted of 10 questions, with yes, no or don't know answers. "No" and "don't know" answers were considered as incorrect answers at the analysis. Correct answers were scored as "1" and incorrect answers were scored as "0". Overall knowledge score ranged from 0-10. Knowledge was categorized into

three levels: poor, moderate, and excellent, based on the percentage of the overall score. If the percentage falls below 60%, it was considered poor knowledge, if it ranges from 61% to 80%, it was considered moderate knowledge, and more than 80%, was considered excellent knowledge.^(8,9) Attitudes were assessed using 10 statements, in a 5-point Likert scale ranging from strongly agreed to strongly disagreed. Score ranged from 1 to 5. Positive attitudes received a higher score, and negative attitudes received a lesser score. The overall attitude scores, which ranged from 10 to 50, was categorized based on the same criteria used for the knowledge score. An overall score of 30 or below was classified as poor attitudes, scores ranged from 31 to 40 were considered moderate, and scores of 41 or above were regarded as excellent attitudes. Practices were assessed using 8 questions with 3- point Likert scale ranging from always (score 2), sometimes (score 1), and never (score 0) answers. Overall practice score ranged from 0-16. Cut-off points for practice score were set same as for the knowledge score. Therefore, overall score of 9.6 or below was considered as poor, score ranged from 9.7 to 12.8 were considered as moderate and a score above 12.9 was considered as excellent. Sample frame was the list of health staff present on the day of the study. After obtaining the written informed consent, self-administered questionnaire was distributed among health care personnel. Data analysis was done using Statistical Package for Social Sciences (SPSS) software 20th version. Data was summarized and presented as mean, percentages and prevalence. Chi square test and ANOVA test were used to assess significance of the association between independent and dependent variables. The p-value below 0.05 was considered as significance level to determine the above associations. Multiple linear regression was used to assess the contributing factors to knowledge, attitude, and practices. Before the analysis certain variables were combined to create fewer categories. In the "ethnicity" variable, the categories of Tamil and other were merged to create a new category called "other ethnicities." Similarly, in the "oral healthcare worker category" variable, consultants and dental surgeons were combined to form the category "clinicians," while dental technicians, paramedical staff, attendants, and nursing officers were grouped together to create the category "other staff". Ethical clearance was granted by Ethics Review Committee, Postgraduate Institute of Medicine, University of Colombo (ERC/PGIM/2022/017).

3 RESULTS

The study included all 172 oral healthcare workers who consented on the day of the research, which accounted for 90% of the entire staff of the dental hospital. Mean age of the sample was 41.8 years (SD 9.2). The sample consisted of 75.6% females, and the majority of the population (97.1%) were Sinhalese. Of the study sample, 89% obtained COVID-19 information through mass media, while only

11% obtained information through social media. The study found that 46.5% of the sample had already infected by the COVID-19 infection. Sociodemographic profile of the study sample is shown in Table 1.

Table 1: Sociodemographic profile of the study sample

Description		Frequency	(%)
Age	40 years or less	79	45.9
	More than 40 years	93	54.1
Sex	Male	42	24.4
	Female	130	75.6
Ethnicity	Sinhala	167	97.1
	Tamil	2	1.2
	Other	3	1.7
Oral healthcare worker category	Consultant	5	2.9
	Dental Surgeon	52	30.2
	Nursing officer	20	11.6
	Dental technician	6	3.5
	Attendant	2	1.2
	Healthcare Assistants	77	44.8
Service period	Paramedical	10	5.8
	Less than 10 years	65	37.8
	More than 20 years	107	62.2
Marital status	Married	151	87.8
	Unmarried	41	8.1
Having children less than 10 years	Other	7	4.1
	Yes	68	39.5
	No	104	60.5

3.1 Knowledge

Based on the results, mean knowledge score regarding the COVID 19 infection among OHCWs, was 6.7 (SD 1.5). Out of all the participants, 6.4% were categorized as having a high level of knowledge, while 52.9% were in the moderate level and 40.7% fell into the poor level of knowledge category. Frequency and percentage of participants with correct responses to knowledge items of the questionnaire is shown in Table 2. In multiple linear regression analysis showed that overall knowledge score was significantly associated with sex, OHCW category, and having children less than 10 years (Table 3).

