International Journal of Science and Research (IJSR)
ISSN (Online): 2319-7064
Index Copernicus Value (2016): 79.57 | Impact Factor (2017): 7.296

Hand Hygiene Practices among Health Care Workers in a Tertiary Care Hospital: A Prospective Descriptive Study

Rejani R[1], Dr Raj Ratan[2*]

[1]Clinical Instructor, College of Nursing, INHS Asvini, Mumbai, Maharashtra, India

[2*]Corresponding Author, Graded Specialist (Gen Surgery), Command Hospital, Pune & Asst professor, Dept of Surgery, AFMC, Pune, Maharashtra, India

Abstract: ***Prospective Descriptive study conducted in a tertiary care hospital in Pune, India; Methods: Aim- to evaluate how well the health care workers follow the recommended guidelines of hand hygiene practices. Objective- (i) to assess the hand hygiene practices among health care workers (ii) to assess the reason for non-compliance in hand hygiene practices. Inclusion Criteria- Health care workers involved in direct patient care activities in tertiary care hospital. They included the Doctors, Nurses & paramedical nursing staff. Exclusion Criteria- Health care workers who were unwilling for the study. A validated tool and an observational scale are used as the tool for this study. Results: most of the study population belonged to 20-29 years (36.67%) and comprised maximally of Nurses~ 57% (16); 50% of subjects used soap and water alone for hand hygiene up to 11-40% times. One person did not use soap and water for hand hygiene. 53.33% (16) used alcohol based hand rub up to 41-70% of time and 16.67% (5) subjects used alcohol based hand rub up for 71-100% of time; all subjects performed hand hygiene after contact with body fluids; Hand hygiene compliance was more than 75% in four out of five situations. The least compliance rate was observed with "after touching patient's surroundings" i.e 60.76%; Nurses showed more compliance than other health care workers (90.82%). Conclusion: Health care workers are the most common vehicle for the transmission of HAIs (Hospital Acquired Infections) from patient to patient and within the health care environment. A large proportion of the infection acquired attributed to cross contamination and transmission of microbes from hands of HCWs(Health Care Workers) to patients. Hand hygiene is the most simple and effective method for the prevention of these hospital & community acquired infections.***

Keywords: hand hygiene, HCWs (Health Care Workers)

1. Introduction

Hospital Aquired Infection (HAI), commonly known as nosocomial infection is a significant cause of morbidity and mortality in hospitalized patients[1]. The World Health Organization (WHO) estimates that at any time, over 1.4 million people worldwide suffer from infections acquired in health-care settings[2]. In industrialized countries, the risk of acquiring HCAI is 5% - 10% among patients admitted to acute care hospitals. In developing countries, the risk is 2-20 times higher, and the proportion of patients infected may exceed 25%[3-7].

It has been widely seen that most nosocomial infections are transmitted by the hands of health care workers. It has long been known that hand hygiene among health care workers plays a central role in preventing the transmission of infectious agents. Hand washing is the most effective way of preventing the spread of infectious diseases. Despite these facts, it is unfortunate that the Centers for Disease Control and Prevention hand hygiene guidelines are yet to achieve adequate implementation in hospitals leading to a low compliance among health care workers. The reasons of lack of compliance to hand washing include: lack of appropriate equipment, low staff to patient ratios, allergies to hand washing products, insufficient knowledge among staff about risks and procedures, the time required and casual attitudes among HCWs (Health Care Workers) towards bio-safety[8].

Hand hygiene is a core element of patient safety for the prevention of Health Care Associated Infection (HCAIs) and spread of anti microbial resistance. Its promotion represents a challenge that requires a multimodal strategy. Hand hygiene prevents cross infection in hospitals, but Health Care Workers (HCWs) adherence to hand hygiene guidelines is poor. Easy, timely access to both hand hygiene and skin protection is necessary for satisfactory hand hygiene behavior. Alcohol based hand rub may be better than traditional hand washing as they require less time, acts faster, are less irritating, and contribute to sustained improvement in compliance associated with decreased infection rates[9].

