

A Randomized Control Trial to Compare the Efficacy of Routine Soap Water V/S Alcohol Based Hand Sanitizer in Pre-Operative Scrubbing at Tertiary Health Centre in Western India

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ABSTRACT

Introduction: Hand Hygiene is important for preventing healthcare related infections. Effective hand scrubbing is important for the success of surgical procedure. Pre operative scrubbing using soap and water is routinely used, however, there are many benefits of using alcohol-based hand sanitizer in pre-operative scrubbing. **Objective:** The objective was to compare the efficacy of Routine soap water scrubbing versus Alcohol based hand sanitizer in pre-operative scrubbing by comparing the microbiological profile of swab samples of scrubbed participants. **Materials and Methods:** Total 200 participants who got scrubbed in the Surgery Department of an Ahmedabad based medical college, were enrolled for the study. Study design chosen was randomized trial where out of 200 participants, 100 each were randomly allocated into two groups of (1) Routine soap water scrubbing and (2) Alcohol-based hand sanitizer scrubbing. After hand scrubbing in either of the group, every participant was sampled from different areas of hand immediately before the operation. The samples were sent for culture and sensitivity (C & S) testing and results obtained were documented. **Results:** No growth of organism was observed in C & S reports from the swabs of all 200 participants. **Conclusions:** Alcohol based hand sanitizer is equally efficacious to Routine soap water scrubbing in preoperative scrubbing.

Keywords: Soap water scrub, Alcohol-based hand sanitizer, pre-operative scrubbing,

INTRODUCTION

Surgical site infections (SSI) constitute global problem resulting significant morbidity¹. Joseph Lister was among the first to demonstrate the effect of skin disinfection on reducing SSIS². Antiseptics should rapidly eliminate transient skin flora and reduce resident flora on the hands to a minimum during a surgical procedure, and thus lower the risk of surgical site infection.

The hands can be a portal and transmitter of infection. While handwashing is the simplest way to control infection, it is often not practiced properly where warranted. All surgical team members should perform the hand and arm scrub before entering the surgical suite. The basic principle of the scrub is to wash the hands thoroughly, up till arm and therefore a systematic approach to the scrub is an efficient way to ensure proper technique³.

Conventional non medicated surgical hand antisepsis consists of an aqueous scrub by using soap and water requiring 5-7 minutes. However, scrubbing with these detergents' strips skin oils, compromises skin integrity, and (if a brush is used) often causes micro-abrasions, thereby increasing the risk of subsequent colonization by pathogens. As a result, conventional non medicated surgical scrub can cause allergic skin reaction. In the laboratory setting, an alcohol-based hand rub is as effective as conventional surgical scrub in its antimicrobial ability. In addition, skin irritation or dermatitis is less frequent with an alcohol-glycerol based hand rub in a small series of case studies. There can be scarcity of safe water in remote hospital locations, resulting to a limited access to safe water for preoperative scrubbing. Scrubbing of hands and forearms using soap and water usually takes 5-7 minutes, which is way longer than scrubbing time of hand sanitizers. This can also help increase the compliance of hand washing by healthcare providers in hospitals. Several alcohol-based hand rubs

have been licensed for the commercial market, although there are very few clinical studies to compare the antiseptics efficacy against routine soap water scrub in a routine operating practice environment.

AIM AND OBJECTIVE

Objective of this study was to compare the efficacy of Routine soap water scrubbing versus Alcohol based hand sanitizer in pre-operative scrubbing by comparing the microbiological profile of swab samples of scrubbed participants.

MATERIAL AND METHOD

This study of efficacy of routine soap water v/s alcohol-based hand sanitizer in pre-operative scrubbing at a tertiary health centre in Western India, was approved by Institutional Ethical Committee (IEC approval no. GMERS/IEC/04/2022). The study was conducted over a period of One year.

