Original Article

AWARENESS TOWARDS PERSONAL PROTECTIVE EQUIPMENT AMONG DENTAL PROFESSIONALS IN INDIA DURING COVID-19 OUTBREAK- A SURVEY

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ABSTRACT

A substantial number of healthcare workers are contracting COVID when dealing with infected individuals. Dentists and dental clinics are more prone to spreading the virus because of the close contact with the patient through blood, saliva, and aerosol. To reduce the risk of contamination, appropriate fluid resistance masks and protective equipment must be worn by dental professionals and clinical auxiliary staff.

An online survey was conducted during the peak time of the Covid-19 spread in India. Data was gathered through an extensive self-administered and self-validated survey questionnaire. The data was analyzed using SPSS 13.01 program to portray the result. Statistical analysis was done using the chi-square test, One way ANOVA, and Karl Pearson test. Out of 589 participants, 79.46% of individuals who responded are from the age group of 25-35 years and 70 % had their working experience less than 5 years. More than half (60.3%) of the participants were aware of Donning and Doffing protocols. About 93.3% of participants feared getting infected due to incorrect use of PPE and 52.3% reported having raised the cost of care due to the rise in the use of PPE kits in dental clinics. This study showed that dental postgraduate students and dental practitioners in India demonstrated good adherence to infection control guidelines.

Key words: Coronavirus-19, Dental professional, Survey, Personal protective equipment.

Introduction

By the end of 2019, a new virus named Coronavirus appeared in China and due to its rapid spread, a pandemic warning had to be officialized by the World Health Organization (WHO) in March 2020. Coronavirus, a single-stranded RNA virus was first found in the province of Wuhan, China where it was reported as pneumonia of unidentified origin [1]. After the rapid rise of this viral pneumonia, on 9 January 2020, the World Health Organization announced the causative agent to be a novel Coronavirus which was never found in humans, first designated as 2019-nCoV and formally entitled as Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-CoV-2) by the International Committee on Taxonomy of Viruses. India reported its first coronavirus case on 30th January 2020 in a student who arrived in Kerala state from Wuhan city, China, and reported its first COVID-19 death on 12 March 2020 in Karnataka [2]. COVID-19 infection in India is reported strikingly low stressing that the level of revival among affected patients is 63.45 percent in the country whereas the mortality rate is 2.3 percent compared to the world average [3]. The coronavirus is responsible for infectious respiratory syndrome, which is now widely known as Corona Virus Disease 19 (COVID-19) [4, 5]. Symptoms of individuals identified with SARS-CoV-2 generally include fever, cough, shortness of breath which show up within 2-14 days [6]. As SARSCoV-2 is airborne, it has the potential to infect people in close contact with infected individuals and health care workers (HCWs) are considered to be at high risk [2, 7].

Considering the plethora of concomitant conditions, HCWs including dental professionals are at a greater risk of getting exposed to the virus. Possible transmission routes for COVID-19 in dental practice include airborne spread through aerosols and droplets produced during a dental procedure, contact spread, and contaminated surfaces spread. Conflict of humanitarianism and professional duty, on one side, with fright and suspicion of potentially exposing their relatives to a deadly virus, on the other side, has been a huge stress for several medical personnel during the COVID-19 outbreak [8].

COVID-19 posed immediate challenges for dental care and education because of the high rate of spread of the virus in dental settings and the precision in clinical practice [9]. The Centers for Disease Control and Prevention (CDC), the American Dental Association (ADA), and WHO have proposed specific recommendations for dentists and dental workers to monitor the escalation of COVID-19. Like for other communicable diseases, such precautions involves personal protective equipment, thorough patient evaluation, hand washing, rubber dam protection, anti-retraction handpiece, pre-procedural mouth rinsing and clinic disinfection [10].

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In a healthcare environment, Personal Protective Equipment (PPE) is used to protect health care workers (HCWs) vulnerable to pathogens and to prevent the transmission of pathogens to different patients. The key types of PPE used against these critical hospital-acquired pathogens to protect HCWs and other patients include standard masks, gowns, gloves, goggles, and face shields [11]. Medical mask is required for droplet precaution and goggles/face shields are necessary for shielding the eyes and for preventing contact spread fluid-resistant gowns and gloves with long sleeves are endorsed [12]. Hence it is vital to know the distinction between respiratory shielding equipments as well as protective clothing. Generally, masks can be ranked as respirators, medical masks, and non-medical masks. The potential of masks depends on a few factors such as their filtration efficiency, facial fit and the number of layers [13].