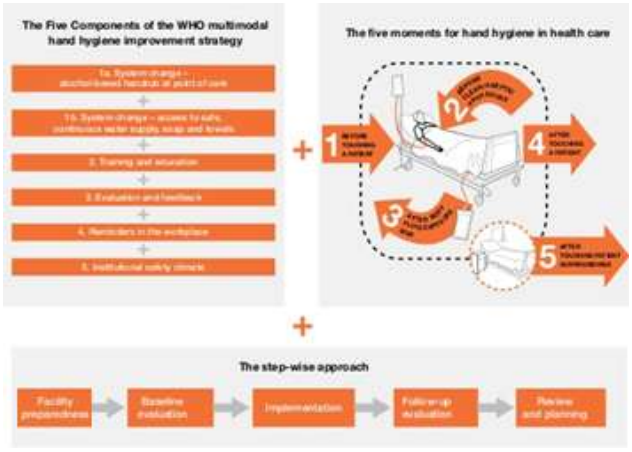
Hand hygiene is the most simple, most effective measure for preventing HAIs. Despite advances in infection control and hospital epidemiological data analysis, Semmelweis' hand washing message is not evidently visible in the clinical practice and HCWs adherence to recommended hand hygiene practice is unacceptably low. Average compliance with hand hygiene recommendations varies between hospital wards, among professional categories of HCWs, and according to working conditions, as well as according to the definitions used in different studies[10]. Compliance with hand hygiene recommendations is the most important measure in preventing health care-associated infections. Transmission of microorganisms from the hands of healthcare workers is the main source of cross-infection in hospitals and can be prevented by hand washing[11].

The use of alcohol-based hand rub solutions (ABHRSs) in health care settings has been associated with increased hand hygiene compliance and reduced rates of nosocomial infection[12]. It has been analyzed at various levels that the adherence to hand hygiene recommendations in the intensive

care unit (ICU) is variable and moderate, at best[13]. It's against this background that the WHO World Alliance for Patient Safety was launched in October 2005 to tackle the problem of HCAIs worldwide. Given the critical nature of this problem, the project was launched as the First Global Patient Safety Challenge "Clean Care is Safer Care"[2, 14]. It aims at reducing HCAI (Health-care Associated Infection) worldwide and the cornerstone of the entire initiative focuses on the promotion of hand hygiene in Health Care. In May 2009, WHO issued a new global guideline on hand hygiene in health care, "WHO Guideline on Hand Hygiene in Health Care".

Failure to perform appropriate hand hygiene is considered to be the leading cause of HCAI and the spread of multi-resistant organisms, and has been recognized as a significant contributor to outbreaks. There is convincing evidence that improved hand hygiene through multimodal implementation strategies can reduce HCAI rates[15]. A sustained decrease of the incidence of multidrug-resistant bacteria isolates and patient colonization has been detected following the implementation of hand hygiene practices[16-18]. Thus, Hand hygiene is the single most effective measure for preventing infections related to health care and needs to be adequately practiced.

The WHO Multimodal Hand Hygiene Improvement Strategy and a wide range of tools were developed in parallel to the Guidelines to translate recommendations into practice at the bedside. The WHO Multimodal Hand Hygiene Improvement Strategy, the "My five moments for hand hygiene" and the five-step approaches are as depicted below:-



The tertiary care hospital wherein the study has been instituted is a multispecialty referral hospital with major specialties like Nephrology, Neurology, Urology, General Surgery, GI Surgery, Vascular Surgery, Reconstructive Surgery, Pediatric Surgery and Neuro surgery. There are 2 ICUs in which various critically ill patients are managed for a plethora of medical & surgical conditions. This study aims to evaluate how well the health care workers follow the recommended guidelines of hand hygiene practices.