3.2 Attitude

The mean attitude score towards COVID-19 infection was 35.5 (SD 3.7), with only 1.7% of the participants having excellent attitudes and 31.4% having poor attitudes towards the disease. A majority (58.7%) of the respondents believed that COVID-19 is a highly dangerous disease, but 77.9% had

Table 2: Frequency and percentage of participants with correct responses to knowledge items of the questionnaire

Statement	Correct response	No correct responses N= (172)	(%)
Covid-19 infected people can transmit the disease before symptoms appear.	Yes	145	(84.3%)
Washing hands for 10 seconds can prevent the transmission of Covid-19.	No	79	(45.9%)
COVID-19 is more commonly transmitted in a cool climate than in a warm climate.	No	18	(10.5%)
The PCR test is generally considered to be more reliable than the Rapid Antigen Test (RAT) for detecting COVID-19.	Yes	123	(71.5%)
It is possible to contract the virus that causes COVID-19 by touching your face.	Yes	142	(82.6%)
COVID-19 patient who is not experiencing fever cannot transmit the disease.	No	148	(86%)
Natural immunity acquired through a previous COVID-19 infection is superior to immunity provided by vaccination.	No	91	(52.9%)
A person who has contracted COVID-19 once will be immune to the disease in the future.	No	160	(93%)
Not all individuals infected with COVID-19 show symptoms of the disease.	Yes	127	(73.8%)
Vaccination totally protects against COVID 19 infection.	No	118	(68.6%)

the attitude that they are happy to work at the hospital during the pandemic period. However, 54.1% were worried about the possibility of spreading the infection to their families. Around 50% of the respondents expressed happy to work on suspected COVID-19 patients. The survey also found that 79.6% of the OHCWs were satisfied with the hospital's plan to prevent the transmission of COVID-19. Multiple linear regression analysis identified that overall attitude score was not significantly associated with socio demographic factors (Table 3). Figure 1, presents a summary of the responses to the questions related to attitudes towards COVID-19.

3.3 Practice

The survey revealed that the mean practice score of OHCWs regarding COVID-19 infection was 13.6 (SD 2.8), with 75.5%

Table 3: Factors associated with knowledge, attitude, and practices toward the COVID 19 infection among OHCWs

Variable		Knowledge Score		Attitude Score		Practice Score	
		*β	P value	*β	P value	*β	P value
Sex	Male	Reference					
	Female	0.17	0.02	-0.12	0.20	0.26	0.00
Age category	Less than 40 years	Reference					
	41 years and above	-0.04	0.67	0.15	0.18	-0.09	0.36
Ethnicity	Sinhala	Reference					
	Other	0.04	0.54	-0.03	0.59	-0.06	0.32
oral healthcare worker category	HCA	Reference					
	Clinicians	0.24	0.00	0.03	0.69	-0.40	0.00
	Other staff	-0.08	0.29	-0.02	0.79	-0.16	0.04
Service period	Less than 10 years	Reference					
	More than 10 years	0.13	0.25	0.14	0.24	0.12	0.21
	Married	Reference					
Marital status	Unmarried	0.12	0.08	-0.12	0.09	0.07	0.44
	Other	-0.14	0.07	-0.03	0.47	-0.23	0.00
Having children less than 10 years	Yes	Reference					
	No	-0.22	0.00	-0.08	0.46	0.07	0.37
Already Contracted with COVID-19	Yes	Reference					
	No	0.12	0.17	-0.03	0.65	-0.01	0.98
Knowledge Score				0.15	0.11	0.08	0.31
Attitude Score						-0.03	0.65

