

**Research Article****Assessment of Hand Hygiene Knowledge among Medical Students at a Teaching Hospital of India****<sup>1</sup>Dr. Sita Chatterjee, <sup>2</sup>Dr. Tushar Kanti Mondal, <sup>3</sup>Dr. Kaushik Sarkar, <sup>4</sup>Dr. Bhaskar Shahbabu, <sup>5</sup>Dr. Ishita Sarkar, <sup>6</sup>Dr. Gautam Barik, <sup>7</sup>\*Dr. Mausumi Basu**<sup>1,2,7</sup>Associate Professor, Department of Community Medicine, IPGME & R and SSKM Hospital, Kolkata<sup>3,4,5</sup>Junior Resident, All India Institute of Hygiene and Public Health, Kolkata<sup>6</sup>Associate Professor, Microbiology, Calcutta medical College, Kolkata, India**\*Corresponding author**

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**Abstract:** Although hand hygiene is a very simple procedure; a review on literatures suggested that the compliance rates by healthcare workers with recommended hand hygiene procedures ranged from 5% to 89% with an average compliance to be below 50%. The main objective is to assess the knowledge of undergraduate medical students with regard to hand washing. A descriptive cross sectional study was carried out at a teaching hospital of Kolkata from May 2015- July 2015 among 191 4<sup>th</sup> and 6<sup>th</sup> semester undergraduate students using WHO's hand hygiene questionnaire for health care workers. The Statistical analysis was by Microsoft office excel 2010, Statistical Package for the Social Sciences SPSS 16 & Epi-info 6.04d. Knowledge on hand hygiene was moderate among 76% of the total study population. Only 8% of participants had good knowledge and rest 16% had poor knowledge regarding hand hygiene. In conclusion emphasis on hand hygiene in the undergraduate curriculum is need of the hour.

**Keywords:** Hand hygiene, medical students, knowledge

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**INTRODUCTION**

Health Care Workers' (HCWs) hands become progressively colonized with commensal flora as well as with potential pathogens during patient care [1]. Hand hygiene is one of the five key initiatives set out by the World Alliance for Global Patient Safety Challenges [2]. As part of a major global effort to improve hand hygiene in health care, the 'SAVE LIVES: Clean Your Hands' annual global campaign was launched in 2009 and was a natural extension of the WHO First Global Patient Safety Challenge: 'Clean Care is Safer Care'; the goal of which was to ensure that infection control was acknowledged universally as a solid and essential basis towards patient safety and supported the reduction of health care-associated infections and their consequences. It advocated the need to improve and sustain hand hygiene practices of health-care workers at the right times and in the right way to help reduce the spread of potentially life-threatening infections in health-care facilities [2].

Although hand hygiene is a very simple procedure; a review on hand hygiene practices suggested that the compliance rates by healthcare workers with recommended hand hygiene procedures ranged from 5% to 89% with an average compliance to be below 50% [1, 3, 4].

It has been suggested that the optimal duration of hand washing is between 30 seconds and one minute as a minimum and a maximum range respectively [5]. The recommendation on hand hygiene has been updated, and hand washing has been replaced by hand-rub as the standard of care [1, 4]. It was also demonstrated that alcohol-based hand antiseptics are used worldwide for their rapid antimicrobial effects, broad-spectrum coverage, better tolerability, and ease of application [5].

Risk factors for non-adherence have been extensively studied globally and physicians have been repeatedly observed as being poor compliers. The total number of hand exposures in a hospital may range from several tens to thousands per day. With each hand-to-surface exposure a two directional exchange of microorganisms occurs between hands and the touched object and the transient hand-carried flora is thus continuously changing. Most of the healthcare workers hand flora gradually gets replaced by pathogenic microorganisms, which can spread throughout a health care environment in a short span of time [6]. According to India's Public Health Association, only 53 per cent of people in India wash hands after defecation, 38 per cent wash hands before eating and only 30 per cent wash hands before preparing food. Many people don't wash their

hands, because they believe that hands that look clean cannot make them sick. [7].

There are several published information on hand washing practices of Health Care Workers (HCWs), their knowledge, perceived barriers & facilities for practicing hand washing in hospitals from India [6, 8, 9, 10].