2. Materials & Methods

a) **Research Approach**
Prospective Descriptive study

b) **Aim of the study**
To evaluate how well the health care workers follow the recommended guidelines of hand hygiene practices.

c) **Objective of the study**:
- To assess the hand hygiene practices among health care workers
- To assess the reason for non-compliance in hand hygiene practices.

d) **Setting of the study**
The study was conducted in a tertiary care hospital in Pune, India. It is 1050 bedded multispecialty referral hospital.

e) **Sample and Sampling technique**
The sample was selected from the health care workers (HCWs) in tertiary care hospital. The purposive sampling technique was used to collect the samples. The sample was selected from the health care workers in the selected hospital. The data was collected by using questionnaire and observational tool. The questionnaire consisted of demographic data & perceived hand hygiene compliance. The study was conducted on 30 HCWs during the first week of April 2017.

f) **Inclusion Criteria**
Health care workers involved in direct patient care activities in tertiary care hospital. They included the Doctors, Nurses & paramedical nursing staff.

g) **Exclusion Criteria**
Health care workers who were unwilling for the study.

h) **Development of tool**
A validated tool and an observational scale are used as the tool for this study.

i) **Description of the tool**
- Part I: This part contained general details such as demographic data which include age, sex, profession and total years of health care experience.
- Part II: An observation tool was used to assess the hand hygiene practices of HCWs.
- Part III: A questionnaire was distributed to HCWs in order to assess the opinion about hand hygiene practices.

j) **Data collection procedure**
No formal permission has been obtained from the requisite/concerned authorities for collection of data. The data was collected from health care workers in tertiary care hospital; the period of data collection was the first two weeks of April 2017. The assessment of staff was done while they were in their respective work places.

The study was completed in two weeks period. In this study a questionnaire and an observation tool have been used. The period of observation of hand hygiene compliance was conducted over a period of two weeks. The observation on activities around individual patient was carried out in random 10 (ten) minutes period interval during day time,

which is the busiest period in the hospital premises. The target patients were selected randomly, at the start of each observation period and were observed continuously for the entire 10- minute period. All Health care personnel who contacted the target patient during this period, including Medical Officers, Nursing Officers and Nursing Assistants were observed unobtrusively. In observation the hand hygiene situations were given to the samples according to their professional duties. There is only one observer in the study. The tools selected for the study were chosen because they were simple, clear and described each observation episode in detail.

On completion of observation period of two weeks, a self-reported questionnaire was circulated to the Doctors, Nurses & paramedical nursing staff who were directly involved in-patient care. The questionnaire was aimed at evaluating the awareness and self-perception of health care workers hand hygiene compliance and assessed the perceived barriers to use appropriate hand hygiene measures. The questionnaires were handed directly to the personnel targeted and were immediately collected once completed. This was to ensure that other personnel did not influence health care personnel. Through the questionnaire, the researcher aimed to assess the reported hand hygiene practices among HCWs.

3. Results & Analysis

The data in the study was arranged and analyzed under the following sections:-

(a) Distribution of subjects according to demographic data.
(b) Distribution of subjects according to hand hygiene compliance.
(c) Distribution of subjects according to observation of hand hygiene practices.

Distribution of subjects according to demographic data

Table 1: Distribution according to Age

Age Group	Frequency	Percentage
<20 years	4	13
20-29 years	11	37
30-39 years	10	33
>40 years	5	17
Total	30	100%

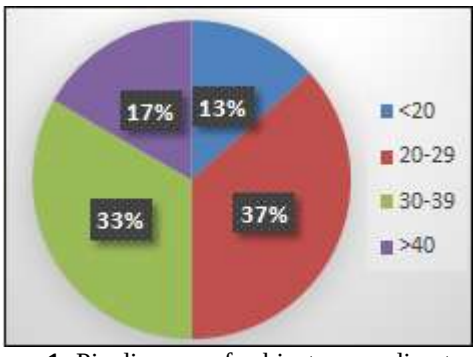


Figure 1: Pie diagram of subjects according to age

The data given in table 1. shows distribution of subjectss according to age ranging from ***<20years to >40years.*** The diagram as depicted in Fig 1. shows that most of the subjects belongs to ***20-29 years (36.67%).***

