

Hand hygiene practice and determinant factors among Community Health Care Providers in Community Clinic: an observational study in Bangladesh

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Abstract

Background

Healthcare-associated infections caused by poor hand hygiene (HH) practices can affect both the care seekers and the health care providers (HCPs) while providing primary health care. No study has been conducted on the compliance of HH practices among the primary level HCPs in Bangladesh.

Objective

The study aimed to assess the compliance rates of HH and its determinant factors among Community Health Care Providers (CHCPs) in Community Clinics (CC).

Methods

A cross-sectional study was conducted from September 2019 to February 2020 among 150 randomly selected CHCPs with functional HH facilities in Patuakhali district, Bangladesh. Structured interviews and observation tools were used to collect data.

Results

Good HH compliance among CHCPs was found to be 16.7% (95% CI: 11.3–21.3). Out of all 1218 possible HH opportunities, only 255 (20.9%) resulted in any HH action. Presence of 70% alcohol-based hand sanitizer at the point of care (aOR: 6.4, 95% CI: 1.1–38.3), HH training (aOR: 4.6, 95% CI: 1.1–18.9), displayed visual cues (aOR: 4.4, 95% CI: 1.1–17.7), knowledge about HH (aOR: 3.8, 95% CI: 1.1–13.6, $p = 0.04$), and number of HH opportunities (aOR: 0.6, 95% CI: 0.4–0.8) were factors associated with HH compliance.

Discussion

Overall HH compliance among CHCPs was quite low. It was recommended to implement multimodal HH improvement strategies including a continuous training program, supply of alcohol-based hand rub, reminder, provision of five moments of HH in the training modules, and feedback on HH performance.

Introduction

Healthcare-associated infections (HCAIs) refer to *“an infection acquired by patients as a result of health procedures carried out and which can also affect the health of professionals during their practice”* (WHO, 2009). Every year, HAIs affect millions of patients globally and the prevalence of overall HAIs ranged from 8.5 to 15.5 per 100 patient. Furthermore, low and middle-income countries (LMICs) have a three times higher prevalence of HCAIs than developed countries (Allegranzi et al., 2011). The estimated prevalence of HAIs is 25 percent among patients and 27 percent among healthcare providers (HCPs) in Bangladesh (icddr, 2011).

The HCPs are the most common means of transmission of HCAIs in the health facility settings. Around 50 percent of HCAIs are caused by the hands of HCPs (Martín-Madrazo et al., 2009). Thus, hand hygiene (HH) is believed to be the best cost-efficient and empirical measure to prevent the spread of HCAIs from tertiary healthcare facilities to primary healthcare centers (Garner and Favero, 1986; Kelčíkova, Skodova and Straka, 2012). However, HCPs around the globe have low compliance with HH, and the average adherence to HH was 38.7 percent of the opportunities (WHO, 2009). In Bangladesh, HCPs in hospital settings are less likely to wash their hands after being exposed to the patient’s body fluids and touching a patient. In Bangladesh, HCPs and family caregivers comply with HH in only 9 percent and 3 percent of the opportunities respectively indicating poor compliance with HH practices among HCPs in Bangladesh (Hornig et al., 2016).

There is limited research that has been done on HH practices among HCPs, especially in LMICs (Meredith Makeham et al., 2008; WHO, 2012). However, the existing studies suggest that lack of HH knowledge, training on HH, and scarcity of evidence about the impact of HH on the spread of HCAIs rates were considered as potential factors influencing adherence to HH practices (Weeks, 1999; Engdaw, Gebrehiwot and Andualem, 2019). It was also evident that increasing the number of accessible handwashing point does not improve HH compliance among HCPs (Whitby and McLaws, 2004). One of the other reasons could be the variation of HH behavior among HCPs within the same unit or institution (Pittet, Mourouga and Perneger, 1999; Whitby and McLaws, 2004). Therefore, it is assumed that personal features might

play a significant role in regulating HH behavior. World Health Organization (WHO) considered this cognitive determinant of hand hygiene behavior as one of the unsolved issues for research to promote hand hygiene in health care settings and suggested that researchers, scientists, and clinical investigators should address it (WHO, 2009).