Awareness regarding hand washing and hygienic practices is low among doctors and nurses in India, according to a study by [AIIMS](#) and [Lady Hardinge Medical College \(LHMC\)](#) covered over 100 doctors and nurses from March 2015 to May 2015 which stressed on regular training sessions to ward off the threat of infections [6]. It was found that most of the doctors still believe that soap and water is the best way of ensuring hygiene of the hand even though the World Health Organisation (WHO) recommends alcohol-based hand rub (ABHR) for hand antisepsis as it acts fast and has broad spectrum of antimicrobial activity. A very recent study during February 2015 among medical students of a rural medical college of West Bengal revealed that universal compliance to personal hygiene was not found among medical students [10]. With this background a study was undertaken with the objective of to assess the knowledge of undergraduate medical students with regard to hand washing.

#### MATERIALS AND METHODS:

**Type and design of study:** An institution based observational descriptive epidemiological study, cross sectional in design.

**Study setting:** A tertiary care teaching urban Government hospital of Kolkata, West Bengal, India.

**Study period and duration:** From May 2015- July 2015; a period of 3 months.

**Study population:** Study population: 4th and 6th semester undergraduate (U.G.) MBBS students of a tertiary care teaching hospital of Kolkata.

**Inclusion criteria:** 4<sup>th</sup> and 6<sup>th</sup> semester U.G. medical students of all ages; both gender; who were available during data collection period; willing to participate in the study; and gave informed written consent.

**Exclusion criteria:** Not willing to participate in the study and not gave informed written consent.

#### Study tools

Knowledge was assessed using WHO's hand hygiene questionnaire for health care workers.<sup>11</sup> This questionnaire of 25 questions included multiple choice questions; "yes" or "no" questions; and "true" or "false" questions. 1 point was given for each correct response so that maximum score for knowledge was 25. A score of more than 75% was considered good, 50–74% moderate, and less than 50% was taken as poor.

#### Study variables

Age, gender, residence, year of study, type of family, Per Capita Monthly Income (PCMI), route of transmission, source of germ, indications of hand hygiene, minimum time required, materials used in hand washing; questions on alcohol based hand rub.

#### Sample size and sampling technique

Among 4 currently studying semester groups, 2 semesters i.e., 4th & 6th semesters were selected randomly by lottery method. All 150 students of 4th semester and 98 students of 6th semester batch were included in the study but due to some or other reasons 104(69.33%) students of 4th semester and 87 (88.77%) students of 6th semester batch were successfully studied.

#### Data collection technique

Data collection was done for each semester separately. Before filling the questionnaire, study populations were briefed about the purpose and nature of the study; their informed written consent taken where confidentiality and anonymity were assured in all aspects. Then they were requested to fill out the questionnaire completely and truthfully after assuring them of the fact that the results had no impact on their final grades in MBBS 2<sup>nd</sup> Professional & 3<sup>rd</sup> Professional Part I examinations. If a designated student could not be contacted or was not cooperative during the three separate visits, the subject was considered as a non-respondent.

#### Data analysis technique

Forms were revised for completeness and consistency. Data were entered in Microsoft Office Excel 2010 (Microsoft Corp, Redmond, WA, USA), and analyzed with Statistical Package for the Social Sciences SPSS Inc. Released 2007. SPSS for Windows, Version 16.0. Chicago & Epi-info 6.04d (Centres for Disease Control and Prevention, Atlanta, GA, USA, 2001). Descriptive statistics was used to calculate percentages for each of the responses given. Chi square test was used to compare the percentage of correct responses between 4<sup>th</sup> and 6<sup>th</sup> semester students. A P values less than 0.05 were considered statistically significant.

#### Working definitions

##### 1. Types of families: [11]

**a) Nuclear family:** It consists of a married couple and their dependent children.

**b) Joint family:** It consists of a number of married couples and their children living together in the same household. All the property is held in common and all the authority is usually vested in a senior male member of the family.

