

Knowledge and practice amongst health care professionals regarding hand hygiene – are we on the right path in the current coronavirus disease 2019 pandemic?

Satvinder S. Bakshi^a, Vinoth K. Kalidoss^b, Seepana Ramesh^a, Sumita Bakshi^c

Departments of ^aENT and Head & Neck Surgery, ^bCommunity and Family Medicine, All India Institute of Medical Sciences, Mangalagiri, Guntur, Andhra Pradesh, ^cDr Smilez Dental Clinic, Pondicherry, India

Correspondence to Satvinder S. Bakshi, MS, DNB, Department of ENT and Head & Neck Surgery, AIIMS, Mangalagiri, Guntur, Andhra Pradesh, PO Box 522503, India.
Tel: +91 969 842 0998; fax: 041322203070; e-mail: saty.bakshi@gmail.com

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Aim

Hand washing is one of the most important practices for preventing nosocomial infections, especially in the current coronavirus disease 2019 pandemic. However, it is seen that hand hygiene has been replaced by just usage of hand sanitizers. We conducted a survey among health care professionals regarding their knowledge, attitude, and practice toward hand hygiene, with special focus on hand sanitizers.

Patients

and methods A cross-sectional survey was conducted among health care professionals using a structured and pretested questionnaire sent through e-mail. The study tool contained questions on basic demography, knowledge, and practice of hand hygiene.

Results

A total of 496 health care professionals completed the survey, the majority being physicians (60%). The correct response for components of hand hygiene was higher among nursing personnel (88.781%) followed by physicians (83.7%) and dentists (83.7%). Overall, 45% of the participants were not aware about the adverse effects of hand sanitizers.

Conclusion

There is an urgent need to educate both health care professionals and patients regarding various aspects of hand hygiene. Hand washing with soap and water should be encouraged where available.

Keywords:

coronavirus disease 2019, hand hygiene, hand sanitizer, hand wash, knowledge and practice

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Introduction

One of the major problems affecting the health care system is nosocomial infections, and one of the major sources of these infections is health care workers, especially contaminated hands. This is more important in the present scenario, where transmission of the novel coronavirus by infected hands has been established. Hand hygiene has been proven to be a simple, economical, and practical intervention in reducing health care-related infections and in reducing the transmission of the virus [1]. Despite being very essential and simple to practice, the awareness and knowledge regarding hand hygiene among health care workers remain poor [2,3]. Moreover, there is a lot to desire in terms of the practice of hand hygiene among health care workers [2]. During the present pandemic, there has been an effort to raise awareness regarding hand hygiene, with governments and international societies developing various educational materials on the same. However, the focus of most of these campaigns has just been using hand sanitizers, and other components of hand hygiene have not been stressed upon.

With this in mind, we planned to survey health care workers, including doctors, nursing personnel, and people working in laboratories and medical students regarding their knowledge and attitude toward hand hygiene, in particular the use of hand sanitizers.

Patients and methods

A cross-sectional study was conducted among health care professionals from India during April 2020. Participants were informed of the nature of the survey and consent was taken. Health care professionals working on coronavirus disease 2019 pandemic control and willing to participate in the study were included in the study. Moreover, medical students doing internships were included. Assuming that 50% will choose washing hands with soap and water as their first choice for hand hygiene, along with 5% marginal error and 95% confidence interval, the

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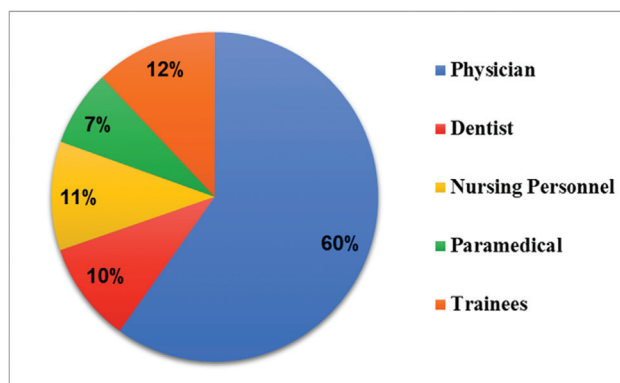
sample size was calculated to be 400. Using consecutive sampling technique, health care professionals working at different levels were included until we reached the required sample size. A self-developed structured and pretested questionnaire developed using Google forms was used and was sent to the participants through e-mail for providing willingness and responses. The study tool contained questions on basic demography, knowledge, and practice of hand hygiene. Individuals providing incomplete questionnaires or having reluctance for participation were excluded. The data were exported into MS Excel (Microsoft, Redmond, Washington, USA) and analyzed using R software (R core team, Vienna, Austria). The categorical variables were summarized as frequency and proportions. The association between the profession and response was analyzed using the χ^2 test, and a *P* value less than 0.05 was considered as statistically significant.