Community clinics (CCs) were initiated by the Ministry of Health and Family Welfare in Bangladesh (MoHFW) to bring primary healthcare to the community doorstep. Each CC is staffed with a Community Health Care Provider (CHCP) to deliver primary health cares including management of fever, diarrhea, measles, cuts, burns, bites, poisoning, asthma, skin infection, conditions with eye and teeth, vaccination, antenatal and post-natal care, child delivery, essential neonatal cares, etc. (MoHFW, 2016). HCAs can affect both the care seekers and the health of professionals during the procedure of this primary healthcare (WHO, 2012).

HH has been acknowledged as an important measure to prevent and control infectious diseases in primary healthcare settings (WHO, 2012). In Bangladesh, various studies have reported HH practices among HCPs in secondary and tertiary healthcare facilities (Horng et al., 2016; Ara et al., 2019), but no study to date has examined the compliance of HH practices among HCPs in primary healthcare facilities. Such a detailed understanding of HH practice and its behavioral drivers among CHCPs is important for developing WASH interventions in CCs to reduce the risk of HCAI. Therefore, the study aimed to assess the compliance rates of HH and its determinant factors among CHCPs in CCs.

Methods

Study design, period, and study area

A cross-sectional study was conducted from September 2019 to February 2020 among CHCPs in CCs in Patuakhali district which is located in the coastal region of Bangladesh. Inclusion criteria: All the CHCPs who had functional HH facility (having both soap and water or 70 percent alcohol-based hand sanitizer) in their CCs were included in this study. Exclusion criteria: We excluded CHCPs who were not available in their CCs and did not give consent for observation at the time of data collection.

Sampling

According to the MoHFW facility registry database (MoHFW, no date), Patuakhali district has a total of 215 numbers of CCs. The sample size was calculated using the EPI INFO stat calc tool by single population proportion formula assuming the population size 215, 50 percent proportion value (since there is no previous study), and 5 percent marginal error, a standard Z score of 1.96 corresponding to 95 percent confidence interval (CI), and 5 percent of nonresponse rate. However, 150 CHCPs participated in this study. The required sample size was calculated as 146, however, 150 CHCPs participated in this study.

Data collection tools

We conducted 2 to 3 hours long observation sessions about CHCP's HH compliance. Participants were informed that the major objective was to observe their daily practices and routines healthcare-related activities in CC settings. Events of HH opportunities and whether or not CHCPs washed their hands with soap at those opportunities were recorded in an observational checklist. Events of HH opportunities included World Health Organization (WHO) recommended "my five moments for hand hygiene": before touching a patient (moment-1), before a clean/aseptic procedure (moment-2), after body fluid exposure risk (moment-3), after touching a patient (moment-4), and after touching a patients' surroundings (moment-5) (WHO, 2009). We also observed the location of handwashing facilities and visual HH cues (signs and posters on HH) and the presence of 70% alcohol-based hand sanitizer at the point of care (the place where the patient, the HCPs, and care come together).

After each observation session, we interviewed the same participant using a Bengali version of a structured questionnaire adapted from different literature (Abdella *et al.*, 2014; Engdaw, Gebrehiwot and Andualem, 2019). Questions relating to socio-demographics, HH knowledge, HH training, attitude, and experience were included in the questionnaire.

Informed consent was obtained from the participants before the data collection. Two days of training was given to the data collectors on the data collection methods, tools, ethics, and how to interact with respondents. The data collectors were graduate students in environmental sanitation.

Operational definitions

Good HH compliance: CHCPs who scored equal or above the 50 percent of the observational checklists (Abdella *et al.*, 2014).

Poor hand hygiene compliance: CHCPs who scored less than 50 percent of the observational checklists (Abdella *et al.*, 2014).

Good HH knowledge: CHCPs who scored equal or above the 50 percent of the knowledge questions regarding WHO recommended six steps and five moments of HH (WHO, 2009).

Poor HH knowledge: CHCPs who scored less than 50 percent of the knowledge questions regarding WHO recommended six steps and five moments of HH (WHO, 2009).

