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Title:
Knowledge, Awareness and Perceptions of Coronavirus Disease 2019 (COVID-19) in a cohort of Indian Dental Professionals : a questionnaire-based study

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Running title : Knowledge of Indian dentists on COVID-19

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Abstract

Introduction: COVID-19 is an unprecedented global public health emergency currently impacting India in an unprecedented manner. Aim of this study was to assess knowledge, awareness, perceptions and related factors of Indian dentists on COVID-19.

Methodology: A cross-sectional, on-line questionnaire-based study was conducted over one week between 3rd May, 2020 to 10th May, 2020. The sample comprised 403 Indian dentists in solo, group practices and in the academic arena. The self-administered questionnaire assessed 1) knowledge/awareness on factors related to COVID-19 patient identification and symptomatology, 2) knowledge/awareness of COVID-19 transmission and 3) perceptions of COVID-19 history taking procedure. Statistical analyses were conducted using Statistical Package for Social Sciences for Windows, version 21.0 (IBM Corp., Armonk, NY., USA). Frequency distributions and logistic regression analyses were used.

Results: Indian dentists demonstrated an overall modest level of knowledge on identification of patients with COVID-19. Moreover, they had a high level of awareness of the COVID-19 transmission means, and the generally accepted procedural perceptions on patient history taking. However, there were some gaps in specific aspects of knowledge and perceptions. Those who were aged ≥ 30-years had a significantly higher level of knowledge of patient identification means than those who were < 30-years (OR=1.78:1.12-2.83); p=0.01. Moreover, specialized dentists were significantly knowledgeable of COVID-19 transmission means than the general dentists (OR=1.89:1.22-2.93; p=0.004).

Conclusions: Our findings demonstrate identifiable gaps in knowledge/awareness and perceptions of COVID-19 in Indian dental professionals. These gaps should be fulfilled, at the earliest, due to the rising burden of COVID-19 in India, to ensure safe dental care delivery.

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Introduction

The pandemic of coronavirus disease 2019 (COVID-19) that originated in Wuhan, China, in December 2019 has become a major public health challenge for the global community. The disease, caused by a novel coronavirus, severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) has impacted livelihoods of a substantive proportion of the global community including dentists. Thus, clinical dental practices, academic dental establishments, and similar private and government funded organisations have either closed or curtailed their professional work due, either to the fear of contracting the infection, and/or the widespread lockdowns initiated by the local, and regional authorities.

In India, the first case of COVID-19 was reported on 30th January, 2020, and at the time of writing on 24th May 2020 the patient numbers have risen to over 1,30,000 with 3867 recorded deaths. First country wide citizen lockdown in India was implemented on 25th March, 2020, and since then the dental practitioners have been instructed by the authorities to carry out only emergency treatment of patients that obviate aerosol production. As in other regions of the World, front line health care workers in India appear to be disproportionately impacted by COVID-19 (1) and dentists, in particular, are likely to be exposed to SARS-CoV-2 (2). This is mainly due to their work in close proximity to the patients, and the intrinsic nature of dentistry entailing high-speed instrumentation, and the likelihood of aerosolizing saliva and virus-laden aerosols in inadequately ventilated clinical settings (2).

There are anecdotal reports of dentists expressing fears on the post-pandemic dental practice and their professional future, but the extent to which these perceptions are based, as well as their clinical knowledge of COVID-19 is unclear. Such information on the knowledge and perceptions of dentists is needed, on a wider scale, not only to identify existing knowledge gaps but also to articulate optimal measures to prevent COVID-19 transmission in the dental clinic. Additionally, if the disease were to sporadically erupt in local or regional pockets from time to time, and/or the so called second wave of the disease were to transpire then dentists could play an important role in early detection of the disease, for which their knowledge of COVID-19 would be critical, in particular for identification and appropriate referral of patients.

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We are unaware of any studies in the literature on the knowledge and perceptions of dental health professionals of India. Therefore, the aims of this study were to assess knowledge and awareness of COVID-19 in a cross section of dental professionals in India,

Methodology

A questionnaire-based, cross-sectional study was conducted from 3rd May, 2020 to 5th May, 2020. The study was approved by the Research Unit, Karnavati School of Dentistry, Karnavati University, India, according to principles of the Helsinki Declaration. The target group was dentists in the single-handed practices, group practices, and academics, irrespective of their specialization.