Results

A total of 496 health care workers completed the survey; the majority were physicians (60%) followed by nursing personnel (12%) and dentist (11%) (Fig. 1). Approximately 64% of the study participants were aged younger than 30 years, and 62% were males (Table 1).

Among the components of hand hygiene, hand washing and hand sanitizer usage were correctly identified by most participants (96 and 95.6%, respectively). Approximately 80% of study participants correctly identified all components of hand hygiene (Fig. 2). The correct response for components of hand hygiene was higher among nursing personnel (88.71%), followed by physicians (83.7%) and dentists (83.7%) (Table 2). Overall, 82.5% of the study participants knew the reduced effect of hand sanitizer on greased or oily hands, and 63% knew about the reduced efficacy of hand sanitizer on hands that are soiled with dirt; this knowledge was again the highest among the nursing personnel. Approximately 70% of the study participants were aware of the minimum percentage of alcohol in hand sanitizer as advised by the WHO. Concerning the adverse effects of sanitizers, only 31.2% were aware, and approximately 45% were not sure about the adverse effects of the hand sanitizer. In continuation with this knowledge, complete symptoms of hand sanitizer ingestion were known by 68% of study participants, and only 38.3% knew that hand sanitizers had the potential of being abused by patients with addictions. Only a few (23%) of the study participants reported that they had actually come across any patient having adverse effects owing to hand sanitizer usage.

Figure 1

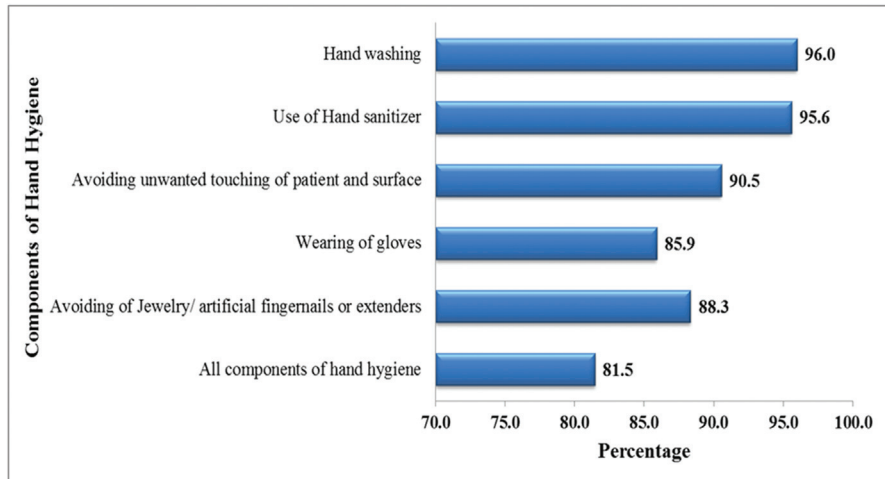


Distribution of profession among the study participants.

Table 1 Distribution of age and sex of the study participants

	Physician [n (%)]	Dentist [n (%)]	Nursing personnel [n (%)]	Paramedical [n (%)]	Trainees [n (%)]	Total [n (%)]
Age group (years)						
18–30	172 (57.9)	28 (57.1)	43 (81.1)	18 (48.6)	57 (95)	318 (64.1)
31–40	81 (27.3)	19 (38.8)	6 (11.3)	10 (27.0)	3 (5.0)	119 (24.0)
>40	44 (14.8)	2 (4.1)	4 (7.5)	9 (24.3)	0	59 (11.9)
Sex						
Male	202 (68)	17 (34.7)	37 (69.8)	23 (62.2)	32 (53.3)	311 (62.7)
Female	95 (32)	32 (65.3)	16 (30.2)	14 (37.8)	28 (46.7)	185 (37.3)
Total	297 (59.9)	49 (9.9)	53 (10.7)	37 (7.5)	60 (12.1)	496 (100)

Figure 2



Distribution of response for components of hand hygiene by the study participants.

