

## Original Research Article

# To compare the efficacy of three different hand hygiene agents in reducing the bacterial load from hands in intensive care areas of a tertiary care hospital

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## ABSTRACT

### Keywords

Hand hygiene,  
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NI's,  
Hand rubs

Hand hygiene remains one of the corner stone in prevention of nosocomial infections. The prevalence of NI's is increasing alarmingly and in ICU's it is marked. Therefore interventional measures like a good hand hygiene policy in place and its compliance is essential. In recent times handwashing has been replaced by alcohol based rubs for several reasons and have been proven to be efficient. In the present study we have tried to compare the efficacy of three different hand hygiene agents in reducing bacterial load from the hands of nursing staff in critical areas. 54 nursing staff were selected in the study and dominant hand impression samples were collected during their routine hospital work followed by a standard hand rub with any one of the hand rub solutions available. Again hand imprints were collected on bacteriological culture media and processed. 80% of the samples yielded bacterial growth before using a hand rub which was reduced to 24% after applying hand rub. Bacterial quantitation revealed that all the three hand rubs were efficient enough in reducing the bacterial load. Cent percent for moderate and confluent growth. Scanty growth was reduced to 24% in samples after hand rub. Therefore we recommend the use hand rubs in regular practice to avoid NI's.

## Introduction

From time immemorial i.e. way back in 1847 when Ignaz Philipp Semmelweis for the first time demonstrated the role of hand washing in reducing peripartum mortality from 16% - 3.06% in itself is a proof for the import of hand hygiene in health care settings [1]. Down the lane we have seen several advances in medicine and sterilization and disinfection techniques still we are contended with the problem of nosocomial infections.

The normal bacterial count from human skin ranges from  $10^2$ -  $10^3$  CFU/cm<sup>3</sup>. The bacterial flora on the hands is divided into resident and transient flora. The transient flora is responsible for transmission of infection from patient to patients. Hands of the health care workers play a crucial role in cross transmission of infectious agents particularly so in intensive care areas where the patients are critically ill. The hands of the care givers come in frequent contact

with patients, their secretions and invasive devices which results in colonization of the hands with transient flora and a higher bacterial load [2,3]. Further these patients have a greater risk of getting colonized with multidrug resistant organism from cross transmission. [3 -9] resulting in NI's and its complications. Therefore hand hygiene is an important infection control intervention to prevent transmission of microbes and should be practised before and after patient care. The morbidity, mortality and financial burden associated with NI's has been a major concern [10,11].

A proper hand hygiene policy and its compliance is essential for prevention of nosocomial infections [12,13]. It has been reported by various authors that around the world the compliance rate is as low as 45% due to several reasons like non availability of water, cost of sinks and their installation in specific areas, over crowding of the patients, understaffing of health care workers and in last the most important fact lack of time [14-18]. Over the time disinfectant based hand rubs have replaced hand washing. Alcohol based hand rubs reduces the risk of transmission of pathogens and they do not require access to water and sinks. They are rapid in action, cheap, safe for hands, easy to use and a best method to improve compliance.

**Aim** – the present study aims at comparing the efficacy of different hand hygiene agents available in the market in reducing the bacterial bioburden from the hands of nursing staff. **Material and methods** – this study was carried out at a tertiary care hospital in the intensive care area from November 2014- December 2014. About 54 nurses working in different shifts were selected for the study. Subsequently they were divided into three groups comprising with 18 members in each in such a way that

each group had an opportunity to use one of the three different hand hygiene agents available. Two samples were collected from each individual one before hand rub during their routine activity and one after using one of the hand rub solution. They were instructed to give dominant hand impressions during their busy work schedule [19 -21] This was followed by a hygienic hand rub for 30 seconds as per [WHO] guidelines with one of the three different hand hygiene products. Then dominant hand impressions were collected again for processing. A total of 108 samples were collected from 54 nursing staff. 54 samples before hand rub and 54 after hand rub.

#### **Details of hand hygiene agents**

1. Sterimax from bioshield – liquid hand rub solution composition -2.5% v/v chlorhexidine gluconate IP, 0.5% w/v Triclosan USP, 50% v/v Isopropyl alcohol [2-3 propanol] 25% v/v N propanol [1 propanol] BP with emollients perfume and brilliant blue FCF colour.

2. Pure hands from Himalaya group of health care products. A herbal hand gel consisting of Hrivera 60 mg, Dhayaka 60mg, Nimbuka 60mg, Ushina 60mg, Nimba 60mg.