**2. Socio-economic Classification:** According to Modified BG Prasad's scale (March) 2015 [12].

##### 3. Based on World Health Organization (WHO) guidelines [1, 13] the following operational definitions were used:

**1) Hand washing:** Washing hands with plain or antimicrobial soap and water.

2) **Hand rubbing:** treatment of hands with an antiseptic hand rub (alcohol-based formulation).  
 3) **Antiseptic agent:** An antimicrobial substance that inactivates microorganisms or inhibits their growth on living tissues. Eg: alcohol, chlorhexidine, iodine etc.  
 4) **Compliance with hand washing:** defined as either washing hands or wrists with water and plain soap or rubbing with an antiseptic solution before and after patient care.  
 5. **Non Compliance:** Any deviation from the above mentioned definition of compliance & departure from the room after patient care without hand washing.  
 6. **Alcohol-based hand rub formulation:** an alcohol-containing preparation (liquid, gel or foam) designed for application to the hands to kill germs.

**RESULTS**

Altogether 191 student participants were there in the study; their socio demographic profiles were depicted in Table 1. Among the study population 104(54.45 %) were of 4th semester batch and 87(45.55 %) were from 6th semester batch. Within 4th semester students 74.04% were male and 25.96 % were female whereas in 6th semester students these figures were 78.16 % and 21.84% respectively. Overall 75.92 % were male and 24.08% were female respectively.

Among 4th semester students 48.08% stayed in college hostel, and 51.92% were day scholars. Among 6th semester students 47.13% stayed in college hostel, and 52.87% were day scholars. For the whole group of study participants 47.64% stayed in college hostel, and 52.36% were day scholars.

**Table 1: Distribution of the study population as per socio demographic profiles (n=191)**

Socio demographic profiles	4 <sup>th</sup> semester N=104(%)	6 <sup>th</sup> semester N=87(%)	Total N=191 (%)
<b>Gender</b>			
Male	77(74.04)	68(78.16)	145(75.92)
Female	27(25.96)	19(21.84)	46(24.08)
<b>Residence</b>			
Day Scholar	54(51.92)	46(52.87)	100(52.36)
Hostel resident	50(48.08)	41(47.13)	91(47.64)
<b>Type of family</b>			
Nuclear	81(77.88)	68(78.16)	149(78.01)
Joint	23(22.12)	19 (21.84)	42(21.99)
<b>PCMI</b>			
Class I (upper): Rs.5,798 and above	70(67.31)	58(66.67)	128(67.01)
Class II (upper middle): Rs.2,899 – 5,797	21(20.20)	16(18.38)	37(19.38)
Class III (lower middle): Rs.1,739 – 2,898	08(07.69)	06(06.90)	14(07.33)
Class IV (upper lower): Rs.870 – 1,738	03(02.88)	04(04.60)	07(03.66)
Class V (lower): Below Rs.870	02(01.92)	03(03.45)	05(02.62)

Mean age of the students were 21 years and 22 years respectively for 4th& 6th semester batch. Age ranged from 20 – 22 years for 4th semester students and 21 – 24 years for 6th semester students respectively. Regarding type of family 77.88% of 4<sup>th</sup> semester students were from nuclear family and rest 22.12% were from joint family;

among 6<sup>th</sup> semester batch the corresponding figures were 78.16% and 21.84% ; and for the whole study population these were 78.01% and 21.99% respectively. About 67.31%; 66.67% & 67.01% of 4<sup>th</sup> semester; 6<sup>th</sup> semester & total students belonged to class I as per modified B.G. Prasad scale 2015Table 1.

**Table-2: Knowledge of the study population regarding hand hygiene (n=191)**

S. No	Items	4 <sup>th</sup> semester N=104(%)	6 <sup>th</sup> semester N=87(%)	X <sup>2</sup> (p-value)
1.	Which of the following is the main route of transmission of potentially harmful germs between patients? (health care workers hands when not clean)	78(75.00)	67(77.01)	0.10; 0.74
2.	What is the most frequent source of germs responsible for health care associated infections? (germs already present on or within the patient)	22(21.15)	33(37.93)	<b>6.50; 0.01</b>
Which of the following hand hygiene actions prevents transmission of germs to the patient?				
3.	Before touching a patient (yes)	94(90.38)	84(96.55)	1.95;0.16
4.	Immediately after risk of body fluid exposure (yes)	87(83.65)	75(86.21)	0.24;0.62
5.	After exposure to immediate surroundings of a patient (no)	27(25.96)	25(28.73)	0.18;0.66
6.	Immediately before a clean/aseptic procedure (yes)	85(81.73)	76(87.36)	1.13;0.28
Which of the following hand hygiene actions prevents transmission of germs to the health care worker?				
7.	After touching a patient (yes)	94(90.38)	84(96.55)	1.95;0.16