Table 2 Knowledge on hand hygiene among the study participants

	Physician [n (%)]	Dentist [n (%)]	Nursing personnel [n (%)]	Paramedical [n (%)]	Trainees [n (%)]	Total [n (%)]	P value
Identifying the components of hand hygiene							
Complete	247 (83.7)	41 (83.7)	47 (88.7)	28 (75.7)	41 (68.3)	404 (81.5)	0.037
Partial	50 (16.8)	8 (16.3)	6 (11.3)	9 (24.3)	19 (31.7)	92 (18.5)	
Effect of hand sanitizer on greased or oily hands							
Correct	245 (82.5)	43 (87.8)	44 (83.0)	27 (73.0)	50 (83.3)	409 (82.5)	<0.001
Incorrect	52 (17.5)	6 (12.2)	9 (17.0)	10 (27.0)	10 (16.7)	87 (17.5)	
Effect of hand sanitizer on hands soiled with dirt							
Correct	173 (58.2)	36 (73.5)	47 (88.7)	31 (83.8)	48 (80.0)	312 (62.9)	<0.001
Incorrect	124 (41.8)	13 (26.5)	6 (11.3)	6 (16.2)	12 (20.0)	184 (37.1)	
Minimum percentage of alcohol in hand sanitizer as advised by WHO							
Correct	206 (69.4)	35 (71.4)	34 (64.2)	30 (81.1)	38 (63.3)	343 (69.2)	0.384
Incorrect	91 (30.6)	14 (28.6)	19 (35.8)	7 (18.9)	22 (36.7)	153 (30.8)	
Does hand sanitizer has side effect							
Yes	79 (26.6)	14 (28.6)	26 (49.1)	14 (37.8)	22 (36.7)	155 (31.3)	0.080
No	73 (24.6)	12 (24.5)	7 (13.2)	10 (27.0)	12 (20.0)	114 (23.0)	
May be	145 (48.8)	23 (46.9)	20 (37.7)	13 (35.1)	26 (43.4)	226 (45.7)	
Symptoms of hand sanitizer ingestion?							
Complete	209 (70.4)	30 (61.2)	42 (79.2)	23 (62.2)	34 (56.7)	338 (68.1)	0.344
Partial	79 (26.6)	16 (32.7)	10 (18.9)	13 (35.1)	22 (36.6)	140 (28.2)	
Unaware	9 (3.0)	3 (6.1)	1 (1.9)	1 (2.7)	4 (6.7)	18 (3.6)	
Does hand sanitizer have the potential of abuse by patients with addictions							
Yes	104 (35.0)	20 (40.8)	27 (50.9)	18 (48.6)	21 (35.0)	190 (38.3)	0.141
No	71 (23.9)	10 (20.4)	4 (7.5)	9 (24.3)	12 (20.0)	106 (21.4)	
May be	122 (41.1)	19 (38.8)	22 (41.5)	10 (48.6)	27 (45.0)	199 (40.1)	
Total	297 (59.9)	49 (9.9)	53 (10.7)	37 (7.5)	60 (12.1)	496 (100)	

Overall, nursing personnel had more knowledge than other categories, and medical trainees had the least knowledge. Hand washing as the first choice for hand hygiene was reported by 80% of the study participants, who reported that their first choice for personal hand hygiene would be hand washing, and 87% reported that they would recommend hand washing as the first choice of hand hygiene to their patients (Table 3). Among the 99 (20%) study participants who reported

hand sanitizer as there the first choice of hand hygiene, 57% recommended hand washing with soap and water as the first choice of hand hygiene to their patients (Table 4), and there is a statistically significant difference ($P<0.001$) between their personal choice of hand hygiene and the one they recommend to patients. It was interesting to note that approximately half had come across a hand sanitizer with lesser than recommended percentage of alcohol in their practice.

Table 3 Distribution of hand hygiene practice among the study participants

	Physician [n (%)]	Dentist [n (%)]	Nursing personnel [n (%)]	Paramedical [n (%)]	Trainees [n (%)]	Total [n (%)]	P value
First choice for personal hand hygiene							
Hand washing	237 (79.8)	32 (65.3)	46 (13.2)	33 (89.1)	49 (81.7)	397 (80.0)	0.037
Hand sanitizer	60 (20.2)	17 (34.7)	7 (13.2)	4 (10.8)	11 (18.3)	99 (20.0)	
Recommend to your patient as first choice of hand hygiene							
Hand washing	254 (85.5)	40 (81.6)	49 (92.5)	35 (94.6)	58 (96.7)	436 (87.9)	0.432
Hand sanitizer	43 (14.5)	9 (18.4)	4 (7.5)	2 (5.4)	2 (3.3)	60 (12.1)	
Came across the use of hand sanitizer with lesser than recommended percentage of alcohol							
Yes	135 (45.5)	19 (38.8)	28 (52.8)	20 (54.1)	26 (56.7)	228 (46.0)	0.525
No	162 (54.5)	30 (61.2)	25 (47.2)	17 (45.9)	26 (43.3)	268 (54.0)	
Came across any patient having side effect due to hand sanitizer usage							
Yes	65 (21.9)	6 (12.2)	18 (34.0)	9 (24.3)	12 (20.0)	112 (22.8)	0.432
No	231 (79.2)	43 (87.8)	35 (66.0)	28 (75.7)	48 (80.0)	384 (77.4)	
Total	297 (59.9)	49 (9.9)	53 (10.7)	37 (7.5)	60 (12.1)	496 (100)	

Table 4 Comparison of first choice of hand hygiene for personal use and recommendation to patients by health care professionals

	What will you recommend to your patient as first choice of hand hygiene [n (%)]		Total	P value
	Hand washing	Hand sanitizer		
What is your first choice of hand hygiene				
Hand washing	379 (95.4)	18 (4.5)	397 (80)	<0.001
Hand sanitizer	57 (57.6)	42 (42.4)	99 (20)	
Total	436 (87.9)	60 (12.1)	496 (100)	

Discussion

Millions of people experience infections that are transferred by health care providers globally [4]. Many of these infections can be stopped by implementing simple techniques of hand hygiene [5]. It is important that all health care workers must know the hand hygiene techniques correctly and should be able to perform them accurately [3].