*Standardize β coefficient

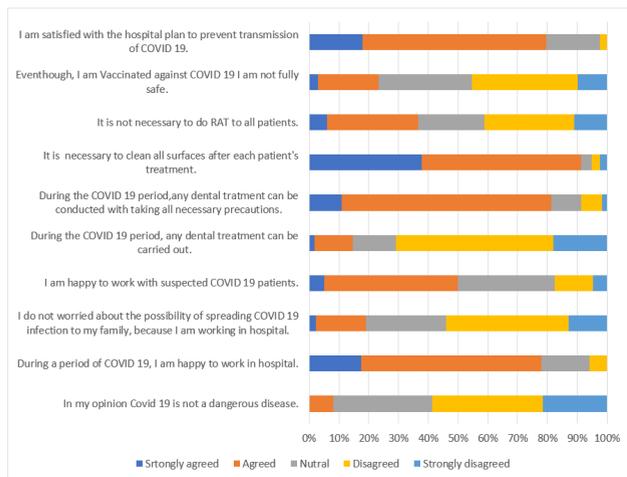


Fig. 1: Responses to questions related to attitudes towards COVID-19 infection

of the participants exhibiting excellent practices. During past one week, majority of OHCWs (84.9%) wore face masks when leaving home, and 87.8% washed their hands upon

returning home. Additionally, 87.2% avoided unnecessary going outs, and 87.8% refrained from consuming outdoor food. Surprisingly, even shopping was restricted by 84.3% of the respondents. Furthermore, 66.9% of the OHCWs reported using Ayurveda medical treatments to boost their immunity against COVID-19 infection. Figure 2, summarizes the responses to the questions related to practices regarding COVID-19. Multiple linear regression analysis found that overall practice score is significantly associated with sex, healthcare worker category, and marital status but not with the knowledge score and attitude score (Table 3).

3.4 Discussion

To the best of our knowledge, this is the first study conducted to assess the Knowledge, Attitude and Practices (KAP) of all categories of OHCWs in Sri Lanka towards the end of the COVID 19 pandemic, while there have been a few studies conducted among other healthcare workers and one among dental surgeons in Sri Lanka. The present study found that the majority of OHCWs had a moderate level of knowledge regarding COVID-19, with very few having

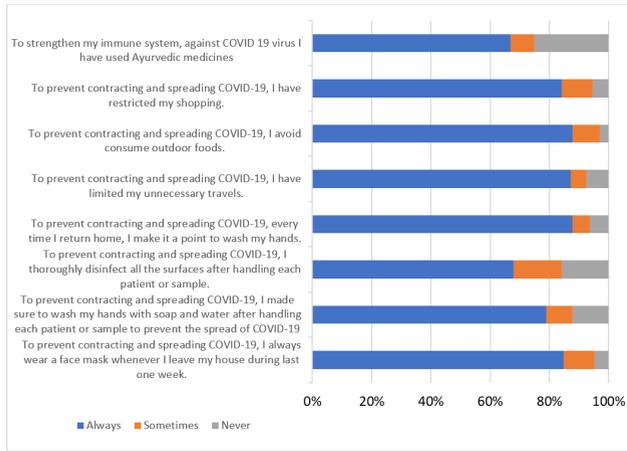


Fig. 2: Responses to the questions related to practices regarding COVID-19

a high level of knowledge. This is in contrast with several other regional and global studies among healthcare workers. For example, a study among healthcare workers in India found that more than 80% of them had an adequate level of knowledge⁽¹⁰⁾, and studies done by Dutta et al. from India⁽¹¹⁾ and Almohammed et al. from Saudi Arabia⁽¹²⁾ also found that knowledge regarding COVID-19 among healthcare workers was at a good level. Additionally, studies conducted among dental students, and practitioners in India revealed that dental students, academicians, and practitioners had a higher level of correct responses to the questions.^(7,13) On the other hand, a study conducted among healthcare workers in primary healthcare centres in Dubai reported that half of the study participants had an unsatisfactory level of knowledge regarding COVID-19 infection.⁽¹⁾ A recent online questionnaire-based survey conducted among dental surgeons in Sri Lanka revealed that the level of knowledge regarding the COVID-19 pandemic among dental surgeons was satisfactory.⁽¹⁴⁾ However, that study had found that there were knowledge gaps to be improved. Another study conducted among Indian dentists also found that the knowledge of dentists in preventing the COVID 19 transmission was at adequate level.⁽⁴⁾ It is important to note that the present study was conducted among all categories of OHCWs in a single tertiary dental hospital, ranging from dental consultants to healthcare assistants, and the sample size was relatively small. Moreover, present study was conducted towards the end of the pandemic period in December 2022. These factors could contribute to most of the sample having only a moderate level of knowledge. The findings of the present study revealed that the knowledge score of OHCWs varied significantly based on sex, OHCW category where dental surgeons had the highest mean knowledge score (7.4, SD 1.3), and having children less than 10 years, which is consistent with some other studies, where they have found that the knowledge score among healthcare

workers significantly differs based on their category of healthcare worker, sex, and age groups.^(5,15) The present study found that the main source of information regarding COVID-19 for OHCWs was mass media. This is in contrasts with some other studies, which have found social media to be the primary source of information for healthcare workers regarding COVID-19.^(16,17)