Data analysis

The obtained data were rechecked for completeness and consistency. Data were analyzed in IBM SPSS Windows version 24. Descriptive statistics were carried out for the socio-demographic characteristics of the respondents. Bivariate and multivariate logistic regressions were performed by computing Crude Odds Ratio (OR), and adjusted Odds Ratio (aOR) with 95% confidence interval (CI) to evaluate significantly associated variables with HH compliance by backward logistic regression variable selection method. *P*-value of 0.05, 0.01, and 0.001 were considered statistically significant.

Results

Socio-demographic characteristics of study participants

Of the 150 participants, 93 (62.0%) were male and 57 (38%) were female. Majority (42.7%) of the study participants were aged between 30 to 34 years. About 83.3 percent of the participants were married. Participants' mean year (\pm SD) of experience as a HCP was 8.3 ± 1.3 (Table 1).

Compliance of hand hygiene among community health care providers

In this study, good compliance with HH of the CHCPs from observation was 16.7%, (95% confidence interval [CI]: 11.3-21.3). A total of 1218 number of HH opportunities appeared, while only 255 (20.9%) resulted in any HH action. Among all the moments that turned into HH practice, compliance rates were found higher at moment-3: after body fluid exposure risk (45.9%) and moment-4: after touching a patient (26.7%) (Figure 1).

Of the participants, 57 (38%) CHCPs were trained on HH, and around half 79 (52.7%) of the respondents were knowledgeable about HH steps and moments. Although a positive attitude towards the HH was found in only 36%, (95% CI: 29.2-42.9) of the participants. The presence of 70% alcohol-based hand sanitizer at the point of care was observed in around one-third of facilities. About 60 (40%) CCs were observed having handwashing location from the point of care (Table 2).

Factors associated with hand hygiene compliance

Multivariate logistic regression analysis showed that the number of HH opportunities was inversely correlated with HH compliance (adjusted odds ratio [aOR]: 0.6, 95% CI: 0.4-0.8, $p=0.001$). Besides, presence of 70% alcohol-based hand sanitizer at the point of care (aOR: 6.4, 95% CI: 1.1-38.3, $p=0.04$), training on HH (aOR: 4.6, 95% CI: 1.1-18.9, $p=0.03$), displayed visual cues (aOR: 4.4, 95% CI: 1.1-17.7, $p=0.03$), knowledge about HH (aOR: 3.8, 95% CI: 1.1-13.6, $p=0.04$) were factors associated with HH compliance (Table 3).

Discussion

The present study demonstrates an alarming picture of compliance to HH among primary level HCPs in Bangladesh. The overall prevalence of good compliance with HH among CHCPs was only 16.7 percent. The finding of the present study was in accordance with findings of a study carried out in primary health care settings in Ethiopia which showed that the overall HH compliance was 14.9 percent (Engdaw, Gebrehiwot and Andualem, 2019). However, this finding was lower than studies conducted in Nigeria; 31 percent (Onyedibe *et al.*, 2020), Kuwait; 33.4 percent (Al-Wazzan *et al.*, 2011), India; 43.4 percent (Harbarth *et al.*, 2001), and higher than a study conducted in Ghana; 12 percent (Owusu-Ofori *et al.*, 2010). The variance could be because of different research sites, type of HCPs, methodology, sample size, availability of HH resources, and awareness about HH.

In this study, only 20.9 percent of all possible HH opportunities resulted in any HH action. This result is slightly above the National Hygiene Baseline Survey 2014, showing that only 9 percent of the total HH opportunities turned into HH performance among HCPs in Bangladesh (Hornig *et al.*, 2016). Contributing factors to such a poor rate of HH performance among HCPs in Bangladesh might be the inadequate refresher training on HH, minor budget for maintenance of HH infrastructures, and lack of HH supplies (Hornig *et al.*, 2016; WHO, 2018).