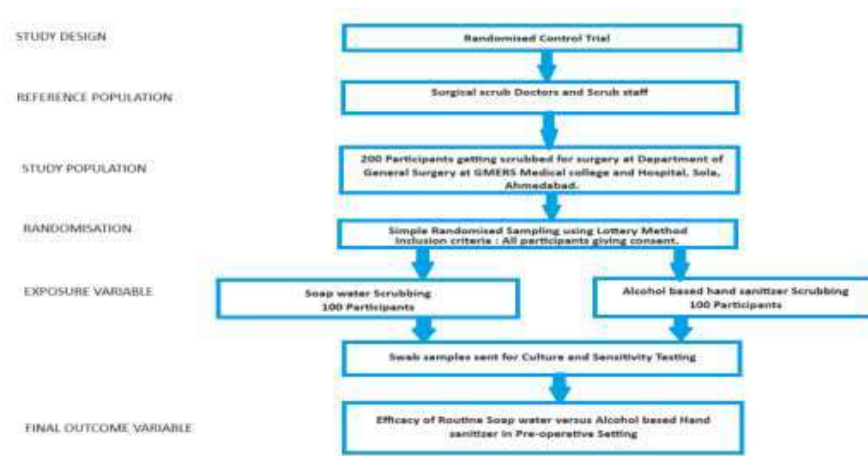


Figure 1: Flow diagram showing the adopted Methodology

Inclusion Criteria for The Study: All staff who got scrubbed for surgery (Surgeon, Assistant surgeon, OT assistant or scrub nurse) willing to give consent for the study were included.

Exclusion Criteria for The Study: Those who had established hand infection and were not willing to give consent, have been excluded from the study.

Hand wash Preparation:

Alcohol based sanitizer: To produce final concentrations of isopropyl alcohol 75% v/v, glycerol 1.45% v/v, hydrogen peroxide (H₂O₂) 0.125% v/v: Into a 1000 ml graduated flask, 751.5ml isopropyl alcohol (purity of 99.8%), 41.7 ml H₂O₂ 3%- and 14.5-ml glycerol (98%) was poured and flask was topped up to 1000 ml with distilled water. The flask was shaken gently to mix the content. The sanitizer was prepared in Pharmacology department by using only pharmacopeial quality reagents. All the jewellery (rings, watches, bracelets) was removed. Enough sanitizer was poured onto the hands to cover all surfaces. The hands were rubbed together including nail, subungual area, interdigital area, hand, forearm and arm. The hands were left to dry for about 20 seconds. The procedure was repeated 3 times, before wearing surgical gown.

Soap water scrub: It was timed 5 - 7 minute consists of the following steps: After removing all the jewellery (rings, watches, bracelets), each side of each finger including interdigital area, subungual area and the back and front of the hand and forearm were washed. Now the arms were scrubbed, always keeping the hand higher than the arm. This prevents bacteria-laden soap and water from contaminating the hand. Each side of the arm were washed up to 3 inches above the elbow. The process was repeated on the other hand and arm. If the hand touched anything except the brush at any time, the scrub was lengthened by one minute for the area that has been contaminated. Hands and arms were rinsed by passing them through the water in one direction only, from fingertips to elbow. Arm (s) were not moved back and forth through the water. Subjects proceeded to operating room suite holding hands above elbows. If the hands and arms are grossly soiled, the scrub time was lengthened.

Once in the operating room suite, hands and arms were dried using a sterile towel and aseptic technique. Finally, the surgical gown and sterile gloves were worn.

Microbiological Testing: After hand scrubbing (with routine soap water & alcohol-based sanitizer), every participant was sampled immediately. Sterile cotton swabs were used to obtain specimens for cultures by wiping through every part of the hand (ventral & dorsal sides), fingertips, subungual areas, interdigital clefts, and wrists. The samples were sealed in a sterile container and immediately sent to Microbiology Department for culture and sensitivity reporting. (Figure 2)

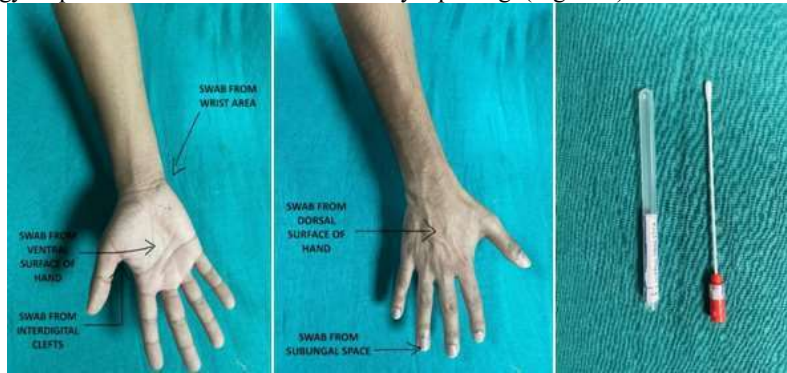


Figure 2: Sites for the collection of swabs

Swabs were inoculated on sterile Blood agar/ MacConkey Agar/ Chocolate agar plates and if needed on SDA agar and incubated for 72 hours at 37° C. The growth of Gram positive/ Gram negative / Anaerobic bacteria was checked for. If there was any growth present, subsequently a colony count was done at the end and results documented.