The questionnaire was developed in English to assess the respondents` knowledge, awareness and perceptions of COVID-19. The questionnaire was compiled using the data garnered on 1st May, 2020, from the websites of the World Health Organization (WHO), US Centre for Disease Control and Prevention (CDC), the Ministry of Health and Family Welfare of the Government of India, and the Dental Council of India (DCI).

First, a pilot survey of the questionnaire was conducted amongst randomly selected 20 dentists, and once their response was received, ambiguities in the questionnaire, if any, were rectified prior to the final mass circulation. Participants were assured of the confidentiality of their responses. The pilot tested dentists were not included in the final study. The survey was conducted online amongst members of a large *facebook* group entitled Endohaveli, a diverse group of dental professionals with over 52,000 members across the globe.

The questionnaire comprised four major components, i) Socio-demographic and personal profile, ii) knowledge/awareness of factors related to COVID-19 patient risk stratification, iii) knowledge/awareness of prevention and control of COVID-19 transmission, and iv) perceptions of COVID-19 risk assessment, and patient history taking.

Once the responses were received the individual components were scored for the foregoing four major components, as follows. The respondents were dichotomized according to their age as <30 years vs ≥ 30-years, while the dental specialties were segregated into two groups as general dental practitioners vs specialists (which included all dental specialties). The scores were dichotomized as ‘good’ and ‘better’ for knowledge/awareness components, and ‘less optimal’ and ‘optimal’ for perception component (Figure 1).

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Univariate associations were assessed for dichotomized outcomes of knowledge and perception components using selected socio-demographic and personal attributes as predictor variables. For perceptions on COVID-19 risk assessment and eliciting patient history, dichotomized knowledge scores were included as additional predictor variables.

Moreover, a multiple logistic regression model was fitted to assess the independent associations of predictor variables with the knowledge/awareness and perception outcomes, and Odds ratio (OR), 95% confidence intervals (CI), and *p-values* were calculated. In the unconditional binary logistic regression analysis, enter option was used and $p < 0.05$ was used as the criterion for retention in the model. Hosmer–Lemeshow goodness of fit test was used to assess the fitness of model. Statistical analyses were conducted using Statistical Package for Social Sciences (SPSS) for Windows, version 21.0 (IBM Corp., Armonk, NY., USA).

Results

In total, 403 responses were collected online from a total of 1,200 randomly selected participants, yielding a response rate of 33.6%. Further analysis revealed that a cross-section of dentists from all the parts of India had participated in the study, indicating a representative all-Indian response.

Demographic data

Almost one half (48.9%) of participants were between 30-40 years of age, and approximately a third (35.5%) were younger than 30 years . The gender of the participants was almost equally split between females (50.1%), and males (49.9%). Except for a single missing response, all the participants mentioned their nationality as Indian. Approximately one half (55.8%) of the responding dentists had only a Bachelor of Dental Surgery (BDS) degree, and the remainder (44.2%) were qualified with a Master's degree (MDS),whilst a majority of the respondents (56.3%) were general dental practitioners. Endodontists were the predominant group of specialists (16.9%) followed by prosthodontists (7.4%) and orthodontists (4.7%). The majority of general and specialized dentists, 60% were engaged in single-handed private practices, while 21.6% were in group private practices, and another 18.4% were working in academia. Furthermore, 62% of participants had used *Arogya Setu* mobile application and 83.4% participants had participated in CPE/Webinars on COVID-19. (Table 1)

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Participants' knowledge and awareness of symptomatology of COVID-19:

An overwhelming majority of participants (90.3%) answered correctly that the incubation period of COVID-19 can be up to 21 days.(Figure 1). All participants were aware of the elevated threat posed by COVID-19 to older individuals, and those with chronic diseases, although 9.7% were unaware of the possible mortality risk of the disease for younger individuals. Approximately, some three quarters of the participants (77.7%) were aware of acute loss of smell and taste could be an early symptom of the disease, and a just over one-half (58.8%) were aware of the full spectrum of COVID-19 symptoms.