Table 2: Distribution According to Sex

Sex	Frequency	Percentage
Male	13	43%
Female	17	57%
Total	30	100%

The data given on fig 2 shows the distribution of subjects according to sex. The diagram shows that about ***57% (19)*** of subjects are ***female***.

Table 3: Distribution According to Profession

Profession	Frequency	Percentage
Doctors	7	23%
Nurses	17	57%
Paramedical nursing staff	6	20%
Total	30	100%

The data given in table 3 shows the distribution of subjects according to the profession. Most of the subjectss comprised of ***Nurses~ 57% (16).***

Table 4: Distribution According to Total Experience

Total Experience (Years)	Frequency	Percentage
<1	5	16
1-5	12	40
6-10	8	27
>10	5	17
Total	30	100

The data given in table 4 shows the distribution of data according to professional experience wherein about ***40%*** of subjects have ***1-5years*** of professional experience.

Distribution of subjects according to hand hygiene compliance

Table 5: Distribution of subjects according to the reported use of soap and Water

Reported use of Soap and water	Frequency	Percentage
Never	1	3.33%
1-10%	3	10%
11-40%	15	50%
41-70%	9	30%
71-100%	2	6.67%
Total	30	100%

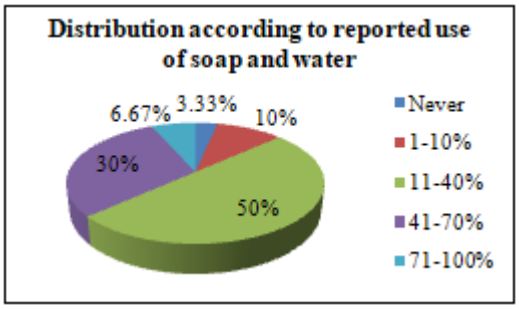


Figure 2: Pie diagram of subjects according to the reported use of soap and water

The data given in table 5 shows the distribution of subjects according to the reported use of soap and water. Approximately ***50%*** of subjects used soap and water alone for hand hygiene up to ***11-40% times***. ***One person*** did not use soap and water for hand hygiene.

Table 6: Distribution of subjects according to the use of Alcohol based hand rub

Reported Alcohol Based Hand Rub (ABHR)	Frequency	Percentage
Never	0	0%
1-10%	1	3.33%
11-40%	8	26.67%
41-70%	16	53.33%
71-100%	5	16.67%
Total	30	100%

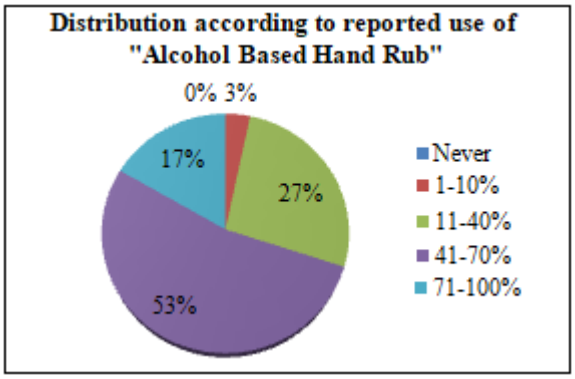


Figure 3: Pie diagram of subjects according to the use of Alcohol based hand rub

Fig 3 shows the distribution of subjects according to the use of alcohol based hand rub. ***53.33% (16)*** use alcohol based hand rub up to ***41-70%*** of time and ***16.67% (5)*** subjects use alcohol based hand rub up for ***71-100%*** of time.

