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COMPARATIVE EFFICACY OF HAND HYGIENE TECHNIQUES FOR REMOVING BACTERIA FROM THE HANDS OF HEALTH CARE WORKERS WITH MICROBIOLOGICAL EVALUATION.

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ABSTRACT

Introduction: Hand hygiene is the simplest and most effective measure for preventing cross-transmission of micro-organisms. The impact of hand hygiene depends not only on the regularity and thoroughness of the procedures used but also on the type of hand washing agent selected. Failure to perform appropriate hand hygiene practice is a leading cause of health care associated infections. This study was conducted to compare the bacterial efficaccy of various hand hygiene techniques and to isolate the common skin contaminants from the hands of health care worker. Methodology: This prospective study was conducted in a tertiary care centre over a period of 2 months. The study included 90 volunteers i.e. 60 nurses and 30 doctors from all surgical and medical wards and ICUs. The volunteers were divided into 3 groups, one group performed handwashing with unmedicated soap, second group with medicated soap and third group performed handrubbing with alcohol based solution .Total 180 samples were collected on Trypticase soy agar by direct imprints of fingertips of the dominant hand of the HCWs before and after the hand hygiene procedure.. Potential pathogenic bacteria from transient bacterial flora were identified using standard microbiological techniques. Data was analysed with microsoft excel and by percentage analysis method. Result: Handwashing with medicated and unmedicated soap and use of alcohol based hand rub showed significant reduction in the bacterial growth on the hands of HCWs i.e. 83.4% for alcohol-based hand rub, 16.7% and 6.7% for medicated and unmedicated soap respectively. Hand contamination was found to be maximum with Coagulase-negative staphylococci (CoNS) in both before and after hand hygiene procedures. Conclusion: Alcohol based hand rub is far more efficient, convenient and time saving as compared to handwashing specially in situation in which the handwashing compliance rate is hampered.

Keywords: hand hygiene, hand rub, handwashing, medicated soap

INTRODUCTION

Hand hygiene is universally acknowledged as a cornerstone of the prevention of health care-associated infections (HAIs). It is the simplest and most effective measure for preventing cross-transmission of micro-organisms and reducing patient morbidity and mortality due to HAIs.[1] The impact of hand hygiene depends not only on the regularity and thoroughness of the procedures used but also on the type of hand washing agent selected.[1] With the increased recognition of the importance of antiseptics use in healthcare settings, the armamentarium for hand hygiene has now been expanded to include antimicrobial foams, rubs, lotions, wipes and soaps.[2] Failure to perform appropriate hand hygiene practice is a leading cause of health care associated infections and the spread of multiresistant organisms and has been recognized as a significant contributor to outbreaks of infectious diseases by the world health organisation (WHO).[3] Compliance with hand washing in hospital environments is generally less than 50% Furthermore, correct handwashing technique, particularly in respect of duration is often not practiced. Reason for insufficient compliance can be insufficient facilities, lack of training and compliance, lack of time or cutaneous

intolerance to soap.[4] Transmission of bacteria is more likely to occur from wet skin than from dry skin, the proper drying of hands after washing should be an essential component of hand hygiene procedure. Drying hands thoroughly with single use, disposable paper towels is the preferred method of hand drying in health care.[5] In a clinical situation, several studies have shown that handrubbing with alcohol-based hand disinfectants is more efficient than with unmedicated soap.[4] Hence we aimed to compare the bacterial efficiency of various hand hygiene techniques including hand rubbing with alcohol based compound and handwashing with medicated and with unmedicated soap and to isolate the common skin contaminants from the hand of health care workers by differentiating resident flora from transient flora.

MATERIALS AND METHODS

TYPE OF STUDY
Prospective

DURATION OF STUDY
2 months

PLACE
Tertiary care centre, Nagpur

SUBJECTS
Total 90 i.e. five volunteers from each unit of surgical and medical wards and ICUs participated in the study. The volunteers included 60 nurses and 30 doctors.

INCLUSION CRITERIA
Health Care Workers (HCWs), without any signs of abrasions, wounds, and infections on the skin of hand were included in the study.

EXCLUSION CRITERIA
Healthcare worker with any visible signs of abrasions, wounds or infections on the skin of hand and those with allergy to soap or handrubbing solution were excluded. Those who were unwilling to give informed consent were excluded from the study.