The number of HH moment was inversely correlated with HH compliance. The present study found that HH compliance decreased by 40 percent among the CHCPs with an increase of 1 HH moment. This finding coherent with research conducted by Hugonnet *et al.* (Hugonnet, Perneger and Pittet, 2002) showed that a higher number of HH moments contribute to less compliance with HH among HCPs. Workload, mobility, and comfort influence the HCPs' choice of HH agent and compliance (WHO, 2009). The present study also found that HCPs who had 70% alcohol-based hand sanitizer were 6.4 times more likely to comply with HH practice than those who did not have 70% alcohol-based hand sanitizer. This result is concordant with other studies carried out in Bangladesh (Hornig *et al.*, 2016), Mali (Allegranzi *et al.*, 2010), Taiwan (Chen *et al.*, 2011), and Brazil (Santana *et al.*, 2007). Workload and inaccessible handwashing resources at the point of care might be one of the reasons for non-compliance to HH. Thus alcohol-based hand sanitizer might make the HH practice more convenient and comfortable for the HCPs. Increasing the supply of alcohol-based hand sanitizer may lead to more compliance with HH, although HH compliance does not necessarily improve by building accessible handwashing infrastructures (Whitby and McLaws, 2004). Therefore, the application of alcohol-based hand sanitizer is a reasonable alternative to resolve the non-compliance to HH, especially in healthcare facilities in LMICs overcrowded with patient and having limited HH resources.

The study identified that HH compliance was 4.6 times more among trained HCPs on HH than those who were not trained. This is consistent with what has been found in previous studies conducted in Bangladesh (Ara *et al.*, 2019), Taiwan (Huang and Wu, 2008), Brazil (Santana *et al.*, 2007), and India (Suchitra JB, 2007) reported that training on HH increases HH compliance among HCPs. Research conducted in a teaching hospital in Ethiopia found a significant association with HH compliance at the baseline and follow-up period after training. This could be due to the fact that HH training has a beneficial influence on the development of awareness, attitudes, and practices of HH compliance among HCPs. Therefore this is indicating the importance of a continuous HH training program for the CHCPs to reduce the HCAs in CCs.

The present study also found a positive association between good compliance and HH knowledge. Those with good HH knowledge had 3.8 times more compliance with HH than those with poor HH Knowledge. This result ties well with previous studies in Kuwait (Al-Wazzan *et al.*, 2011) and Ethiopia (Engdaw, Gebrehiwot and Andualem, 2019) reported the significant relationship between HH knowledge and good compliance to HH. The possible explanation might be knowledge on HH make HCPs more aware of the merits and demerits of HH compliance, mode of HCAs transmission and its' prevention, and help HCPs to comply with recommended HH practices.

The odds of having good compliance with HH were 4.4 times higher among CHCPs who had visual HH cues compared to those who did not have visual HH cues displayed at their CCs. This is in line with researches conducted in the Netherlands (Arntz *et al.*, 2016) and United States (Wiles, Roberts and Schmidt, 2015) reported that the presence of HH cues increases compliance with HH. The HH visual cues act as a reminder and instruct the HCPs to maintain HH in healthcare settings, thus it triggers the compliance to HH (Nevo *et al.*, 2010).

Our study has some definite limitations. Firstly, the causality association between the explanatory and outcome variable could not be defined due to the cross-sectional design. Secondly, we didn't measure the duration of HH. Thirdly, the presence of observers may affect the participants' performance, which might be also the case in the current study.

Conclusion

Overall HH compliance among CHCPs in CCs in Patuakhali, Bangladesh was quite low. Besides, the presence of 70% alcohol-based hand sanitizer at the point of care, training on HH, displayed visual cues, knowledge about HH, and the number of HH opportunities were factors associated with compliance to HH among CHCPs. Based on the findings of this study, it was recommended to implement multimodal HH improvement strategies including a continuous training program, supply of alcohol-based hand rub, reminder, provision of five moments of HH in the training modules, and feedback on HH performance.

Declarations

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Conflict of Interest:

The authors declare that they have no conflict of interest.

Ethics

Informed consent was obtained from all participants. This study was performed as per the ethical standards outlined in the 1964 Declaration of Helsinki and its later amendments. Research Ethical Committee (REC) of the Department of Environmental Sanitation, Patuakhali Science and Technology University, Bangladesh (approval no.:16/11/2019:05) reviewed the protocol and approved this study.