3. Xepi™ from Sanmed health care systems consisting of 2 propanol IP 45 gms, macetronium, ethyl sulphate 0.3 gms, 1 propanol 30 gms and skin protective agents.

Two of the agents were alcohol based preparations and one a hand gel consisting of herbal ingredients from Himalaya co. liquid hand rubs were applied in the quantity of 3ml and hand gel in 0.5ml quantity. After which hands were air dried and imprints collected.

## **Bacteriological processing**

Samples were collected from the dominant hand before and after hand rub on 5% sheep blood agar from HIMEDIA CO. Plates were incubated aerobically at 37°C for 24-48 hrs. Bacterial growth was identified as per the standard practical medical microbiology text [22].

Bacterial growth was Quantified as [23].

No growth

< 20 colonies – scanty

20-80 - moderate growth

>100 - heavy growth

Ethical issues related to the study were cleared from the ethical committee of the hospital and the nursing staff enrolled in the study were explained about the protocol and use of the hand hygiene products by repeated demonstrations.

## **Result and Discussion**

In the present study 43 [80%] samples before application of the hand rub yielded bacterial growth. Whereas only 13 [24%] of the samples after hand rub yielded bacterial growth. A variety of bacterial agents were isolated from the hands of the nursing staff in before hand rub samples. Gram positive cocci like staphylococci and streptococci were isolated from the samples.

Staphylococci remained a major isolate followed by gram negative bacilli. Gram negative bacilli like citrobacter, Acinetobacter and pseudomonas have been isolated in the study. On two occasions even fungi were isolated. Multiple isolates were also noticed in some samples shown in graph 1.

Bacterial growth was quantified as heavy, moderate, scanty and no growth. fig 1.2.3.

Quantitation of bacterial growth in before and after hand rub agents revealed the following results.

80% of the sample before application of hand rub solution showed bacterial growth. After hand hygiene only 24% of the samples yielded growth. Scanty bacterial growth was noticed in 57% of the sample in before and 24% in after hand hygiene. Moderate and heavy bacterial growth was reduced by centpercent graph 2.

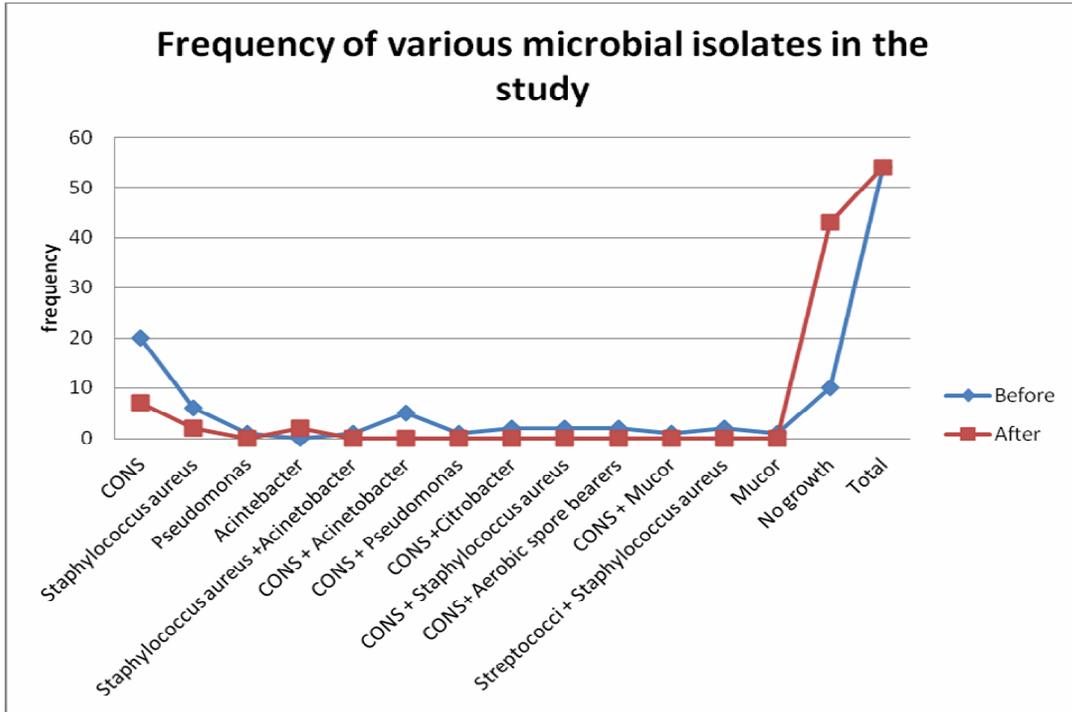
Further confluent or heavy bacterial growth was noticed in < 22%, 6% and 33% of the samples before hand rub while using the three different hand hygiene agents in the order sterimax, pure hands followed by xepi™. Moderate growth was noticed in 6%, 0% and 11% of the samples before hand hygiene. Majority of the samples showed scanty growth 67%, 61% and 44% before hand rub.