8.	Immediately after a risk of body fluid exposure (yes)	88(84.61)	77(88.51)	0.61;0.43
9.	Immediately before a clean/aseptic procedure (no)	52(50.00)	52(59.77)	1.82;0.17
10.	After exposure to the immediate surroundings of a patient (yes)	70(67.31)	67(77.01)	2.20;0.13
	Which of the following statements on alcohol-based hand rub and hand washing with soap and water is true?			
11.	Hand rubbing is more rapid for hand cleansing than hand washing (true)	72(69.23)	68(78.16)	1.93;0.16
12.	Hand rubbing causes skin dryness more than hand washing (false)	24(23.08)	18(20.69)	0.15;0.69
13.	Hand rubbing is more effective against germs than hand washing (false)	45(43.27)	27(31.03)	3.01;0.08
14.	Hand washing and hand rubbing are recommended to be performed in sequence (false)	43(41.35)	30(34.48)	0.94;0.33
15.	What is the minimal time needed for alcohol-based hand rub to kill most germs on your hands? (20 seconds)	32(30.77)	29(33.33)	0.14;0.70
	Which type of hand hygiene method is required in the following situations?			
16.	Before palpation of the abdomen (rubbing)	27(25.96)	35(40.23)	<b>4.39;0.03</b>
17.	Before giving an injection (rubbing)	26(25.00)	34(39.08)	<b>4.35;0.03</b>
18.	After emptying a bed pan (washing)	71(68.27)	68(78.16)	2.33;0.12
19.	After removing examination gloves (rubbing/washing)	65(62.50)	69(79.31)	<b>6.39;0.01</b>
20.	After making a patient's bed (rubbing)	26(25.00)	22(25.29)	0.00;0.96
21.	After visible exposure to blood (washing)	47(45.19)	51	1.88;0.16
	Which of the following should be avoided, as associated with increased likelihood of colonization of hands with harmful germs?			
22.	Wearing jewellery (yes)	93(89.42)	82(94.25)	1.44;0.23
23.	Damaged skin (yes)	98(94.23)	83(95.40)	0.00;0.97
24.	Artificial fingernails (yes)	85(81.73)	79(90.80)	3.21;0.07
25.	Regular use of a hand cream (no)	46(44.23)	53(60.92)	<b>5.28;0.02</b>

The knowledge on hand hygiene was moderate (145 out of 191) among 76% of the total study population. Only 8% of participants (15 out of 191) had good knowledge and rest 16% (31 out of 191) had poor knowledge regarding hand hygiene. The percentages of correct responses of the two groups of students to the individual questions on hand hygiene knowledge were given in Table 2.

## DISCUSSION

The participants involved in this study were assessed for knowledge of hand hygiene. In the present study the knowledge on hand hygiene was moderate among majority (76%) of the study population which was a positive finding; only 8% of participants had good knowledge and rest 16% had poor knowledge; these findings were corroborative with the findings of some previous similar studies in India and abroad [6, 14-23].

Ansari *et al.* at Delhi compared the level of knowledge regarding hand hygiene among doctors and nurses; there was a significant improvement in the knowledge, attitude & practice (KAP) score for both doctors and nurses after the training sessions (good knowledge: pre test vs. post test from 7.1% to 46.4% among doctors & from 2.2% to 45.5% among nurses) and doctors had better knowledge of hand hygiene [6].

A study by Nair *et al.* at a tertiary health care centre of Raichur, Karnataka, India among medical and nursing students revealed that both study groups had

moderate knowledge on hand hygiene and nursing students knowledge were significantly better than medical students.

In another earlier study from Riyadh, Saudi Arabia by Basurrah *et al.*; among health care workers (HCWs), adherence to hand hygiene was seen among 70% among medical students, 69.2% among interns, 18.8% among nurses, 12.5% among residents and 9.1% among consultants [15].