Word count

Total words=3513 (including abstract, main manuscript, tables, and figures, and excluding reference)

References

- Abdella, N. M. *et al.* (2014) ‘Hand hygiene compliance and associated factors among health care providers in Gondar University Hospital, Gondar, North West Ethiopia’, *BMC Public Health*. BioMed Central, 14(1), p. 96. doi: 10.1186/1471-2458-14-96.
- Al-Wazzan, B. *et al.* (2011) ‘Hand hygiene practices among nursing staff in public secondary care Hospitals in Kuwait: Self-report and direct observation’, *Medical Principles and Practice*. Med Princ Pract, 20(4), pp. 326–331. doi: 10.1159/000324545.
- Allegranzi, B. *et al.* (2010) ‘Successful Implementation of the World Health Organization Hand Hygiene Improvement Strategy in a Referral Hospital in Mali, Africa’, *Infection Control & Hospital Epidemiology*. Cambridge University Press, 31(2), pp. 133–141. doi: 10.1086/649796.
- Allegranzi, B. *et al.* (2011) ‘Burden of endemic health-care-associated infection in developing countries: systematic review and meta-analysis’, *The Lancet*. Elsevier, 377(9761), pp. 228–241. doi: 10.1016/S0140-6736(10)61458-4.
- Ara, L. *et al.* (2019) ‘Transferring knowledge into practice: a multi-modal, multi-centre intervention for enhancing nurses’ infection control competency in Bangladesh’, *Journal of Hospital Infection*. Elsevier Ltd, 102(2), pp. 234–240. doi: 10.1016/j.jhin.2018.07.042.
- Arntz, P. R. H. *et al.* (2016) ‘Effectiveness of a multimodal hand hygiene improvement strategy in the emergency department’, *American Journal of Infection Control*. Mosby Inc., 44(11), pp. 1203–1207. doi: 10.1016/j.ajic.2016.03.017.
- Chen, Y. C. *et al.* (2011) ‘Effectiveness and limitations of hand hygiene promotion on decreasing Healthcare-Associated infections’, *PLoS ONE*. PLoS One, 6(11). doi: 10.1371/journal.pone.0027163.
- Engdaw, G. T., Gebrehiwot, M. and Andualem, Z. (2019) ‘Hand hygiene compliance and associated factors among health care providers in Central Gondar zone public primary hospitals, Northwest Ethiopia’, *Antimicrobial Resistance and Infection Control*. BioMed Central Ltd., 8(1), p. 190. doi: 10.1186/s13756-019-0634-z.
- Garner, J. S. and Favero, M. S. (1986) ‘CDC Guideline for Handwashing and Hospital Environmental Control, 1985.’, *Infection control: IC*, 7(4), pp. 231–243. Available at: <http://www.ncbi.nlm.nih.gov/pubmed/3009347> (Accessed: 9 July 2019).
- Harbarth, S. *et al.* (2001) ‘Compliance with hand hygiene practice in pediatric intensive care’, *Pediatric Critical Care Medicine*. Pediatr Crit Care Med, 2(4), pp. 311–314. doi: 10.1097/00130478-200110000-00004.
- Hornig, L. M. *et al.* (2016) ‘Healthcare worker and family caregiver hand hygiene in Bangladeshi healthcare facilities: results from the Bangladesh National Hygiene Baseline Survey.’, *The Journal of hospital infection*. NIH Public Access, 94(3), pp. 286–294. doi: 10.1016/j.jhin.2016.08.016.
- Huang, T. T. and Wu, S. C. (2008) ‘Evaluation of a training programme on knowledge and compliance of nurse assistants’ hand hygiene in nursing homes’, *Journal of Hospital Infection*. W.B. Saunders, 68(2), pp. 164–170. doi: 10.1016/j.jhin.2007.11.020.
- Hugonnet, S., Perneger, T. V. and Pittet, D. (2002) ‘Alcohol-based handrub improves compliance with hand hygiene in intensive care units’, *Archives of Internal Medicine*. American Medical Association, 162(9), pp. 1037–1043. doi: 10.1001/archinte.162.9.1037.