Participants' knowledge and awareness of COVID-19 transmission modes:

The participants knowledge and awareness of major transmission portals of COVID-19, and key features of its prevention and control were relatively high as 97.0%, 98% and 94.8% were aware of main source of infection transmission, infected body fluids as a source of infection transmission, and the crucial importance of hand-hygiene in prevention and control measures, respectively (Figure 2). Surprisingly though, only 29.8% were aware of the 6-feet distance as the minimum physical/social distance for COVID-19 transmission prevention.

Factors related to patient history taking practices:

The vast majority of the respondents (98.3%) indicated that knowing the patient's residential area was highly important in COVID-19 risk assessment, whilst a similar proportion (93.8%) perceived the importance of knowing patient's travel history, prior to treatment provision. On the contrary, two thirds of the respondents (68.0%) did not wish to offer treatment to patients without the *Arogya Setu* mobile application.

On correlating factors related to knowledge/awareness of the respondents on COVID-19 to patient risk stratification, gender and age were significantly related to the level of knowledge on COVID-19, as female dentists had higher level of knowledge (OR=1.67:1.09-2.56) compared to their male counterpart (p=0.02), whilst those aged $\geq$30-year-olds had significantly higher level of knowledge than those < 30 years (p=0.01; OR=1.78:1.12-2.83);. However, specialization status, participating in COVID-19 CPD/Webinar programmes, and use of *Arogya Setu* mobile application were not significantly related to knowledge/awareness of COVID-19.

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In terms of the factors related to awareness/knowledge of Indian dentists on SARS-CoV-19 infection transmission, prevention and control, specialized dentists had a significantly higher level of knowledge/awareness on COVID-transmission than the generalists. (OR=1.89:1.22-2.93; p=0.004; Table 3). None of the other socio-demographic and personal attributes were significantly related to knowledge/awareness.

As for the factors related to perceptions of COVID-19 risk, and history taking, except for a marginal significance of the age group (p=0.05), in the direction of younger dentists having better perceptions compared to older dentists, no other factors evaluated were significantly different (Table 4)

Discussion

One of the high-risk groups susceptible to SARS-CoV2 infection is health care providers, specifically dentists, due to the nature of their work that entails aerosol production, and working in extremely close proximity to their patients. Indeed, in a recent analysis by the O*Net Bureau of Larur Statistics of the USA, dentists were considered the highest risk group of health care workers at risk for contracting COVID-19 (3).

This was borne out during the Severe Acute Respiratory Syndrome (SARS) outbreak in 2003, with some countries reporting that up to a third infected being health care workers (4). Hence, in order to institute appropriate professional guidelines and related public health measures, it is important to assess the knowledge and awareness, and institute clinical measures for controlling COVID-19 transmission in dentistry in a country such as India where the pandemic is ferociously spreading. The current study, to our knowledge is the first to assess the latter parameters in a wide cross-section of Indian dentists.

The overall response rate of 403 received out of 1200 questionnaires forwarded on-line, was 33.6% and is considered acceptable for on-line surveys (5). The low response rate may be due the rapid nature (conducted over three days) when the country was still under lockdown, and many dentists may have been occupied with emergency procedures or personal commitments.

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In terms of the response it was notable that four fifths of our respondents were in private practices, and, hence the data can be construed as more representative of the latter group. On the other hand, the gender of the respondents was almost equally split between males and females and the latter had better knowledge of COVID-19 than their male counterparts. ($p<0.05$), Similar gender differences in the knowledge of infections and control measures have been reported in survey of dentists in countries such as Saudi Arabia (6).

In general, older age group dentists (> 30 years) had significantly higher awareness of COVID-19 cross infection risk assessment, and measure impeding infection transmission measures in the clinic, than the younger dentists. One possible reason for this may be the greater exposure of the older dentists to continuing education courses on infection control in comparison to the younger counterparts. This said, it appeared that an overwhelming majority of dentists (83.4%) had participated in CPE/Webinar programmes on COVID-19 pandemic and dentistry, although such participation did not significantly correlate with their knowledge and perceptions of the disease. In this context, dentists with a post-graduate education also had a significant higher level of awareness on COVID-19 transmission than the generalists.