An important trend that has been seen during the present pandemic is the rise in the use of hand sanitizers; many times these ethanol-containing hand rubs are used frequently as a substitute for hand washing with water and soap. However, not all viruses are inactivated by a short-term rubbing with alcohol. In a study by Savolainen-Kopra *et al.* [6], the capacity of a single round of hand cleaning with water and soap or ethanol-containing hand rub, correspondingly, was tested for removal of human

rhinovirus administered onto the skin of healthy volunteers on the back of the hands. They found that hand washing with soap and water was much more efficient for removing rhinoviruses from the skin than rubbing hands with an ethanol-containing disinfectant. Another study by Tuladhar *et al.* [7] concluded that washing hands with soap and water is better than using alcohol-based hand disinfectants in removing noroviruses from hands. It has also been seen that hand washing with soap and water is significantly more effective at removing *C. difficile* spores from the hands than is alcohol-based hand rubs [8].

The duration and quantity of usage of hand rub are also controversial, with no clear guideline as to how long the rub should be applied or what quantity should be used for a single rub. Bellissimo-Rodrigues *et al.* [9] found that the bacterial reduction was significantly lower for large hands compared with small hands, which suggests a need for customizing the volume of alcohol-based

hand rub for hand hygiene. It is also seen that people use hand wipes instead of rubbing hand sanitizers directly and replace them with hand wash. This again is a dangerous trend as hand wiping with or without an alcohol-based solution was found to be inferior to hand rubbing with an alcohol-based solution in a study conducted by Ory *et al.* [10].

We saw in our survey too that although many health professionals themselves chose hand washing with soap and water, very few recommended it to their patients. Besides very few were aware of the adverse effects of the usage of hand sanitizers.

Alcohol-based hand rubs have an abuse potential and can be abused by people with psychiatric conditions [11]. The lack of knowledge regarding this was also seen in our survey too, and only 23% were aware of it. Besides this, alcohol-based rubs are also poisonous when consumed, and many adverse events have been reported, especially in children. During 2011–2014, 70 669 exposures to alcohol and nonalcoholic hand sanitizers were reported in children aged less than or equal to 12 years to the National Poison Data System in the USA. Approximately 90% of these exposures occurred among children aged 0–5 years. Among that age group, 97% of exposures were oral ingestions. Children aged 6–12 years had more intentional exposures of alcohol hand sanitizers, suggesting this might be a potential product of abuse among older children. Older children also reported more symptoms and had worse outcomes than did younger children. It is prudent that caregivers are aware of the potential risks and dangers associated with the improper use of hand sanitizer products among children and the need to use proper safety precautions to protect children [12]. Another disturbing trend was that many came across hand sanitizers with less than recommended percentage of alcohol, implying lax quality measures, which can be detrimental to the people using them.

There are certainly other issues like the lack of quality control in many alcohol-based solutions. Very often people have reported that the hand sanitizers available in the market have less than the recommended alcohol percentage [13]. This was also seen in our study, where more than half the participants had come across hand sanitizers with less than recommended alcohol percentage. There is also a possibility of the development of resistance to alcohol-based solutions if overused [14].

We would like to recommend that healthcare professionals should be made aware of the potential

dangers associated with the use of hand sanitizers. The habitual use of hand sanitizers must be avoided and should be used when soap and water are not available. Hand sanitizers should be kept away from children and people with abuse potential. The public should be asked to purchase a small number of hand sanitizers to avoid being addicted to their use. The quality and composition of the hand sanitizers must be checked before purchase; an average of 60–70% of alcohol should be present. Lastly, all the components of hand hygiene, such as nail clipping and removal of ornaments like rings before handling infected patients/surfaces, should be taught to the health professionals and the general public and not just hand washing.

Conclusion

Although hand sanitizers represent a very convenient and easy-to-use option for hand hygiene, it should not supersede the traditional hand washing with soap and water. Hand hygiene with soap and water is safe and should be the first choice of hand hygiene. There is an urgent need to educate both health care professionals and patients regarding this aspect and appropriate interventions should be devised to disseminate this message.

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Conflicts of interest

There are no conflicts of interest.

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