Medical masks are also called surgical masks. They are loose-fitting masks that act as a barricade to hinder droplet spread from the dentists to the patients and also protect the dentist from the patient's bodily fluids, respiratory droplets, and blood that may become airborne during the procedure. According to US National Institute for Occupational Safety and Health (NIOSH), particulate filtering facepiece respirators (FFRs) are classified into 9 categories based on their filtration efficiency (95%, 99%, and 99.7%) and their capability to filter oil droplets (N95,99,100: not resistant to oil, R95,99,100: mildly resistant to oil, P95,99,100:highly resistant to oil).

The N95 title denotes that it can filter 95% of 0.3-micron size aerosol particles [14]. The guidelines by WHO and CDC urged the use of fluid-repellent gowns as well as gloves During this pandemic period when caring for patients. Based on their impermeability to liquid and microbes, gowns are classified into high performance and standard performance by the European standard EN13759. However, to protect the HCWs from contagious sources gowns should have the standard EN14126, which comprises tests for resistance to perforation by fluids, blood or microbes under varying hydrostatic pressure from Class 1(0 kPa) to Class 6 (20kPa) [12]. Face shields and goggles are auxiliary measures alongside surgical masks or respirators [14].

The outbreak of the Ebola virus disease (EVD) in 2014–2016 showed the need for more scientific evidence on best practices for safely donning and doffing of PPE [15]. Appropriate use of PPE becomes critical when HCWs treat patients who can be symptomatic or asymptomatic carriers with highly pathogenic species such as coronavirus. Hence, this study intended to evaluate the knowledge and perception of PPE kits among dental professionals in India during the COVID-19 outbreak.

Materials and Methods

A web-based survey was conducted using Google forms in May 2020. Ethical clearance was granted by KAHER University (Sl No: 1364) and consent was acquired from participants before the study. The study included dental practitioners and dental postgraduate students all over India. The study excluded the participants who were not practicing dentistry. A self-designed questionnaire was prepared and validated using Chronbach alpha and the value was 0.84. The questionnaire was distributed through social media applications like Whatsapp, Instagram, Facebook, and Twitter. The confidentiality of study participants was maintained throughout the study. The questionnaire included 22 questions out of which 16 were knowledge-based (k1 to k16) and 6 on perception (p1 to p6) and all the questions were closed-ended. Survey feedback was gathered from May 2020 to July 2020. A total of 589 responses were obtained. Demographic details included name, age, gender, years of working experience, region, and designation of the study participant. Respondents were asked about the recent protective measures used during COVID 19 outbreak, knowledge regarding Covid-19, PPE, difficulties faced while using PPE, and their attitude towards them. Survey responses were downloaded into a Google sheet and descriptive analysis was performed using SPSS version 22. Comparison of demographic details was done using Mean and standard deviation. Linear comparison between knowledge was done by chi-square t-test in which a p-value less than 0.05 was considered as significant. Correlation between knowledge and perception scores was analyzed using Karl Pearson's correlation coefficient method. Paired t-test and ANOVA were also used to compare between different groups.

Results and Discussion

589 subjects were involved in the study of which 79.46% were from the age group of 25 – 35 years and only 5.9% were from the age group of 45-55 years. Out of the responses received, 70% had their working experience of fewer than 5 years. Demographically, 52% of study participants were from South India and the remaining were from East (15.9%), West (12.9%), and North (18.34%).

A greater part of the subjects was aware of COVID-19 symptoms (98.6%), among which 86.9% of the people feared the risks involved in the dental profession and 98.5% of them were aware of different protective measures adapted during the COVID-19 outbreak. The majority of them (98.8%) were aware of the different components of a PPE kit, whereas only 60.3% understood protocols regarding donning and doffing, and out of that only 46% of people knew the proper course of donning and 62.3% regarding doffing procedures and this suggested the chances of cross-contamination due to protocol deviation by dental professionals.