Confluent and moderate bacterial growth has been drastically reduced to 0% after hand rub with almost all the three hand hygiene agents. Scanty bacterial growth after hand rub was reduced to 33%, 28% and 11% of the samples. Graph 3.

Fungus mucor was isolated in two of the samples in before hand rub category and in zero number of samples after hand rub.

Our study showed that 80% of the staff during their routine hospital practice had their hands contaminated with bacteria [3,5,6,7,8, 9]. At least 64% of the samples yielded a single bacterial isolate and 36% had multiple bacterial isolates. And on two occasions we have isolated fungus like mucor which is responsible for serious invasive mycosis in immunocompromised patients.

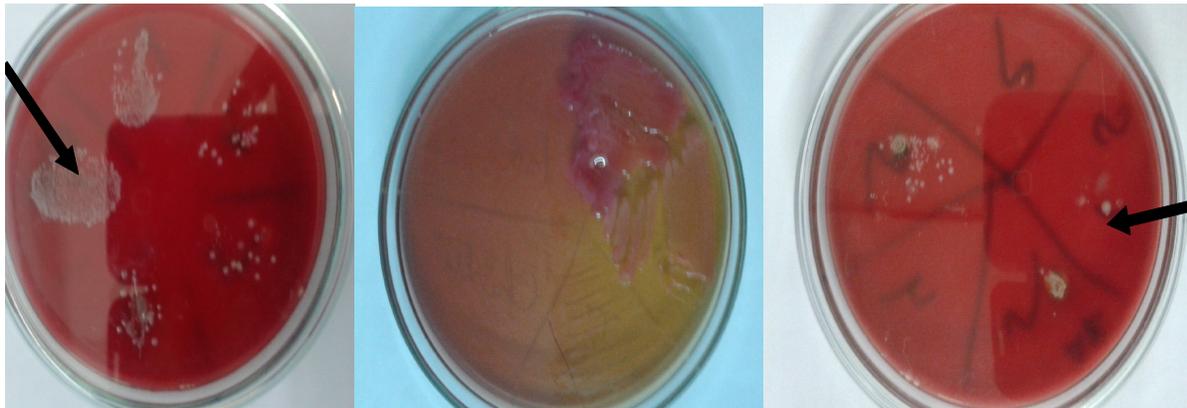
**Graph 1**



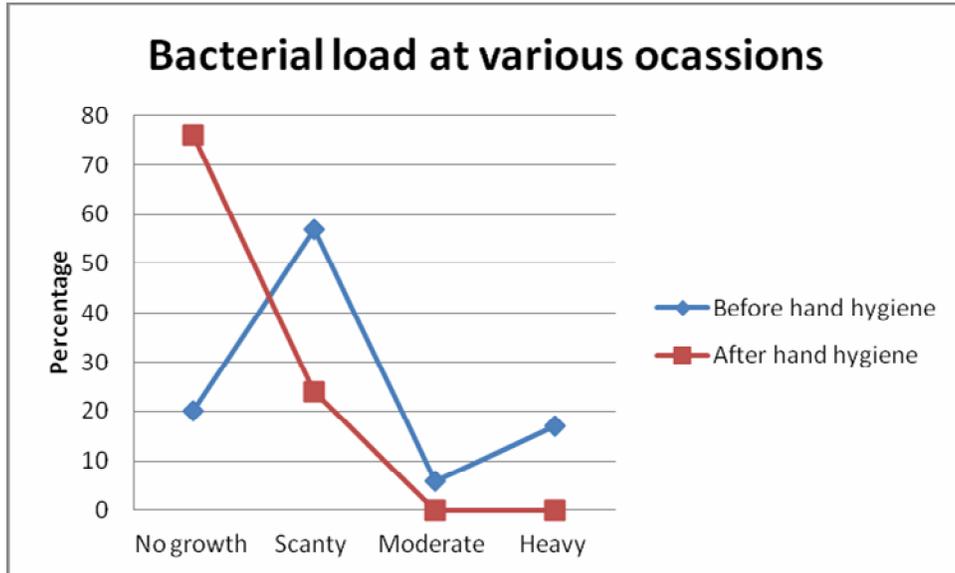
Confluent growth

Acintobacter and other gram negative bacilli

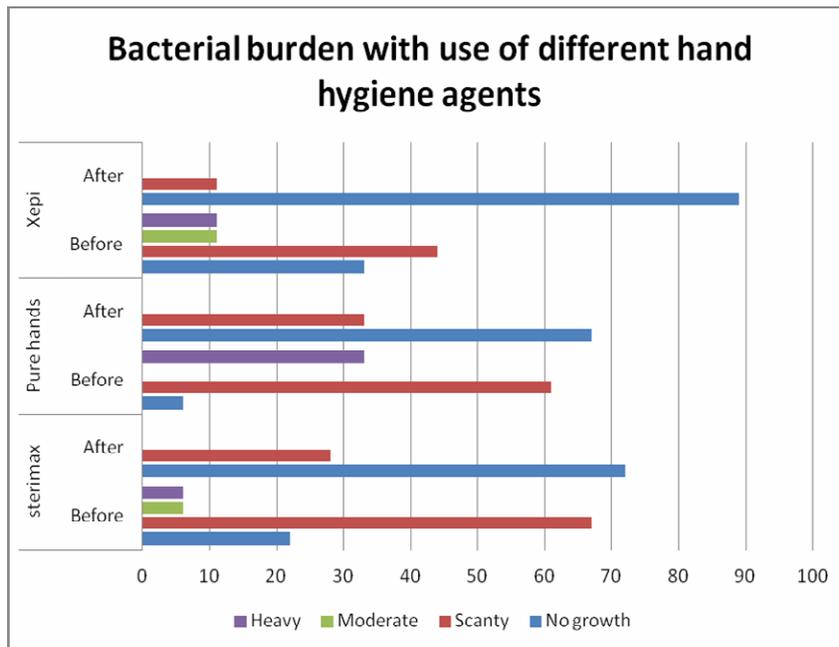
Scanty growth



**Graph 2.**



**Graph 3.**



Though they are less common causative agents of nosocomial infections but their frequency and importance is increasing [24]. Staphylococcus was the major isolate as reported in other studies [23]. It is one of the important nosocomial pathogen as reported by [25]. Transient colonization of hands with gram negative bacilli ranges from 21-86% [26]. Gram negative bacilli as nosocomial pathogen in intensive care set up have been reported with various frequencies by different authors [27]. In the present study they were seen in 23% of the samples positive for bacterial growth, either alone or in combination with gram positive cocci. *Off late acinetobacter* is emerging as a nosocomial pathogen, in our study it is seen in 14% of the samples showing growth. Their significance lies in being resistant to almost all antimicrobials in use which makes treatment of NI's difficult. Therefore efficient use of alcohol based hand rubs can definitely reduce the chances of transmission of nosocomial infections [28,29].