Table 7: Distribution according to the use of both Soap & water and alcohol based hand rub

Reported use of Both Soap & water and Alcohol Based Hand Rub (ABHR)	Frequency	Percentage
Never	14	46.67%
1-10%	7	23.33%
11-40%	6	20%
41-70%	2	6.67%
71-100%	1	3.33%
Total	30	100%

46.67% of the subjects reported that they never used both soap and water and alcohol based hand rub together. Only ***10%*** reported that they used both for ***more than 40%*** of the time.

Table 8: Distribution according to reasons for lack of hand hygiene

Reasons	Frequency	Percentage
Too busy	18	60%
Forget	5	16.67%
Unsure of need	1	3.33%
Out of products	4	13.33%
Products at inconvenient locations	2	6.67%
Total	30	100%

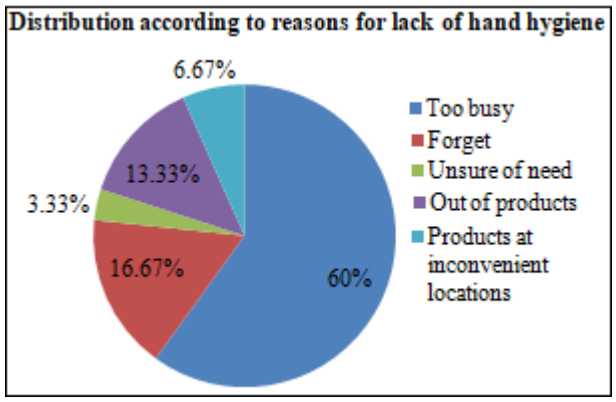


Figure 4: Pie diagram of the subjects according to reasons for lack of hand hygiene

The data given in table 8 shows the distribution of subjects according to the reasons for lack of hand hygiene. The pie diagram shows about ***60%*** of lack of hand hygiene is because of ***too busy*** and ***6.67%*** is due to ***product at inconvenient location***

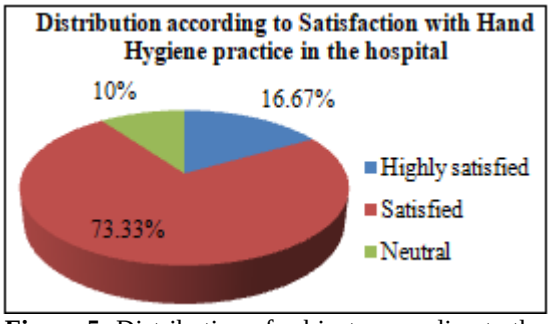


Figure 5: Distribution of subjects according to the Satisfaction with Hand Hygiene practice in the hospital

The data given in Fig 5 shows that ***90%*** subjects were ***satisfied*** with the present hand hygiene practices in the hospital.

Table 9: Distribution of subjects according to the opinion about the relationship between good hand hygiene practices and hospital acquired infection

Opinion	Frequency	Percentage
Very weak	0	0%
Weak	0	0%
Neither weak or strong	1	3.33%
Strong	10	33.33%
Very strong	19	63.33%
Total	30	100%

Table 9 shows about the opinion of the HCWs; majority ***(96.67%)*** opined that there is relationship between good hand hygiene practices and hospital acquired infection

Table 10: Reported hand hygiene compliance among different health care workers

Health Care Worker	No of Hand Hygiene Situations	Reported Hand Hygiene	Percentage Compliance
Doctors	30	19	63.33%
Nurses	80	76	95%
Paramedical nursing staff	40	33	82.5%
Total	150	128	85.33%

Majority of HCWs identified and reported that situations / patient care activities that require hand hygiene.