- icddr, b (2011) *Hospital-acquired infections in Bangladesh*. Available at: <https://www.icddr.org/news-and-events/news?id=351&task=view> (Accessed: 19 October 2020).
- Kelčíková, S., Skodova, Z. and Straka, S. (2012) 'Effectiveness of Hand Hygiene Education in a Basic Nursing School Curricula', *Public Health Nursing*, 29(2), pp. 152–159. doi: 10.1111/j.1525-1446.2011.00985.x.
- Martín-Madrazo, C. *et al.* (2009) 'Effectiveness of a training programme to improve hand hygiene compliance in primary healthcare', *BMC Public Health*. BioMed Central, 9(1), p. 469. doi: 10.1186/1471-2458-9-469.
- Meredith Makeham, A. *et al.* (2008) *Methods and Measures used in Primary Care Patient Safety Research; Results of a literature review*. Geneva, Switzerland. Available at: https://www.who.int/patientsafety/research/methods_measures/makeham_dovey_full.pdf (Accessed: 13 July 2019).
- MoHFW (2016) *BANGLADESH ESSENTIAL HEALTH SERVICE PACKAGE (ESP)*. Bangladesh. Available at: http://www.mohfw.gov.bd/index.php?option=com_docman&task=doc_download&gid=9484&lang=en.
- MoHFW (no date) *Facility Registry*. Available at: <http://facilityregistry.dghs.gov.bd/search.php> (Accessed: 13 July 2019).
- Nevo, I. *et al.* (2010) 'The Efficacy of Visual Cues to Improve Hand Hygiene Compliance', *Simulation in Healthcare: The Journal of the Society for Simulation in Healthcare*, 5(6), pp. 325–331. doi: 10.1097/SIH.0b013e3181f69482.
- Onyedibe, K. I. *et al.* (2020) 'Assessment of hand hygiene facilities and staff compliance in a large tertiary health care facility in northern Nigeria: A cross sectional study', *Antimicrobial Resistance and Infection Control*. BioMed Central Ltd., 9(1). doi: 10.1186/s13756-020-0693-1.
- Owusu-Ofori, A. *et al.* (2010) 'Assessing Hand Hygiene Resources and Practices at a Large African Teaching Hospital', *Infection Control & Hospital Epidemiology*. Cambridge University Press (CUP), 31(8), pp. 802–808. doi: 10.1086/654005.
- Pittet, D., Mourouga, P. and Perneger, T. V (1999) 'Compliance with Handwashing in a Teaching Hospital', *Annals of Internal Medicine*, 130(2), pp. 126–130. doi: 10.7326/0003-4819-130-2-199901190-00006.
- Santana, S. L. *et al.* (2007) 'Assessment of Healthcare Professionals' Adherence to Hand Hygiene After Alcohol-Based Hand Rub Introduction at an Intensive Care Unit in São Paulo, Brazil', *Infection Control & Hospital Epidemiology*. Cambridge University Press (CUP), 28(3), pp. 365–367. doi: 10.1086/510791.
- Suchitra JB, L. D. N. (2007) 'Impact of education on knowledge, attitudes and practices among various categories of health care workers on nosocomial infections.', *Indian J Med Microbiology*, pp. 181–187. doi: <https://doi.org/10.4103/0255-0857.34757>.
- Weeks, A. (1999) 'Hand washing. Why I don't wash my hands between each patient contact.', *BMJ (Clinical research ed.)*, 319(7208), p. 518. Available at: <http://www.ncbi.nlm.nih.gov/pubmed/10454415> (Accessed: 9 July 2019).
- Whitby, M. and McLaws, M.-L. (2004) 'Handwashing in healthcare workers: accessibility of sink location does not improve compliance', *Journal of Hospital Infection*. W.B. Saunders, 58(4), pp. 247–253. doi: 10.1016/J.JHIN.2004.07.024.
- WHO (2009) *WHO Guidelines on Hand Hygiene in Health Care*. Geneva, Switzerland. Available at: https://apps.who.int/iris/bitstream/handle/10665/44102/9789241597906_eng.pdf?sequence=1 (Accessed: 9 July 2019).
- WHO (2012) 'Hand Hygiene in Outpatient and Home-based Care and Long-term Care Facilities'. Available at: https://apps.who.int/iris/bitstream/handle/10665/78060/9789241503372_eng.pdf;jsessionid=5D613FEAFBEDE096CABC7FB7C00A4510?sequence=1 (Accessed: 5 October 2019).
- WHO (2018) 'Independent Evaluation of Community Based Health Services in Bangladesh'. Available at: https://www.who.int/docs/default-source/searo/bangladesh/pdf-reports/cbhs-report-2019.pdf?sfvrsn=fdecaade_2.
- Wiles, L. L., Roberts, C. and Schmidt, K. (2015) 'Keep It Clean: A Visual Approach to Reinforce Hand Hygiene Compliance in the Emergency Department', *Journal of Emergency Nursing*. Mosby Inc., 41(2), pp. 119–124. doi: 10.1016/j.jen.2014.11.012.