METHOD
After obtaining the approval from the ethical committee, consent was obtained from the respective volunteers. The hand hygiene technique was standardized in terms of duration of application, method for drying hand and absence of recontamination after drying. Imprints of fingertips of dominant hand were taken on Trypticase soy agar, before hand hygiene. Then volunteers were divided into 3 groups, one group performed handwashing with unmedicated soap [duration 40 seconds], second group with medicated soap [duration 40 seconds] and third group performed handrubbing with alcohol based solution [propanol IP 70% v/v] [duration 20 seconds]. Hand hygiene procedures were followed according to WHO guidelines.[6] After washing and rinsing hands with soap, volunteers' were asked to dry hands with single use, sterile disposable paper towels and handrubbing with alcohol was allowed to air dry. Then imprints of fingertips of dominant hand were taken on Trypticase soy agar (TSA). Total 180 specimens were obtained (90 before and 90 after the hand hygiene procedure). The plates were incubated at 37 degree Celsius under aerobic condition for 48 hours. Potential pathogenic bacteria from transient bacteria were identified using standard microbiological techniques.[1,4,7-9] For each volunteer, a case record form was made in which information like: age, sex of the volunteer and hand hygiene technique used were recorded.

STATISICAL TEST
Appropriate statistical test was applied and data was analysed with microsoft excel and percentage analysis.

RESULTS

Total 148 specimens were culture-positive out of 180 specimens. 90 (30 from each group) were culture positive before hand hygiene and 58 were culture positive after hand hygiene i.e. 5 after alcohol rub, 25 after handwashing with medicated soap and 28 after unmedicated soap.

Hand contamination before hand hygiene
Table no.1 shows bacteria isolated from the fingertips of the healthcare workers before performing hand hygiene. Total 90 (100%) bacteria were isolated before performing the hand hygiene procedure. Hand contamination was found to be maximum 58.89% with Coagulase-negative staphylococci (CoNS) followed by Diptheroids. Gram negative bacilli (GNB) and S. aureus were found to be 4.44% and 3.34% respectively.

Table 1
Bacteria isolated from the hands of healthcare workers before performing hand hygiene

Bacterial isolates	Number(n=90)	percentage
CoNS	53	58.89
S.aureus	3	3.34
Diptheroids	30	**33.33**
GNB	4	**4.44**
Total	90	**100.0**

Hand contamination after hand hygiene

After the various hand hygiene procedures, it was found that there was a significant reduction in the bacterial contamination on the hands of the healthcare workers. Bacterial reduction after handrubbing with alcohol based disinfectant was maximum followed by handwashing with the medicated soap. Handwashing with unmedicated soap was the least effective technique. Bacteria isolated after performing the hand hygiene procedure were depicted below in table (2) for unmedicated soap, table (3) for medicated soap and table (4) for alcohol rub.

Table 2
Bacteria isolated after hand washing with unmedicated soap

Bacteria isolated	Number(n=30)	Percentage
CoNS	**16**	**53.33**
S.aureus	**1**	**3.33**
GNB	**1**	**3.33**
Diptheroids	**10**	**33.33**
Total	**28**	**93.33**

Table 3
Bacteria isolated after hand washing with medicated soap

Bacteria isolated	Number(n=30))	Percentage
CoNS	13	43.33
S.aureus	1	3.33
GNB	1	3.33
Diptheroids	10	33.33
Total	25	83.33

Table 4
Bacteria isolated after hand rubbing with alcohol rub.

Bacteria isolated	Number(n=30)	Percentage
CoNS	**0**	**0**
S.aureus	**1**	**3.33**
GNB	**0**	**0**
Diptheroids	**4**	**13.33**
Total	**5**	**16.66**

Handwashing with medicated soap and unmedicated soap and use of alcohol based hand rub showed significant reduction in the bacterial growth on the hands of HCWs. The reduction in the growth of bacteria was 83.4%, 16.7% and 6.7% for alcohol-based hand rub, medicated and

unmedicated soap respectively. CoNS were isolated from 82 specimens, of the total 148 culture positive specimens. Diptheroids were found to be the second highest bacteria to contaminate the hands after CoNS, followed by S. aureus and gram negative bacilli (GNB) which includes Escherichia coli, Klebsiella, Pseudomonas and Acinetobacter.