Distribution of subjects according to observation of hand hygiene practices

Table 11: Observed Hand hygiene compliance specific to each opportunity (Overall)

Situations	No of Opportunities observed	Hand Hygiene performed	
		Number	**%**
Before patient contact	66	57	86.36
Before clean and aseptic procedures	22	17	77.27
After patient contact	66	63	95.45
After contact with body fluids	27	27	100
After touching patient's surroundings	79	48	60.76

The table 11 shows over all observed hand hygiene compliance, ***all subjects performed hand hygiene after contact with body fluids***. Hand hygiene compliance was ***more than 75%*** in four out of five situations. The least compliance rate was observed with "after touching patient's surroundings" i.e ***60.76%.***

Table 12: Observed Hand hygiene compliance among different health care workers

HCW	No of Opportunities observed	Hand Hygiene performed	Overall compliance
Doctors	63	47	74.60%
Nurses	98	89	90.82%
Paramedical nursing staff	74	62	83.78%

Table 12 shows the observed compliance among different health care workers; ***Nurses*** showed more compliance than other health care workers **(90.82%)**. The ***doctors*** showed an overall compliance rate of **74.6%**.

4. Discussion

Hand hygiene, a relatively simple cost effective measure has been instituted in several hospital facilities across the globe to prevent HCAI. Studies have shown that contaminated hands are vehicles for spread of micro-organisms. In Intensive Care Units, the burden of HAIs is greatly increased, causing additional morbidity and mortality. Multidrug – Resistant pathogens are commonly involved in such infections and render effective treatment challenge. Health care workers are the most common vehicle for the transmission of HAIs from patient to patient and within the health care environment[8].

The risk of acquiring HCAI depends on factors related to the infectious agent (e.g. virulence, capacity to survive in the environment, antimicrobial resistance), the host (e.g. advanced age, low birth weight, underlying diseases, state of debilitation, immunosuppression, malnutrition) and the environment (e.g. ICU admission, prolonged hospitalization, invasive devices and procedures, antimicrobial therapy). Although the risk of acquiring HCAI is universal and pervades every health-care facility and system around the world, the global burden is unknown because of the difficulty of gathering reliable diagnostic data. This is mainly due to the complexity and lack of uniformity of criteria used in diagnosing HCAI and to the fact that surveillance systems for HCAI are virtually nonexistent in most countries. Therefore, HCAI remains a hidden, cross-cutting concern that no institution or country can claim to have solved as yet.

Transmission of health care-associated pathogens takes place through direct and indirect contact, droplets, air and a common vehicle. The transmission through contaminated HCWs' hands is the most common pattern in most settings and requires five sequential steps[19]:-

1) Organisms are present on the patient's skin, or have been shed onto inanimate objects immediately surrounding the patient
2) Organisms must be transferred to the hands of HCWs
3) Organisms must be capable of surviving for at least several minutes on HCWs' hands
4) Hand washing or hand antisepsis by the HCWs must be inadequate or omitted entirely, or the agent used for hand hygiene inappropriate
5) The contaminated hand or hands of the caregiver must come into direct contact with another patient or with an inanimate object that will come into direct contact with the patient.

Dedrick et al[20] (2007) conducted an observational study to identify characteristics of encounters between healthcare workers (HCWs) and patients that correlated with hand hygiene adherence among HCWs. The authors concluded that in this study, adherence to hand hygiene practices was lowest after brief patient encounters (ie, <2 minutes). Therefore, improving adherence after brief encounters may have an important overall impact on the transmission of healthcare-associated pathogens and may deserve special emphasis in the design of programs to promote adherence to hand hygiene practices. The present study shows that over all everyone observed hand hygiene compliance, all subjects performed hand hygiene after contact with body fluids. Hand hygiene compliance was *more than 75%* in four out of five situations. The least compliance rate was observed with "after touching patient's surroundings" i.e 60.76%.