Similar to the knowledge score, the present study found that OHCWs had a moderate level of attitudes towards COVID-19 infection, in contrast to many other studies, which have found excellent attitudes among health care workers.^(8,18) More than half of the participants believed that COVID-19 was a dangerous disease, which is consistent with findings from an Ethiopian study where 75% of participants believed that COVID-19 is a serious and dangerous disease.⁽¹⁹⁾ According to a study conducted in Iran, 42.1% and 46.7% of health care workers perceived the current pandemic to be of a very high and high level of danger, respectively.⁽²⁰⁾ Moreover, 54% of OHCWs were worried that they could spread the infection to their families, which was a similar attitude found in other studies among health care workers^(1,10) and OHCWs.⁽²¹⁾ However, 50% of OHCWs felt happy to work with suspected COVID-19 patients. Another study conducted by Almohammad et al. found that more than 75% of healthcare workers had fear or felt threatened when providing care for suspected COVID-19 patients.⁽¹²⁾ Further, another study has indicated that the level of comfort among dentists when providing treatments falls in the mid-point between somewhat uncomfortable and neither comfortable nor uncomfortable.⁽²²⁾

In contrast to the knowledge score and attitude score, the present study found that practices related to COVID-19 infection were excellent among OHCWs. Similar results have been found in the literature. A study conducted among dental healthcare professionals in Saudi Arabia also found an excellent practice score among study participants, and they revealed that the practice score was significantly associated with education level.⁽²³⁾ Similarly, the present study also found that the practice score was significantly associated with the OHCW category. Despite masks not being mandatory in the country at the period of the current study, over 80% of participants reported wearing masks when leaving their homes within the past week. This suggests that even as the country has passed the peak periods of pandemic, healthcare staff continued to adhere to good practices. Further, more than 65% of the participants had the practice of disinfecting all surfaces after each patient in the present study, which was higher than the 50% found in a study conducted in India among dental care personnel.⁽²⁴⁾ A study conducted among 346 Nigerian health care workers found a significant positive correlation between knowledge, attitude, and practices.⁽²⁵⁾

One of the main limitations of this study is that it was restricted to one dental hospital. Therefore, before

generalizing the findings to oral healthcare workers in Sri Lanka, further studies including all oral healthcare workers in Sri Lanka are needed. In addition, increasing the sample size could improve the reliability and generalizability of the findings.

4 CONCLUSION

Oral healthcare workers in a tertiary dental care hospital in Sri Lanka had a moderate level of knowledge and attitude but excellent practices towards the COVID-19 infection. Continuous in-service training programs should be conducted among all oral healthcare workers to improve the level of knowledge and practices as well as to maintain good practices towards the prevention and transmission of COVID-19 infection. This will help to ensure the safety of both healthcare workers and patients in the dental setting during any pandemic periods.