Except for the questions "Do you feel that you have sufficient knowledge regarding the use of PPE and how safely you can work in a dental clinic" (p-value= 0.008) and "whether you know how to dispose of the PPE kit properly" (p-value= 0.018) all other questions estimated statistically insignificant according to chi-square test. It was also

observed that dentists of higher age groups (45-55 years) were more aware of the protocols regarding PPE **(Table 1)**.

Table 1. Comparison of age groups with correct knowledge in each item of respondents

Item	25-35 years %	35-45 years %	45-55 years %	Total	%	χ^2	p-value
K1	98.7	97.7	100.0	581	98.6	1.1030	0.5760
K2	86.3	86.0	97.1	512	86.9	3.4220	0.1810
K3	98.3	98.8	100.0	580	98.5	0.7220	0.6970
K4	66.0	77.9	85.7	406	68.9	9.6830	0.0080*
K5	98.9	98.8	97.1	582	98.8	0.8880	0.6420
K6	57.9	67.4	74.3	355	60.3	5.8110	0.0550
K7	45.9	44.2	51.4	271	46.0	0.5300	0.7670
K8	61.8	62.8	68.6	367	62.3	0.6550	0.7210
K9	95.1	90.7	91.4	555	94.2	3.1070	0.2110
K10	87.6	82.6	77.1	508	86.2	4.1620	0.1250
K11	84.8	86.0	74.3	497	84.4	2.9590	0.2280
K12	57.9	66.3	80.0	356	60.4	8.0840	0.0180*
K13	90.8	83.7	88.6	528	89.6	3.9810	0.1370
K14	96.6	95.3	94.3	567	96.3	0.7120	0.7000
K15	77.8	74.4	68.6	452	76.7	1.8500	0.3960
K16	24.4	33.7	34.3	155	26.3	4.5030	0.1050

*p<0.05

When years of experience and knowledge of participants were compared, only for the questions "Are you aware of donning and doffing protocols" (p-value = 0.005) and "Filtering facepiece respirators referred as" were accounted to be statistically significant and further questions remained statistically insignificant **(Table 2)**.

Table 2. Comparison of Years of experience with correct knowledge in each item of respondents

Item	<5 years %	5- 10 years %	>10 years %	Total	%	χ^2	p-value
K1	98.6	97.8	100.0	581	98.6	1.6820	0.4310
K2	86.5	92.2	83.3	512	86.9	3.2400	0.1980
K3	97.8	100.0	100.0	580	98.5	3.8320	0.1470
K4	68.0	67.8	75.0	406	68.9	1.6860	0.4300
K5	98.6	100.0	98.8	582	98.8	1.3160	0.5180
K6	56.4	74.4	64.3	355	60.3	10.732	0.0050*
K7	46.0	44.4	47.6	271	46.0	0.1760	0.9160
K8	61.7	68.9	58.3	367	62.3	2.2930	0.3180
K9	93.7	95.6	95.2	555	94.2	0.6350	0.7280
K10	85.1	91.1	86.9	508	86.2	2.3190	0.3140
K11	86.5	81.1	77.4	497	84.4	5.2750	0.0500*
K12	58.3	64.4	66.7	356	60.4	2.7510	0.2530
K13	89.2	91.1	90.5	528	89.6	0.3770	0.8280
K14	97.1	94.4	94.0	567	96.3	2.7990	0.2470
K15	79.0	72.2	70.2	452	76.7	4.2440	0.1200
K16	24.3	27.8	34.5	155	26.3	3.8550	0.1450

*p<0.05

When region and knowledge of the participants were compared, 95-100% of dentists from western and southern regions responded correctly and no significant difference was seen for all the questions except for a few such as ‘‘What all are the different types of masks?’’ and ‘‘difference between mask and respirators’’.

About half of the (58.4%) study participants had started wearing PPE kits in their daily dental practice and 73.2% agreed that the use of PPE kits in a dental clinic is a mandatory requirement than a normal surgical gown. Various responses were recorded regarding the question ‘‘How to limit the use of PPE kit in a dental clinic’’, 31.9% of study participants opined that nonurgent procedures should be postponed, whereas 71.5% suggested use of alternate tools such as telemedicine, 45.5% of study participants felt patient contact should be limited and PPE could be reused with proper decontamination guidelines according to 49.4% participants. Among the study population, 93.9% of participants agreed to the fact that they fear the misuse of PPE kits can lead to infection. Concerning the difficulties of wearing the PPE kit, 46.5% claimed that there was an inconvenience. More than half of the population (52.3%) reported that they have increased the treatment costs due to the growing trend of usage of PPE kits in a dental clinic.