The nosocomial infection rates range from 3.5 – 10 % in general hospital practice and in greater percent in intensive care areas 15-40% [25]. The infection control team aims at having low nosocomial infection rates. In order to achieve this a standard infection control policy with proper hand hygiene guidelines and compliance is important [28,29]. Improving hand hygiene can lead to reduced infection rates and acquisition of multi drug resistant organisms [29]. Hand washing being a simplest method of avoiding cross transmission and prevention of nosocomial infections but in practical its application and compliance is affected by factors like availability of water, sinks and time. Therefore medicated hand rubs especially alcohol based hand rubs have been proven microbiologically in in-vitro and in-vivo studies to be more effective.

[6,7,15,17, 28,29, 30, 31,32]. In the present study we have compared the efficacy of three different hand hygiene agents in reducing the bacterial load from the hands of nursing staff in intensive care areas. Two of the solutions were medicated and one herbal. All were found to be efficient enough in reducing bacterial burden to more than 60%. The two medicated hand rubs containing alcohol were found to be better than the herbal one. And Xepi™ from sanmed health care systems was found to be the most efficient of the three; which achieved around 89% microbial killing.

Based on the findings of the study we recommend the use of alcohol based hand rubs in regular practice. For reasons like they are cheap, easy to use, handy; can be carried in pockets or can be installed on the bedside with dispensers and are safe to use. Further they save time which is a major constraint when there is over crowding of the patients or understaffing. It just takes 30 seconds of your time as compared to an efficient hand wash which requires at least 1-2 minutes of your precious time.

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