Van de Mortel *et al.* in 2010 compared the hand hygiene knowledge, beliefs, and practices between Greek nursing and medical students. They found that the nursing students hand hygiene knowledge was significantly higher than that of medical students [16].

A study among final year medical and nursing students at the University of Sri Jayewardenepura by Ariyaratne *et al.* demonstrated that the knowledge on hand hygiene was moderate (77%) among the total study population; only 9% of participants had good knowledge regarding hand hygiene. Moreover nursing students had significantly better knowledge than medical students [17].

Mahesh *et al.* at Kancheepuram district of India found moderate awareness about hand hygiene among medical students; and less male female differences existed in the knowledge of hand hygiene [18].

Kadi *et al.* at Saudi Arabia [19] observed that the average awareness regarding the positive indications of hand hygiene was 56% among medical students with no

significant difference between the genders while Mann and Wood [20] reported awareness in only 56% of students.

Harsha Kumar *et al.*; at Mangalore city showed that knowledge of doctors on various aspects of hand washing was inadequate though it was better than nurses [21]. Kairo study by Elaziz *et al.*; demonstrated that the mean knowledge score was higher in nurses compared to doctors [22].

Nawab *et al.*; at Aligarh revealed that majority of both the nursing (76.2%) and medical students (80%) had moderate knowledge. Only 7% of both the medical and nursing students had good knowledge on hand hygiene [23].

### LIMITATIONS

First of all, there was little relevant literatures available regarding hand hygiene KAP among medical students in India and West Bengal. Also because of the cross sectional study design, institution based study and small sample size; the results obtained may not truly reflect awareness of hand hygiene in the population. Moreover there is a possibility that some of the responses to certain questions being inaccurate.

### CONCLUSIONS AND RECOMMENDATIONS

This study revealed that the knowledge on hand hygiene was moderate among 76% of the total study population. Only 8% of participants had good knowledge and rest 16% had poor knowledge regarding hand hygiene. Studies with larger and more diverse samples are needed to confirm these results.

Increasing emphasis on hand hygiene in the undergraduate curriculum might improve students' knowledge, beliefs and practices about hand hygiene.

Hand hygiene training sessions need to be conducted for medical students with continuous monitoring and performance feedback to encourage them to follow correct hand hygiene practices.

### REFERENCES

1. World Health Organisation. WHO guidelines on hand hygiene in health care. WHO Press, Geneva, Switzerland 2009. Available from: [http://whqlibdoc.who.int/hq/2009/WHO\\_IER\\_PS\\_P\\_2\\_009.07\\_eng.pdf](http://whqlibdoc.who.int/hq/2009/WHO_IER_PS_P_2_009.07_eng.pdf) [Accessed on 14.08.2015].
2. World Health Organization. World Alliance for patient Safety. Global Patient Safety Challenge 2005-2006. Clean Care is Safer Care. SAVE LIVES: Clean Your Hands-WHO's global annual call to action for health workers. World Health Organization, 20 Avenue Appia, 1211 Geneva 27, Switzerland 2005. Available from <http://www.who.int/gpsc/5may/en/> [Accessed on 14.08.2015].
3. Lankford MG, Zembower TR, Trick WE, Hacek DM, Noskin GA, Peterson LR; Influence of role