In the battle against COVID-19, the Government of India has developed the *Arogya Setu* (literally, bridge for disease freeness) mobile application to connect essential health services with the people of India. It is designed to keep a user informed in case he/she has crossed paths with a COVID-19 patient, and is widely used by the Indian public. Approximately two thirds of the respondents (62 %) who were users of this mobile app were better prepared with modest concerns than non-users in providing patient care ($p<0.05$), while a majority of respondents (68%) did not wish to treat patients who were not using this application.

It is now known that that SARS-CoV-2 infected person can be asymptomatic for up to 21 days. constituting a major potential source of infection (7). Almost all of the respondents (99%) were aware of this fact as well as that, the older people and those with underlying chronic medical conditions are more prone to disease complications (8). Additionally, a large proportion (90.3%) were aware of the possible mortality risk of COVID-19 among young people. However, the knowledge of the responders in terms of the full spectrum of known symptoms of COVID-19

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was relatively low (41.2%) in comparison to the foregoing. Nevertheless, it was heartening to note that over three quarters of the responders were aware that acute loss of taste (dysgeusia) and smell (anosmia) are early symptoms of the COVID-19, despite the fact that the announcement was made by the US Centers for Disease Control only in mid-April, 2020. As substantiated by our findings, it would be helpful to address this existing core knowledge gaps among Indian dentists by tailored interventions.

Government of India has divided entire country into Red Zones, Orange Zones and Green Zones implying varying levels of restrictions aimed at containing the spread the disease, a promulgation that is revised weekly. Almost all the dentists were aware of the importance of patients' residential areas during history taking, possibly due to the practical utility of the implementing appropriate infection control guidelines. The COVID-19 pandemic has now spread to more than 200 countries and hence the travel history of a patient could be crucial in determining his/her risk status. In relation to the final section of the questionnaire, on patient history taking, clearly almost all of the respondents (93.9%) were aware of the critical importance of ascertaining the recent travel history of the patient. This is likely be due to their wide and constant media exposure, as well as numerous webinars on awareness on COVID-19 directly targeting the dental professionals.

Though recent studies suggest that early detection, hand washing, self-isolation, and household quarantine will likely be more effective than travel restrictions at mitigating this pandemic (9). Moreover, perceptions of Indian dentists on COVID-19 patient history taking was not significantly related to socio-demographic and personal attributes except that the younger dentists had better perceptions than their older counterpart ($p=0.05$; Table 4).

Alike other respiratory diseases, the transmission of SARS-CoV-2 occurs mainly through respiratory droplets and aerosols generated by coughing and sneezing. Analysis of data related to the spread of in China indicates that close contact increases disease transmission (10). 97% dentists were aware about such modes of infection for COVID-19 which is quite high compared to awaresness of MERS-CoV (11). Majority of dentists (94.8%) were aware of importance of hand hygiene in prevention and control of COVID-19; a greater awareness of hand hygiene than during the MERS-CoV era (12). Social distancing is a new normal for the entire world. It is strongly

recommended to maintain minimum distance of 6 feet from others to avoid respiratory droplets (13). Despite the Government's disease education initiatives 29.8% dentists were not aware of the critcal importance of maintaing the 6 feet of social distancing limit (Figure 2).

Furthermore, our study implies that neither partcipating in continuing dental education (CDE)/Webinar programmes on COVID-19, nor using *Arogya setu* mobile application were not significantly related to levels of knowledge/awareness and perceptions on COVID-19 patient identification, disease transmission and history taking among Indian dentists (Tables 2,3,4). Such findings merit further investigations.

The study has some limitations. First, it was a cross-sectional study that provided a quick snap-shot view and hence cause-effect relationship of knowledge, and awareness could not be ascertained. Second, the response rate, though theoretically acceptable, was low.