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REFERENCES

- 1) Albahri AH, Alnaqbi SA, Alnaqbi SA, Alshaali AO, Shahdoor SM. Knowledge, Attitude, and Practice Regarding COVID-19 Among Healthcare Workers in Primary Healthcare Centers in Dubai: A Cross-Sectional Survey. *Frontiers in Public Health*. 2021;9:1–11. Available from: <https://doi.org/10.3389/fpubh.2021.617679>.
- 2) Mann A, Dahiya A, Souza LC, Letra A. Considerations for Pregnant Dental and Health Care Workers amid COVID-19. *JDR Clinical & Translational Research*. 2020;5(4):300–306. Available from: <https://doi.org/10.1177/2380084420952747>.
- 3) Gómez-Clavel JF, Morales-Pérez MA, Argumedo G, Trejo-Iriarte CG, and AG. Concerns, Knowledge, and Practices of Dentists in Mexico Regarding Infection Control during the Coronavirus Disease Pandemic: A Cross-Sectional Study. *Healthcare (Basel)*. 2021;9(6):1–11. Available from: <https://doi.org/10.3390/healthcare9060731>.
- 4) Teja KV, Vasundhara KA, Sriram G. Knowledge, Awareness, and Practice of Dentists in Preventing Novel Corona Virus (COVID-19) Transmission - A Questionnaire Based Cross-Sectional Survey. *Brazilian Dental Science*. 2020;23(2,supl):1–9. Available from: <https://pesquisa.bvsalud.org/gim/resource/en/biblio-1100337?src=similardocs>.
- 5) Zhang M, Zhou M, Tang F, Wang Y, Nie H, Zhang L, et al. Knowledge, attitude, and practice regarding COVID-19 among healthcare workers in Henan, China. *Journal of Hospital Infection*. 2020;105(2):183–187. Available from: <https://doi.org/10.1016/j.jhin.2020.04.012>.
- 6) Asemahagn MA. Factors determining the knowledge and prevention practice of healthcare workers towards COVID-19 in Amhara region, Ethiopia: a cross-sectional survey. *Tropical Medicine and Health*. 2020;48(1):1–11. Available from: <https://doi.org/10.1186/s41182-020-00254-3>.
- 7) Raza M, Jain S, Sharma P, Kumar P, Shetty D, Juneja A. Awareness related to COVID 19 among dental health-care students and professionals of national capital region: A cross sectional study. *Indian Journal of Dental Sciences*. 2020;12(4):209–215. Available from: https://doi.org/10.4103/IJDS.IJDS_107_20.
- 8) Chaudhary C, Khan M, Parveen S, Sharma U, Singh V, Anand BK. A study to assess knowledge attitude and practices towards Covid-19 among frontline workers of a north Indian district. *The Indonesian journal of public health*. 2021;16(3):336–348. Available from: <https://doi.org/10.20473/ijph.v16i3.2021.336-348>.
- 9) Sun Q, Yu C, Zheng Z, Wu Q, Zhang J, Jiang P, et al. Knowledge, attitude, and practices on COVID-19 prevention and diagnosis among medical workers in the radiology department: A multicenter cross-sectional study in China. *Frontiers in Public Health*. 2023;11:1–11. Available from: <https://doi.org/10.3389/fpubh.2023.1110893>.
- 10) Gopalakrishnan S, Kandasamy S, Abraham B, Senthilkumar M, Almohammed OA. Knowledge, Attitude, and Practices Associated With COVID-19 Among Healthcare Workers in Hospitals: A Cross-Sectional Study in India. *Frontiers in Public Health*. 2021;9:1–7. Available from: <https://doi.org/10.3389/fpubh.2021.787845>.
- 11) Dutta S, Lal H, Kumar T, Mishra G, Charan J, Ambwani S. Knowledge, Attitude, Practice among Healthcare Workers Regarding COVID-19: An Online Questionnaire-based Study. *International Journal of Pharmaceutical Sciences Review and Research*. 2021;69(2):238–244. Available from: <https://globalresearchonline.net/journalcontents/v69-2/35.pdf>.
- 12) Almohammed OA, Aldwihi LA, Alragas AM, Almoteer AI, Gopalakrishnan S, Alqahtani NM. Knowledge, Attitude, and Practices Associated With COVID-19 Among Healthcare Workers in Hospitals: A Cross-Sectional Study in Saudi Arabia. *Frontiers in Public Health*. 2021;9:1–11. Available from: <https://doi.org/10.3389/fpubh.2021.643053>.
- 13) Rao LN, Shetty A, Senthilkumar PL, Shetty KS, Shetty B, Natarajan S, et al. Knowledge, attitude and practice of dental students and practitioners during the early days of COVID-19 pandemic in India: A cross-sectional study. *International Journal of Clinical Practice*. 2021;75(11):1–10. Available from: <https://doi.org/10.1111/ijcp.14858>.
- 14) Jayasinghe RD, Jayasinghe RM, Hettiarrachchi PVKS, Samaranyake LP. Sri Lankan dental professionals' knowledge of the Corona Virus Disease-19 (COVID-19): a questionnaire survey. *Stomatology Edu Journal*. 2021;8(1):1–11. Available from: <https://www.stomaeduj.com/wp-content/uploads/art-1-1-2021.pdf>.
- 15) Nepal R, Sapkota K, Paudel P, Adhikari B, Adhikari K, Sapkota K, et al. Knowledge, attitude and practice regarding COVID-19 among healthcare workers in Chitwan, Nepal. *Journal of Chitwan Medical College*. 2020;10(33):98–102. Available from: <https://www.nepjol.info/index.php/JCMC/article/view/32064>.
- 16) Saqlain M, Munir MM, Rehman SU, Gulzar A, Naz S, Ahmed Z, et al. Knowledge, attitude, practice and perceived barriers among healthcare workers regarding COVID-19: a cross-sectional survey from Pakistan. *Journal of Hospital Infection*. 2020;105(3):419–423. Available from: <https://doi.org/10.1016/j.jhin.2020.05.007>.
- 17) Huynh G, Han NTN, Van Tran Khanh, Ngan VK, Van Tam V, An PL. Knowledge and attitude toward COVID-19 among healthcare workers at District 2 Hospital, Ho Chi Minh City. *Asian Pacific Journal of Tropical Medicine*. 2020;13(6):260–265. Available from: <https://dx.doi.org/10.4103/1995-7645.280396>.
- 18) Yesse M, Muze M, Kedir S, Argaw B, Dengo M, Nesre T, et al. Assessment of knowledge, attitude and practice toward COVID-19 and associated factors among health care workers in Silte Zone, Southern Ethiopia. *PLoS ONE*. 2021;16(10):1–11. Available from: <https://doi.org/10.1371/journal.pone.0257058>.
- 19) Jemal B, Aweke Z, Mola S, Hailu S, Abiy S, Dendir G, et al. Knowledge, attitude, and practice of healthcare workers toward