DISCUSSION

In the study, it was found that there was marked reduction in the growth on the hands of healthcare workers after performing hand hygiene procedures. The growth was found to be 64.4% after performing hand hygiene (58 bacterial agents was found after the hand hygiene which was compared with the 90 bacterial agents isolated before the procedure). Thus the reduction in growth was found to be 35.6%. Similar results were reported in study of Lucet J.C. et al and Abaza F.A. et al where bacterial reduction was found after the hand hygiene procedure.[4,1] The reduction of the total bacterial contamination of participants' hands was significantly higher with handrubbing than with handwashing with soap. Several studies have compared the efficiency of handwashing with soap and handrubbing with alcohol based solution. These studies have shown handrubbing to be far more efficient than handwashing with soap. This study also confirms the greater efficiency of the alcohol based solution over handwashing with unmedicated soap. The reduction in the growth was 83.4% with handrubbing in this study.[1,10,11] However the reduction of growth was 16.7% after handwashing with medicated soap which was very less in comparison with handrubbing. Studies like Lucet J.C. et al and Girou E. et al have compared the efficiency of handwashing with medicated soap with use of an alcohol based solution.[4,7] The result of the study carried out by Lucet J.C. et al showed handwashing with medicated soap as efficient as handrubbing. But present study shows handwashing with medicated soap to be more effective but to a lesser extent, as there was much difference in the bacterial reduction by handrubbing and handwashing with medicated soap. This difference in efficacy may have been partly due to duration of handwashing and partly due to recontamination of hands immediately after handwashing and it might be due to single soap is used by whole staff for hand washing after washing the tap was closed by same hands. However both the studies proved handrubbing with alcohol based rub and handwashing with medicated soap to be far more effective than handwashing with unmedicated soap.[4,7] Hands are normally colonized by resident and transient bacterial flora. Resident flora, the less pathogenic bacteria is more resistant to remove (CoNS and Diptheroids). Transient flora is more likely to cause disease and is less resistant to remove (S. aureus, GNB). Hands are contaminated during contact with patients or environmental flora contaminated by patients environment.[12] CoNS are the main type of resistant skin flora, they are found on almost every hand. In the present study, CoNS were isolated from 82 specimens, of the total 148 specimens which showed growth. Thus CoNS colonization was seen in 55.4% of the specimens. Nearly similar results were reported by Abaza F.A et al, where CoNS were found to colonize 133 and 74 hands of experienced nurses and newly graduate nurses respectively. Diptheroids were found to be the second highest bacteria to contaminate the hands after CoNS.[1] Regarding transient flora, S. aureus was found in nearly 4% samples. GNB were also isolated from 4% of the samples, including Escherichia coli, Klebsiella, Pseudomonas and Acinetobacter. Likewise, nearly similar results were reported for S. aureus and GNB colonization in the study of Abaza F.A.et al.[1]

CONCLUSION

Alcohol based hand rub is far more efficient, convenient and time saving as compared to handwashing. But if the hands are soiled with dirt, handwashing with medicated soap is must before performing hand rubbing with alcohol based solution. Moreover improving hand hygiene compliance can lead to reduced rates of nosocomial infections and reduced acquisition of multiresistant bacteria

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REFERENCES

1. Abaza F, Amine E, Hazzah A. Comparative study on efficacy of different alcohol hand rubs and routine hand wash in a health care setting, alexandria, Egypt. Journal of Egypt Public Health Association. 2010;85(5):273-83.
2. Emily E, Sickbert B, Weber J, Sobsey D, Samsa P. Comparative efficacy of hand hygiene agents in the reduction of bacteria and viruses. American J Infect Control 2005;33(2):67-77.
3. Watutantrige R, Pakirisamy P, Lum Wai S and Xiaofen E. A study on hand contamination and hand washing practices among medical students. International Scholerity Research Network. Public Health Volume 2012; Article ID 251483, 5 pages, doi:10.5402/2012/251483.
4. Lucet J, Rigaud M, Mentret F, Kassis N, Deblangly C, Andremont A, et al. Hand contamination before and after different hand hygiene techniques: a randomized clinical trial. Journal of hospital infection 2002;50(4):276-280.
5. Gustafson D, Vetter E, Larson D, Ilstrup D, Maker M, Thompson R, et al. Effects of 4 hand drying methods for removing bacteria from washed hands: a randomized trial. Mayo clin proc. 2000;75(July):705-708.
6. WHO guidelines in health care - A summary. World Health Organisation 2009, Hand hygiene techniques .Chapter 2,Part II, Page 12-15.
7. Girou E, Loyeau S, Legrand P, Oppein F, Brun-Buisson C. Efficacy of handrubbing with alcohol based solution versus standard handwashing with antiseptic soap: randomized controlled trial. British Medical Journal. 2002;17(325):7360-362.
8. Duigid J.P, Staning methods in ; Collee J.G. J.G. Fraser A.G, Marimon B.P., Simmons A.(eds), Mackii and Mc Carty (1996). Practical medical Microbiology 14th edition . Churchhill livingstone New York, 1996;113-29.
9. Kaathekar M, Bharadwaj R, Kolhapure S. Evaluation of clinical efficacy and safety of pure hands in hand hygiene. Medicine Update; 2004;12(3): 49-55
10. Zaragoza M, Salles M, Gomez J, Bayas J, Trilla A. Handwashing with soap and alcoholic solution? A randomized clinical trial of its effectiveness. American journal of infection control. 1999; 27(3):258-261
11. Kac G, Podglajen I, Gueneret M. Microbiological evaluation of two hand hygiene procedures achieved by healthcare workers during routine patient care: a randomized study. J Hosp Infect. 2005; 60(1): 32-9.
12. Ananthnarayan & Panikers. Normal microbial flora of human body. In Arti kapil editor: Textbook of microbiology, 9th edition, University press; 2013. P. 621-624.