In conclusion, our study has demonstrated that dentists from India have a reasonable knowledge of COVID-19, and its transmission modes, while the specialist dentists were significantly better informed than the generalists. Moreover, the older age group showed modest knowledge of the disease symptoms, and this was significantly better among older female dentists compared to their younger male counterparts. As India is currently experiencing a major threat from COVID-19 pandemic that will reverberate well into the future, assessment of the knowledge and practices of dental and medical personnel, related to the disease is critical to identify knowledge gaps and formulate and institute standardized, best practice guidelines against COVID-19 spread. Indeed, the Government of India together with the Indian Dental Council need lead this initiative by conducting further comprehensive sub-continent-wide surveys on this critically important subject.

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Author Contributions

NK composed the questionnaire, disseminated and collated the data and drafted and edited the final the manuscript. LPS conceptualized the study, wrote the original draft, vetted and approved the final draft. IP curated and analyzed the data, performed the statistical analysis, wrote the original draft and vetted the final manuscript. ZP collated the data and drafted and edited the final the manuscript. All four authors read and approved the final version of the manuscript..

Conflict of interest

None declared.

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Table 1: Socio-demographic profile of the responding Dentists

Attribute	Number	%
Gender		
Male	201	49.9
Female	202	50.1
Age group		
<30 years	143	35.5
30-40 years	197	48.9
40-50 ears	46	11.4
>50 years	17	4.2
Professional qualifications		
BDS*	225	55.8
MDS	178	44.2
Specialization		
Not specialized-General Practitioner	227	56.3
Endodontist	68	16.9
Prosthodontist	30	7.4
Periodontist	23	5.7
Orthodontist	19	4.7
Paedodontist	14	3.5
Oral & Maxillofacial Surgeon	14	3.5
Oral Radiologist	8	2.0
Practice Type		
Private Solo Practice	242	60.0
Private Group Practice	87	21.6
Academic	74	18.4
Use of A*rogya Setu* Mobile Application		
No	153	38.0
Yes	250	62.0
CPE/Webinar Programme participation on management of patients during COVID-19 pandemic		
No	71	17.6
Yes	332	83.4

* *includes 32 dental postgraduate trainees*

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Table 2: Related factors of knowledge/awareness of COVID-19 patient risk stratification, among Indian Dentists

Factor	Unadjusted Odds ratio (95% CI)	*p-value*	Adjusted Odds ratio (95% CI)	*p-value*
Gender				
Male	1		1	
Female	1.46(0.07-2.19)	0.07	1.67(1.09-2.56)	**0.02***
Age group				
<30-years	1		1	
≥ 30-years	1.71(1.11-2.64)	0.016*	1.78(1.12-2.83)	**0.01***
Qualifications				
BDS only	1		1	
Specialized	1.27 (0.84-1.90)	0.25	1.19(0.77-1.82)	0.40
COVID-19 CDE/Webinar participation				
No	1		1	
Yes	1.51(0.87-2.64)	0.14	1.29(0.72-2.31	0.39
Using *Arogya Setu* mobile application				
No	1		1	
Yes	0.95(0.63-1.45)	0.82	1.07(0.70-1.65)	0.76

*Significance, p<0.05

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Table 3: Demographic data and Related factors of knowledge/awareness of COVID-19 transmission among Indian dentists

Factor	Unadjusted Odds ratio (95% CI)	*p-value*	Adjusted Odds ratio (95% CI)	*p-value*
Gender				
Male	1		1	
Female	0.94(0.62-1.42)	0.78	0.91(0.59-1.40)	0.66
Age group				
<30-years	1		1	
≥ 30-years	1.12(0.73-1.72)	0.60	1.09(0.68-1.72)	0.72
Qualifications				
BDS only	1		1	
Specialized	1.89 (1.23-2.90)	0.004*	1.89(1.22-2.93)	**0.004***
COVID-19 CPD/Webinar participation				
No	1		1	
Yes	0.91(0.53-1.58)	0.75	0.76(0.42-1.36	0.35
Using *Arogya Setu* mobile application				
No	1		1	
Yes	0.65(0.42-1.00)	0.05	1.66(0.42-1.03)	0.07

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Table 4: Related factors of perceptions of Indian dentists on eliciting COVID-19 risk related history from patients