RESULT

The results of Culture and sensitivity testing of swab samples of 100 soap water scrubbing, as well as 100 alcohol-based hand sanitizers revealed no growth of organism as shown in the figure 3.

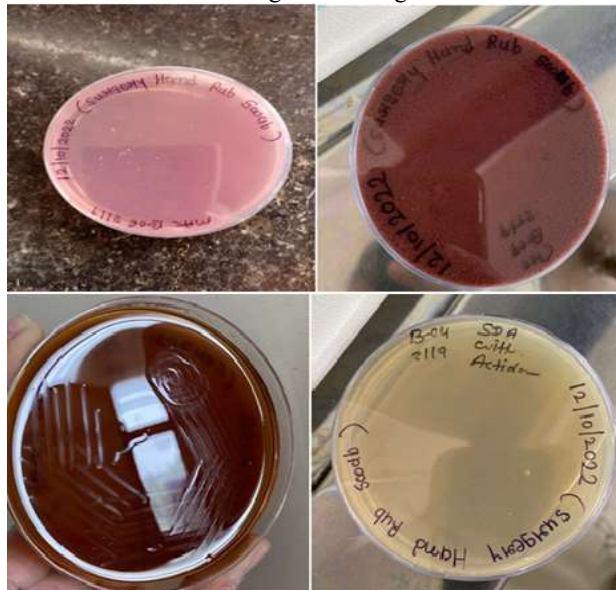


Figure 3: Culture plates showing no growth of any organisms MacConkey Agar, Chocolate Agar, Blood Agar & SDA

Table 1: Participant profile of Routine soap water scrub vs Alcohol based hand sanitizer

Number	Participant Profile		Routine soap water scrub (N=100)	Alcohol based hand sanitizer scrub(N=100)
1	Designation	Surgeon	33	40
		First Assistant	54	49
		Scrub nurse	13	11
2	Age (Years)	20-30	62	49
		30-40	37	51
		> 40yrs	1	0
3	Sex	Male	90	99
		Female	10	1
4	Comorbidity	No Comorbidity	84	77
		Diabetic	16	23
		Other Comorbidity	0	0
5	Culture Report	Growth	0	0
		No Growth	100	100

The participant profile of both the groups (routine soap water scrub & Alcohol based hand sanitizer scrub) is presented (Table 1). In our study, 33 surgeons, 54 first assistants and 13 scrub nurses got scrubbed using routine soap and water; meanwhile 40 surgeons, 49 first assistants and 11 scrub nurses made use of hand sanitizer for scrubbing. Also, there were 90 males and 10 females in routine soap and water group in contrast to 99 males and 1 female in alcohol-based sanitizer group. Another point observed was that 16 and 23 participants were diabetic in routine soap and water scrubbing and alcohol-based hand sanitizer scrubbing groups respectively. In addition to it, no other comorbidity was found among the participants. As mentioned earlier no growth of organisms was reported from the swabs from either of the study groups.

DISCUSSION

This study compared hand rubbing with alcohol-based solution and traditional soap water scrubbing in preoperative settings. In our study, there was no growth of organism on C & S of both group participants. This shows that Routine soap water scrubbing, and Alcohol based hand sanitizer are equally efficacious in hand disinfection in pre-operative settings. Also, it was observed that Alcohol based hand sanitizer had better compliance and was quicker in action than routine soap water scrubbing.

Any direct comparison between our study and other reported studies would be improper, as they differ in several aspects, such as SSI rates or comparison alcohol-based scrubbing with medicated soap water scrubbing. Contrary to our study, a study⁴ concluded that Alcohol based hand sanitizers are microbiologically more effective. It also observed that Alcohol based hand sanitizers save time and have better compliance, which was comparable to our study.

Another study⁵ demonstrated that hand rubbing with aqueous alcoholic solution was as effective as traditional hand scrubbing with antiseptic soap in preventing SSI. SSI rates were 2.44% in hand rubbing protocol with alcoholic solutions than 2.48% in hand scrubbing protocol with antiseptic soap. Also, similar to our study, alcohol rubbing protocol was better tolerated with improved compliance. In a separate study⁶ comparing alcohol-based hand rub with povidone iodine scrub, no significant difference in efficacy of hand antisepsis was established in reducing bacterial load. Also, no incidence of SSI was found. A cluster randomised, crossover trial in a rural Kenya,⁷ demonstrated the feasibility and affordability of alcohol based handrubs for preoperative hand preparation in settings without continuous clean water supply. This study showed no statistical difference in SSI rates.