Figures

Figure 1: Moment when CHCPs were observed to comply with hand hygiene in Community Clinics in Patuakhali, Bangladesh

(n=150)

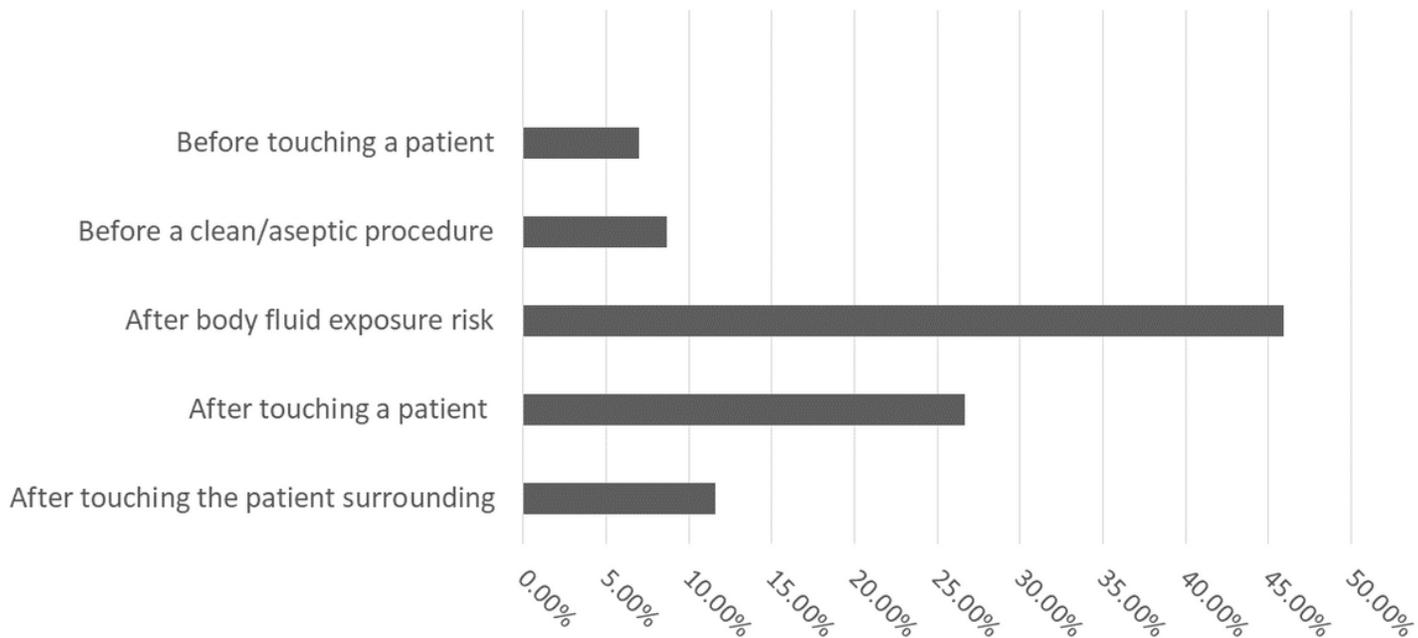


Figure 1

Moment when CHCPs were observed to comply with hand hygiene in Community Clinics in Patuakhali, Bangladesh (n=150)