Factor	Unadjusted Odds Ratio (95% CI)	p-value	Adjusted Odds Ratio (95% CI)	p-value
Gender				
Male	1		1	
Female	1.32(0.86-2.04)	0.20	1.21(0.77-1.90)	**0.41***
Age group				
< 30-years	1		1	
≥30 years	0.63(0.40-0.97)	0.04	0.63(0.39-1.00)	**0.05**
Qualifications				
BDS only	1		1	
Specialized	1.02(0.66-1.58)	0.92	1.04(0.66-1.64)	0.85
COVID-19 CDE/Webinar participation				
No	1		1	
Yes	1.07(0.61-1.89)	0.82	1.28(0.70-2.38)	0.42
Using *Arogya Setu* mobile application				
No	1		1	
Yes	0.63(0.41-0.98)	0.04	0.64(0.41-1.01)	0.06
Knowledge on COVID-19 patient risk stratification				
Good	1		1	
Better	0.62(0.39-0.99)	0.04	0.77(0.59-1.01)	0.61
Knowledge on COVID-19 transmission				
Good	1		1	
Better	1.01(0.64-1.58)	0.98	0.96 (0.60-1.54)	0.88

*** Significance,** $p < 0.05$

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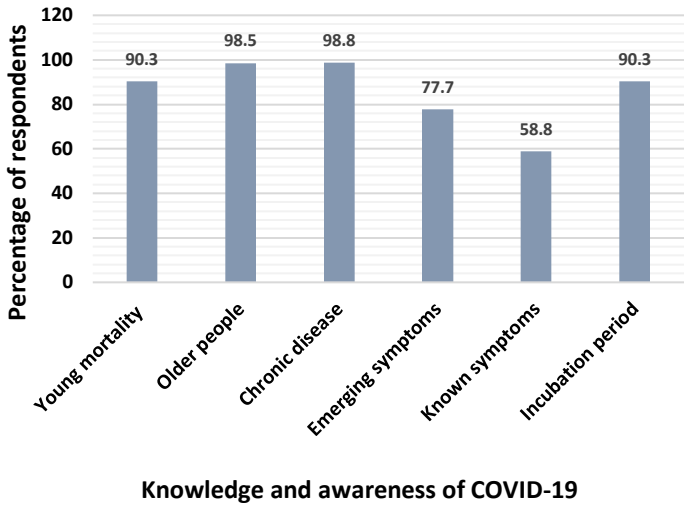

Figure 1: Percentage of respondents who correctly answered questions on knowledge/awareness of COVID-19

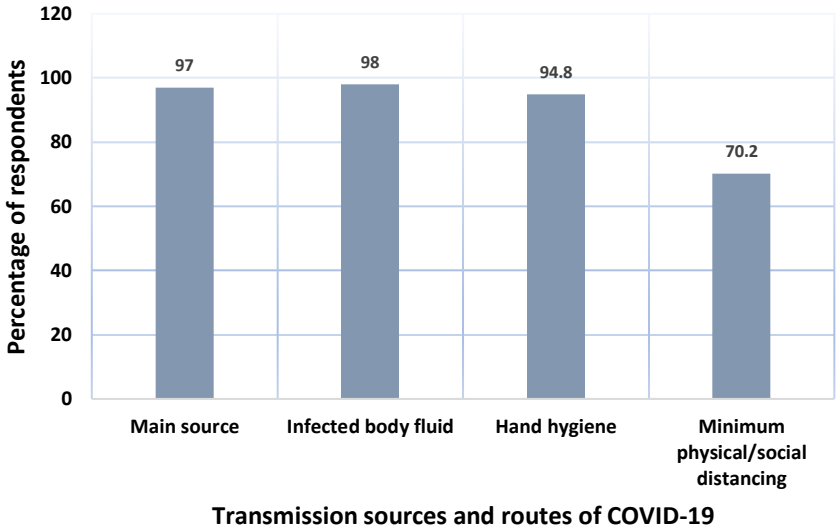

Figure 2: Percentage of respondents who correctly answered questions on COVID-19 transmission sources and routes