When age groups with correct perception were compared a statistically significant (p-value= 0.028) difference was seen with the question on ‘‘Importance of usage of PPE in a clinic than a surgical gown’’ (P2) according to chi-square test **(Table 3)**.

Table 3. Comparison of age groups with correct perception in each item of respondents

Item	25-35 years %	35-45 years %	45-55 years %	Total	%	χ^2	p-value
P1	64.8	56.7	28.6	344	58.4	1.6830	0.4310
P2	79.8	80.0	33.3	431	73.2	7.1330	0.0280*
P3.1	37.6	25.6	10.7	188	31.9	2.1110	0.3480
P3.2	80.0	68.9	32.1	421	71.5	0.6330	0.7290
P3.3	51.1	45.6	17.9	268	45.5	0.2700	0.8740
P3.4	56.1	48.9	16.7	291	49.4	1.3720	0.5040
P4	106.0	90.0	38.1	553	93.9	0.3960	0.8200
P5	52.0	44.4	21.4	274	46.5	0.3640	0.8340
P6	57.3	55.6	23.8	308	52.3	1.8960	0.3870

*p<0.05

Also when years of experience with correct perception were compared, a statistically notable variation (0.05) was noted with the question on ‘‘Do you have fear that misuse of PPE can get you infected’’ (P4) suggested that irrespective of years of experience dental professionals had fear of misuse of PPE can get them infected, with the highest being in the 5-10 years **(Table 4)**. Mean knowledge scores were obtained using Oneway ANOVA and no significant difference was noted except for working in different sectors (p-value=0.009) **(Table 4)**. It was also found that the Correlation between knowledge and perception scores by Karl Pearson’s correlation coefficient method was significant (p-value: 0.001).

Table 4. Comparison of years of experience with correct perception in each item of respondents

Item	<5 years %	5- 10 years %	>10 years %	Total	%	χ^2	p-value
P1	58.6	50.0	66.7	344	58.4	4.9810	0.0830
P2	74.5	70.0	70.2	431	73.2	1.1790	0.5550
P3.1	31.8	28.9	35.7	188	31.9	0.9390	0.6250
P3.2	69.4	76.7	76.2	421	71.5	2.9840	0.2250
P3.3	45.1	48.9	44.0	268	45.5	0.5210	0.7710
P3.4	50.4	46.7	47.6	291	49.4	0.5290	0.7680
P4	93.5	98.9	90.5	553	93.9	5.7390	0.0500*
P5	46.0	43.3	52.4	274	46.5	1.5680	0.4570
P6	54.5	47.8	46.4	308	52.3	2.6730	0.2630

*p<0.05

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This survey was conducted to appraise the cognizance of Indian dental professionals as well as dental postgraduates about the extent of knowledge and perception of Personal Protective Equipment Kits in the wake of the COVID-19 pandemic.

An appreciable amount of participants (64.4%) were not aware of the differences between N95, N99, N100 masks in the study conducted by Lodhi *et al*. while in the current study 94.2% of study participants were well informed of different types of face masks [16]. Almost 86.2% of participants were updated on different factors that determine the efficiency of masks and 84.4% of participants knew the distinction between mask and respirators. Also, 89.6% of subjects were aware of the fact that filtering facepiece respirators are also called N95 masks. In comparison, 84% supported the need for N-95 masks for conventional dental treatments in this COVID scenario. On the contrary, 90% of the surveyed population did not use an N-95 mask while caring for a patient and 85% acknowledged that a surgical mask was not sufficient to avoid cross-infection of COVID-19 according to Ahmed *et al*. [17] Medical mask can be worn in low-risk procedures such as non-aerosol procedures in normal clothes along with surgical gloves and goggles as there are chances of shortage of respirators in this peak time. However, WHO set regulations to curb the advancement of COVID-19 which directs health professionals to wear a NIOSH certified N95 respirator which is equivalent to European standard FFP2 especially when aerosol causing procedures (high-risk procedures) are carried out [18].