Asare A et al[10] (2009) observed that the compliance to hand hygiene recommendations before versus after patient contact was 15.4% versus 38.5% for physicians and 14.1% versus 9.9% for nurses. The researcher concluded that hand hygiene compliance of physicians and nurses were low. Bukhari et al[23] (2011) observed that the overall compliance rate was 50.3%, and its distribution among staff was as follows; doctors 49.1%, nurses 52.2%, and technicians 42.8%. The highest compliance rate among doctors and nurses was found in surgical units. The authors concluded that the overall hand hygiene compliance rate among healthcare professionals reached 50% after prolonged educational campaign and was highest among the nurses.

In the present study, the Nurses showed more compliance than other health care workers (90.82%). The doctors showed an overall compliance rate of 74.6%. 53.33% of the HCWs observed used alcohol based hand rub up to 41-70%

of time while 16.67% used alcohol based hand rub up for 71-100% of time.

Khaled M et al[21] (2008) observed that the most common type of handwashing practiced among HCW was the routine hand washing (64.2%) and the least was the antiseptic handwashing (3.9%). Having a short contact time and improper drying (23.2%) was the most common form of inappropriate HW. Most of the wards had available sinks (80%) but none of them had available paper towels. In our study, we observed that 50% of the study population used soap and water alone for hand hygiene up to 11-40% times. 46.67% of the study population reported that they never used both soap and water and alcohol based hand rub together. Only 10% reported that they used both for more than 40% of the time.

Van De Mortel et al[22] (2011) conducted a study to examining the hand hygiene knowledge, beliefs and practices of Italian nursing and medical students; wherein the authors observed & concluded that there existed a knowledge deficit in relation to the use of alcohol based hand rubs to decontaminate hands in the healthcare setting in both the nursing & medical students and a significant disciplinary differences in hand hygiene knowledge and self-reported practices were apparent among undergraduate Italian healthcare students. In the present study, majority of HCWs (Heath Care Workers) identified and reported the situations / patient care activities that require hand hygiene.

There is convincing evidence that improved hand hygiene through multimodal implementation strategies can reduce HCAI (Hospital & Community Acquired Infection) rates[8]. There are at least 20 hospital-based studies of the impact of hand hygiene on the risk of HCAI have been published between 1977 and June 2008 which further enrich the results of the various studies on effect on hand hygiene practices on reduction of HCAI.. Despite study limitations, most reports showed a temporal relation between improved hand hygiene practices and reduced infection and cross transmission rates.

5. Conclusion

Hand hygiene, a relatively simple cost effective measure has been instituted in several hospital facilities across the globe to prevent HCAI. Studies have shown that contaminated hands are vehicles for spread of micro-organisms. In Intensive Care Units, the burden of HAIs is greatly increased, causing additional morbidity and mortality. Multidrug – Resistant pathogens are commonly involved in such infections and render effective treatment challenge. Health care workers are the most common vehicle for the transmission of HAIs from patient to patient and within the health care environment. A large proportion of the infection acquired attributed to cross contamination and transmission of microbes from hands of HCWs to patients. The risk of transmission of infections is higher if basic infection prevention and control practices are not observed especially in high risk patients. Health care associated infections persist as a major problem in most Intensive Care Units. Hand hygiene is the most simple and effective method for the prevention of these hospital & community acquired infections. Hence, the assessment of reported hand hygiene practices and its' further observation is essential to find out gaps and develop appropriate and targeted interventions for improving hand hygiene.