A study conducted on practising Ophthalmic surgeons in Israel, for preoperative hand antisepsis concluded alcohol rub protocol as more effective in reducing the bacterial counts on hands than

routine surgical hand preparation with povidone iodine and chlorhexidine solution⁸. A review article including seven scientific articles⁹ published in Sweden, concluded that alcohol-based hand disinfection (Sterillium) is significantly more effective than preoperative antiseptic hand disinfection method (Hibiscrub). A study from Taiwan,¹⁰ showed that culture positivity rate of alcohol-based hand rub was 6.2% as compared to 47% culture positivity rate with conventional surgical scrub. This was in contrast to our study, where culture positivity rates were 0% for both the groups.

CONCLUSION

On the basis of the results obtained above, it can be concluded that Alcohol-based Hand Sanitizer is equally efficacious to Routine Soap water scrubbing in preoperative hand disinfection. In hospitals with limited OT space, using alcohol-based hand sanitizer has an added advantage that there is no requirement of separate scrubbing area. Due to water scarcity in remote hospital locations or where the availability of clean/ fresh water is problematic, use of Alcohol based hand sanitizers is more feasible. Also, as reported by other studies, Alcohol based hand sanitizers have easy and wide availability with higher user compliance.⁴⁻⁵ This concludes that Alcohol based Hand sanitizers can be used safely for preoperative scrubbing in Hospitals.

REFERENCES

1. Delgado-Rodríguez M, Gómez-Ortega A, Llorca J, Lecuona M, Dierssen T, Sillero-Arenas M, Sierra A. Nosocomial infection, indices of intrinsic infection risk, and in-hospital mortality in general surgery. *J Hosp Infect.* 1999 Mar;41(3):203-11.
2. Keen, W. W. "Before and after Lister." *Science*, vol. 41, no. 1068, 1915, pp. 881–91. *JSTOR*, <http://www.jstor.org/stable/1640393>. Accessed 23 Dec. 2023.
3. Deborah Gardner, LPN, OPACellen Anderson-Manz, RN, BSN. How To Perform Surgical Hand Scrubs. *Infection Control today*;2001.
4. Widmer AF. Replace hand washing with use of a waterless alcohol hand rub? *Clin Infect Dis.* 2000 Jul;31(1):136-43.
5. Parienti JJ, Thibon P, Heller R, Le Roux Y, von Theobald P, Bensadoun H, Bouvet A, Lemarchand F, Le Coutour X; Antisepsie Chirurgicale des mains Study Group. Hand-rubbing with an aqueous alcoholic solution vs traditional surgical hand-scrubbing and 30-day surgical site infection rates: a randomized equivalence study. *JAMA.* 2002 Aug 14;288(6):722-7.
6. Deshmukh S, Fulare S, Gokhale A. Surgical hand antisepsis-comparison of alcohol-based hand rub (propan-2-ol 45gm, propan-1-ol 30gm, mectronium ethyl-sulphate 0.2gm) and povidone iodine scrub (7.5%). *International Journal of Surgery Science* 2021; 5(3): 23-28.
7. Nthumba PM, Stepita-Poenaru E, Poenaru D, Bird P, Allegranzi B, Pittet D, Harbarth S. Cluster-randomized, crossover trial of the efficacy of plain soap and water versus alcohol-based rub for surgical hand preparation in a rural hospital in Kenya. *Br J Surg.* 2010; 97(11):1621-8.
8. Forer Y, Block C, Frenkel S. Preoperative Hand Decontamination in Ophthalmic Surgery: A Comparison of the Removal of Bacteria from Surgeons' Hands by Routine Antimicrobial Scrub versus an Alcoholic Hand Rub. *Curr Eye Res.* 2017;42(9):1333-1337.
9. Lindström P, Grbic K, Seffo N et.al. Evaluation of two different methods of hand disinfection, sterillium® compared with hibiscrub®: the experience from Sweden. *Int J Health Sci Res.* 2020; 10(8):110-19.
10. Shen NJ, Pan SC, Sheng WH, Tien KL, Chen ML, Chang SC, Chen YC. Comparative antimicrobial efficacy of alcohol-based hand rub and conventional surgical scrub in a medical centre. *J Microbiol Immunol Infect.* 2015;48(3):322-8.