- COVID-19 and its prevention in Ethiopia: A multicenter study. *SAGE Open Medicine*. 2021;9:1–10. Available from: <https://doi.org/10.1177/20503121211034389>.
- 20) Hatami H, Kolahi AA, Ghamari SH, and MAK. Knowledge, Attitudes, and Practices About COVID-19 Among Healthcare Workers in Iran During the First Wave of the Pandemic. *Frontiers in Public Health*. 2022;10:1–10. Available from: <https://doi.org/10.3389/fpubh.2022.827817>.
- 21) Turska-Szybka A, Prokopczyk M, Winkielman P, Olczak-Kowalczyk D. Knowledge and attitude of Polish dental healthcare professionals during the COVID-19 pandemic. *International Journal of Environmental Research and Public Health*. 2021;18(22):12100–12100. Available from: <https://doi.org/10.3390/ijerph182212100>.
- 22) Bakaeen LG, Masri R, AlTarawneh S, Garcia LT, AlHadidi A, Khamis AH, et al. Dentists' knowledge, attitudes, and professional behavior toward the COVID-19 pandemic. *The Journal of the American Dental Association*. 2021;152(1):16–24. Available from: <https://dx.doi.org/10.1016/j.adaj.2020.09.022>.
- 23) Srivastava KC, Shrivastava D, Sghaireen MG, Alsharari AF, Alduraywish AA, Al-Johani K, et al. Knowledge, attitudes and practices regarding COVID-19 among dental health care professionals: a cross-sectional study in Saudi Arabia. *Journal of International Medical Research*. 2020;48(12):1–19. Available from: <https://doi.org/10.1177/0300060520977593>.
- 24) Indu M, Syriac G, Beena V, Mcherian L, Paul S, Sathyan P. Assessment of knowledge, attitude and practice regarding dental care during COVID 19 pandemic-a cross sectional study among dental health professionals in tertiary care centers of Kerala. *IOSR Journal of Dental and Medical Sciences*. 2020;19(5):5–10. Available from: <https://www.iosrjournals.org/iosr-jdms/papers/Vol19-issue5/Series-11/B1905110510.pdf>.
- 25) Ejeh FE, Saidu AS, Owoicho S, Maurice NA, Jauro S, Madukaji L, et al. Knowledge, attitude, and practice among healthcare workers towards COVID-19 outbreak in Nigeria. *Heliyon*. 2020;6(11):1–10. Available from: <https://dx.doi.org/10.1016/j.heliyon.2020.e05557>.