References

[1] Ofori AO, Jennings R, Burges J,et al.Assessing Hand Hygiene Resources and Practices at a Large African Teaching Hospital. Infect Control Hosp. Epidemiology 2010; 31:802-808.
[2] World Alliance for Patient Safety. The Global Patient Safety Challenge 2005–2006 "Clean Care is Safer Care". Geneva, World Health Organization, 2005.
[3] Mayon-White RT, Ducel G, Kereseselidze T, Tikomirov E. An international survey of the prevalence of HAI. J Hosp. Infect 1988; 11:43-48.
[4] Ponce-de-Le´on S. The needs of developing countries and the resources required. J Hosp Infect 1991; 18:376-381.
[5] Western KA, St John R, Shearer LA. Hospital infection control and international perspectives. Infect Control 1982; 3: 453-45.
[6] Macias AE, Mun˜oz JM, Bruckner DA, et al. Parenteral infusion contamination in a multi-institutional survey in Mexico: considerations for nosocomial mortality. Am J Infect Control 1999; 27:285-290.
[7] Rezende EM, Couto BR, Starling CE, Modena CM. Prevalence of nosocomial infections in general hospitals in Belo Horizonte. Infect Control Hosp Epidemiol 1998; 19:872-876.
[8] Allegranzi B, Pittet D. Role of hand hygiene in health care associated Infection prevention. Journal of Hosp Infection.2009; 73(4): 305-15.
[9] Pittet D, Hugonnet S, et al. Effectiveness of a hospital-wide programme to improve compliance with hand hygiene. Infection Control Programme. Lancet. 2000 Oct 14;356(9238):1307-12.
[10] Asare A, Enweronu – Laryea CC, Newman MJ. Hand hygiene practice in neonatal Intensive care unit inGhane.JinfectControl.2009; 1: 3(5): 352-6.
[11] Akyol AD.Handhygiene among nurses in Turkey: opinion and Practices. J CLINICAL nursing. 2007; 16(3): 431-7.
[12] Ahamed – Lecheheb D, Cunat L, Hartemann P, Hautemaniere A. Prospective observational study to assess hand skin condition after application of alcohol based hand rub solution. Amj Infect.2011.
[13] Qushmaq IA, Heels – Ansdello, Cook DJ,Loeb MB,Meade MO. Hand hygiene in Intensive Care Unit : Prospective observation of clinical practice. Pol arch Med Wewn .2008; 118(10):543.
[14] Pittet D, Donaldson L. Clean care is safer care: the first Global Challenge of the World Health Organization World Alliance for Patient Safety. Infect Control Hosp Epidemiol 2005; 26:891-89.
[15] Ehrenkranz NJ, Alfonso BC. Failure of bland soap hand wash to prevent hand transfer of patient bacteria to urethral catheters. Infection Control and Hospital Epidemiology, 1991,12:654–662.
[16] Asare A, Enweronu-LaryeaCC, Newman MJ. J Infect Dev Ctries2009; 3(5):352356.Infections. Behavioral Medicine, 2000,26:14-22.

[17] Lam BC, Lee J, Lau YL. Hand hygiene practices in a neonatal intensive care unit: a multimodal intervention and impact on nosocomial infection. Pediatrics, 2004,114:565-571.
[18] Won SP, Chou HC, Hsieh WS, et al. Handwashing program for the prevention of nosocomial infections in a neonatal intensive care unit. Infection Control and Hospital Epidemiology, 2004,25:742-746.
[19] Pittet D et al. Evidence-based model for hand transmission during patient care and the role of improved practices. Lancet Infectious Diseases, 2006, 6:641- 652.
[20] Dedrick RE, Sunkowitz, Cochran RL, Cunningham C, Muder RR, Perreian P, Cardo DM.Hand hygiene practice after brief encounters with Patients : An important opportunity for the prevention. Journal of Infection Control hosp epidemiol. 2007; 28(3): 341-5.
[21] Khaled M, Abd elaziz, Iman. Assessmentof knowledge, attitude and practice of hand washing among HCWs in Ain-Shams University Hospital In Cario. The Egyptian Journal of community Medicine.2008;26(2)
[22] Van De Mortel, Kermode, T.prongo etal.A comparison of hand hygiene knowledge belief and practices of Italian Nursing and Medical students, Journal of Advanced Nursing.2011.
[23] Bukhari SZ, Hussain WM, Banjar A, Almanimani WH, Karima TM, Fantani MI. Hand hygiene compliance rate among health care Professional. Saudi med J.2011; 32(5): 515-9.