- models and hospital design on hand hygiene of healthcare workers. *Emerg Infect Dis*, 2003; 9(2):217-223.
4. Pittet D, Hugonnet S, Harbarth S, [Mourouga P](#), [Sauvan V](#), [Touveneau S](#) *et al.*; Effectiveness of a hospital-wide programme to improve compliance with hand hygiene, *Infection Control Programme*. *Lancet*, 2000; 356(9238): 1307-12.
5. Girou E, Loyeau S, Legrand P, Oppein F, Brun-Boisson C; Efficacy of hand-rubbing with alcohol based solution versus standard hand washing with antiseptic soap: Randomised clinical trial. *BMJ*, 2002; 17:325-362.
6. Ansari SK, Gupta P, Jais M, Nangia S, Gogoi S, Satia S *et al.*; Assessment of the Knowledge, Attitude and Practices Regarding Hand Hygiene amongst the Healthcare Workers in a Tertiary Health Care Centre. *International Journal of Pharma Research and Health Sciences*, 2015; 3(3):720-726.
7. UNICEF India. Health News. Global Hand washing Day. 2008. Available from [http://www.unicef.org/infobycountry/india\\_45974.html](http://www.unicef.org/infobycountry/india_45974.html) [Accessed on 15.08.2015].
8. Mehta Y, Chakravarthy M, Nair R, Jawali V, Pawar M, Rosenthal VD; Prospective study to evaluate hand washing compliance in two Indian Hospitals. *Am J infect control*, 2005; 33: e73-4 .
9. Mahesh Devnani, Rajiv Kumar, Rakesh KS, Anil KG; A survey of hand-washing facilities in the outpatient department of a tertiary care teaching hospital in India. *J Infect Dev Ctries*, 2011; 5: 114-18.
10. Das D, Mandal AK, Das J, Sardar S, Naskar S, Kole S; Practice of Personal Hygiene & Morbidity Pattern among Medical Students of a Rural Medical College, West Bengal, India. *IOSR Journal of Dental and Medical Sciences*, 2015; 14(5): 39-44.
11. Park K. Park's Textbook of Pre ventive and Social Medicine. 22<sup>nd</sup> Edition. Banarsidas Bhanot Publishers. Jabalpur 2013:p635.
12. Sharma R. Online interactive calculator for real-time update of the Prasad's social classification for 2015. Available at: <http://www.prasadscaleupdate.weebly.com> (Accessed on 2015/ May/ 21).
13. World Health Organization. Hand Hygiene Knowledge Questionnaire for Health-Care Workers. Patient Safety: A World Alliance for Safer Health Care. Save lives: Clean Your Hands. WHO. Geneva. Switzerland.1999. Available from [Accessed on 16.08.2015].
14. [Nair SS](#), [Hanumantappa R](#), [Hiremath GS](#), [Siraj MA](#), [Raghunath P](#); Knowledge, Attitude, and Practice of Hand Hygiene among Medical and Nursing Students at a Tertiary Health Care Centre in Raichur, India. *ISRN Preventive Medicine*, 2014; 2014: 608927.

15. Basurrah M, Madani T; Hand washing and gloving practice among health care workers in medical and surgical wards in a tertiary care centre in Riyadh, Saudi Arabia. *Scandinavian Journal of Infectious Diseases*, 2006; 38(8): 620–624.
16. Van de Mortel TF, Apostolopoulou EA, Petrikkos GL; A comparison of the hand hygiene knowledge, beliefs, and practices of Greek nursing and medical students. *American Journal of Infection Control*, 2010; 38(1): 75–77.
17. Ariyaratne MHJD, Gunasekara TDCP, Weerasekara MM, Kottahachchi J, Kudavidanage BP, Fernando SSN; Knowledge, attitudes and practices of hand hygiene among final year medical and nursing students at the University of Sri Jayewardenepura. *Sri Lankan Journal of Infectious Diseases*, 2013; 3(1): 15-25.
18. Mohesh G, Dandapani A; Knowledge, attitude and practice of hand hygiene among medical students - A questionnaire based survey. *Unique Journal of medical and dental sciences*, 2014; 2(2):127-131.
19. Kadi AA, Salati SA; Hand Hygiene Practices among Medical Students. *Interdiscip Perspect Infect Dis*, 2012; 2012: 679129.
20. Mann CM, Wood A; How much do medical students know about infection control? *Journal of Hospital Infection*, 2006; 64(4): 366–370.
21. Harsha Kumar HN, Dileep D; An epidemiological study on hand washing practices among Health Care Workers in Hospitals of Mangalore City. *Natl J Community Med*, 2013; 4(2): 261-266.
22. Abd ElAziz KM, bAKr IM; Assessment of knowledge, attitude and practice of hand washing among health care workers in Ain Shams University hospitals in Cairo. *J prev med hyg*, 2009; 50: 19-25.
23. Nawab T, Mehnaz S, Abedi AJ, Safwi SR, Khaliq N, Ansari MA *et al.*; KAP study of hand hygiene among medical and nursing students in a tertiary teaching hospital. *International Journal of Sciences & Applied Research*, 2015; 2(6): 29-39.