An immense majority of dental practitioners (98.5%) were practicing the recent protective measures adapted around the outburst of COVID-19 which included the use of hand sanitizer, regular hand washing, and protective face masks which is similar to the study conducted by Lodhi *et al.* where a positive curve was seen in 91.7% of participants when they were inquired about precautions taken before the patient encounter [16]. Hand sanitation and degloving protocol alterations were prevalent during doffing of both Ebola virus disease and contact precaution PPE in the study conducted by Kwon *et al*., whereas in this study only 46% of study participants knew the exact sequential order of donning and 62.3% were aware of doffing sequence. The study conducted by Kwon *et al*. proved that degloving and hand sanitation carry high-risk chances of self-contamination to HCWs. In the current study, 93.5% of participants feared that misuse of PPE kits can get them infected [15]. While in a study conducted by Khader *et al*., 368 dentists described cleansing hands frequently using hand rub made of alcohol or soap and water, surface disinfection in proximity with suspected patients, and putting on PPE can help prevent transmission from patients suspected with COVID-19 [10]. Khader *et al*. when inquired about the details that must be observed to recognize patients at threat of having COVID-19, where 316 (85.9%) participants indicated the signs of existence of a respiratory infection, 347 (94.3%) gave a history of journey to COVID hotspot areas, and 345 (93.8%) declared history of contact with possible infected patients [10]. Similarly in this study 98.6% were aware of the clinical symptoms of Covid-19. About 86.9% of dental practitioners and postgraduate students feared the risk involved in the dental profession which is equivalent to the result found by Ahmed *et al*. in which 87% of subjects were petrified of getting infected with COVID-19 from either a co-worker or a patient and a significant number of dentists (66%) desired to reduce their practices until there is a decline in the total of COVID-19 cases [17]. In a study on the impact of COVID 19 on knowledge, attitude and infection control behaviours among dentists by Cheng *et al*. reported, high rates of accurate COVID-19 knowledge (94.76%), fears of being getting infected with the coronavirus (94%) and the use of PPE (mask, glove and protection gown; 95%) [19]. Speaking about the availability of PPE, Monika *et al*. in their study stated that a total of 75.3% of respondents had insufficient access to PPE, and those who started their practice had only 46% of adequate PPE supplies [20]. To the contrary in this Indian population 58.4% of dentists started using PPE kits in their routine practice after the Covid-19 outbreak. When comparing gowns and coveralls, gowns are simple, easier, and comfortable to don and doff while coveralls are strenuous to doff resulting in self-contamination causing increased heat stress [12]. In the present study, almost 60.3% of study participants were aware of "Donning and Doffing" procedure which was related to the results of the study conducted by Lodhi *et al*. in which 67.2% of the dentists were enlightened of the current international guidelines by WHO and CDC about the Personal Protective Equipment while half of the participants (47.9%) did not receive any training related to the precise use of Personal Protective Equipment [16]. Therefore a complex PPE need not be considered as seen in the incident of SARS epidemic in Canada which infected a profound number of HCWs. A 'buddy system' can help in inspecting the sequential order of donning and doffing of PPE precisely and proper instruction and execution should be given to the practitioners before performing any treatment procedures [21].

As SARS-CoV-2 expands its rapid spread, universal facial masking could be one of the foundations of Covid-19 pandemic management, which may help in minimizing the severity of the disease and ensure a higher percentage of new illnesses are asymptomatic. The inoculum that a susceptible individual inhales may be minimized by masking [22].

Aladelusi *et al*. concluded in their study that precautionary measures against the spread of COVID-19 in dental practice include utilization of teledentistry, clinical triaging, preprocedural oral rinses, and appropriate use of Personal Protective Equipment (PPE) [23]. The training of dental professionals on donning and doffing PPE is as crucial as choosing the appropriate PPE for the reason that it can be related with a risk of infection [24]. As using respirators , N95 masks and PPE has shown to reduce the rate of a new infection, this has to be accepted as a new normal to win the war between humans and the new deadly Coronavirus.

Conclusion

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To sum up, our study signifies that utilization of PPE diminishes COVID-19 transmission rates and acts as a shield to health care workers. Even though a lack of knowledge was evident regarding the proper protocol of wearing PPE kits, a good amount of dental postgraduate students and dental practitioners in India demonstrated a positive persuasion towards infection control instructions. Therefore, dental professionals must realize PPE's function and purpose, as a mechanism for reducing the spread of novel coronavirus from patients to dentists and vice versa.

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