Isolation of Some Microorganisms from Bar Soaps and Liquid Soaps in Hospital Environments

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Abstract

This study was designed to determine the colonization of the in-use hand washing soaps in hospital settings. It is a comparative cross-sectional research in a surgical specialties and Baghdad teaching hospital in Baghdad, Iraq. Swabs from surfaces of bar soaps and from liquid soaps via their applicator tips; at the sinks of toilets of hospital staff and working rooms of the wards were taken in January 2008. Conventional microbiologic methods were used for culture of the swabs and identification of the isolates. Colonization was detected 60% and 15.9% in bars and liquid forms respectively. And this lead to the conclusion that bar soaps could be colonized with microorganisms excessively. Liquid hand washing soaps are more appropriate in hospital environments. Proper using conditions of the hand washing items should be defined in health care settings.

Keywords: Bar soap, liquid soap, *pseudomonas aeruginosa*, nosocomial infections.

الخلاصة

تلوث اليد بالبكتريا يعتبر من أهم الطرق لانتقال العدوى بين المرضى أو من العاملين في مجال الرعاية الصحية إلى المريض. نظافة اليد تعتبر أهم أداة في السيطرة على حالات العدوى المستشفويه. هدفت هذه الدراسة لتحديد بعض الإحياء المجهرية المستعمرة على أنواع الصابون المستخدم في المستشفيات. صممت هذه الدراسة على شكل مقارنة مقطعية وتم جمع مسحات من أسطح الصابون الصلب ومن فتحات جهاز الإعطاء للصابون السائل في مستشفى بغداد التعليمي و الجراحات التخصصية في بغداد, العراق. أظهرت النتائج أن نسبة تلوث الصابون الصلب كانت ٦٠% بينما كانت ١٥.٩% للصابون السائل. هذه النتائج تؤكد أن استعمال الصابون السائل بالمستشفيات انسب من الصابون الصلب.

Introduction

Hand carriage of bacteria is an important route of transmission of infection between patients or from the health care worker to the patient.[1-6] Hand hygiene has been considered to be the most important tool in nosocomial infections control. Failure to perform appropriate hand hygiene is supposed to be the leading cause of nosocomial infections and the spread of multiresistant microorganisms, and has been recognized as a significant contributor to outbreaks. The microbial flora of the skin of hands consists of resident and transient microorganisms. The resident microorganisms survive and multiply on the skin. The transient microorganisms represent recent contaminants of the hands acquired from colonized or infected patients/clients or contaminated environment or equipment. Transient microorganisms are not consistently isolated from most persons. In contrast to the resident microorganisms, the transient microorganisms found on the hands of health care personnel are more frequently implicated as the source of nosocomial infections. The most common transient microorganisms include gram negative coliforms and *Staphylococcus aureus.* Hand washing with plain soap is effective in removing most transient microrganisms.[7-9] The mechanical action of washing and rinsing removes most of the transient microorganism present.[10-12].Health care workers wash their hands in two ways: (a) the social hand wash, which is the cleaning of hands with plain, non-medicated bar or liquid soap and water for removal of dirt, soil, and various organic substances; (b) the hygienic or antiseptic hand wash, which is the cleaning of hands with antimicrobial or medicated soap and water. Most antimicrobial soaps contain a single active agent and are usually available as liquid preparations. Appropriate hand washing results in a reduced incidence of both nosocomial and community infections.[13] Much studies have been written and debated regarding the use of bar versus liquid skin cleansers in relation to infection control.[7,14-22] In this study, the aim was to detect and compare bacterial contamination of soap bars and liquid soaps.

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Materials and Methods

Setting

Surgical specialties and Baghdad teaching hospital in Baghdad, at the middle of Iraq.

Materials

In January 2008, 50 swabs from surfaces of bar soaps at the sinks of toilets and working rooms of the wards were collected; 44 swabs were collected from tips of the applicators of liquid soaps containers approximately at the same hospital points. Swabs were collected from wet surfaces of bars and tip of the containers of liquid soaps. Soap bars were plain soaps (Duru, Turkey). Liquid soaps (Johnson, Turkey) included formaldehyde (in trace amount as antiseptic agent according to label information). Despite of the liquid soaps in this settings were called antibacterial by the manufacturer; formaldehyde that was included in the liquid soaps considered as preservative rather than antibacterial effect.

Microbiology

Collected swabs were dipped into tubes containing 1 ml sterile normal saline (0.9%). Samples were brought to the microbiology laboratory without delay. Tubes were shaked and Ten microliter of substance was inoculated on blood agar and eosin-methylen-blue (EMB) agar incubated at 37 ^{0}C for 22-24h. Sabouraud`s agar media are enforced with chloramphenicol (16 µg/mL) to inhibit the growth of contaminating bacteria; incubated at 30C$^{\circ}$, for 30 days were used to rule out fungi . Unfortunately anaerobic laboratory conditions could not be accomplished during this study due to the shortage in laboratory facilities. Yielded microorganisms were identified by conventional microbiological methods and by using API 20E, API 20NE & API Strep (Biomerieux, USA).

Statistics

T-tests were used for calculating significance of difference of colonization rates between bar soaps and liquid soaps and also comparing the frequency of yielding microorganisms.

Results

Among 50 swabs of bar soaps, 30 (60%) swabs were found colonized. A total of 44 microorganisms were isolated. Numbers of isolate are shown in figure 1. *Pseudomonas aeruginosa* (41%) was the most frequent isolated bacteria followed by *Escherichia coli* (13.6%) and *Acinetobacter baumanii* (11.4%).From liquid soaps, 6 microorganisms were detected at only 7 tips (15.9%) of the total 44 containers. This includes 4 (66.6%) *P. aeruginosa*, one (16.6%) *Proteus penneri* and one (16.6%) *Flavimonas oryzihabitans.*

Comparison of the rates of bacterial colonization between bar soaps and liquid soaps are shown in figure 2 and 3.Bar soaps were found more colonized than the liquid soaps significantly ($p<0.05$). *P. aeruginosa* was the most frequent isolate in both two group whereas isolation rate was significantly higher ($p<0.05$) in bar soaps but not in the liquid soaps ($p>0.05$) as statistically.

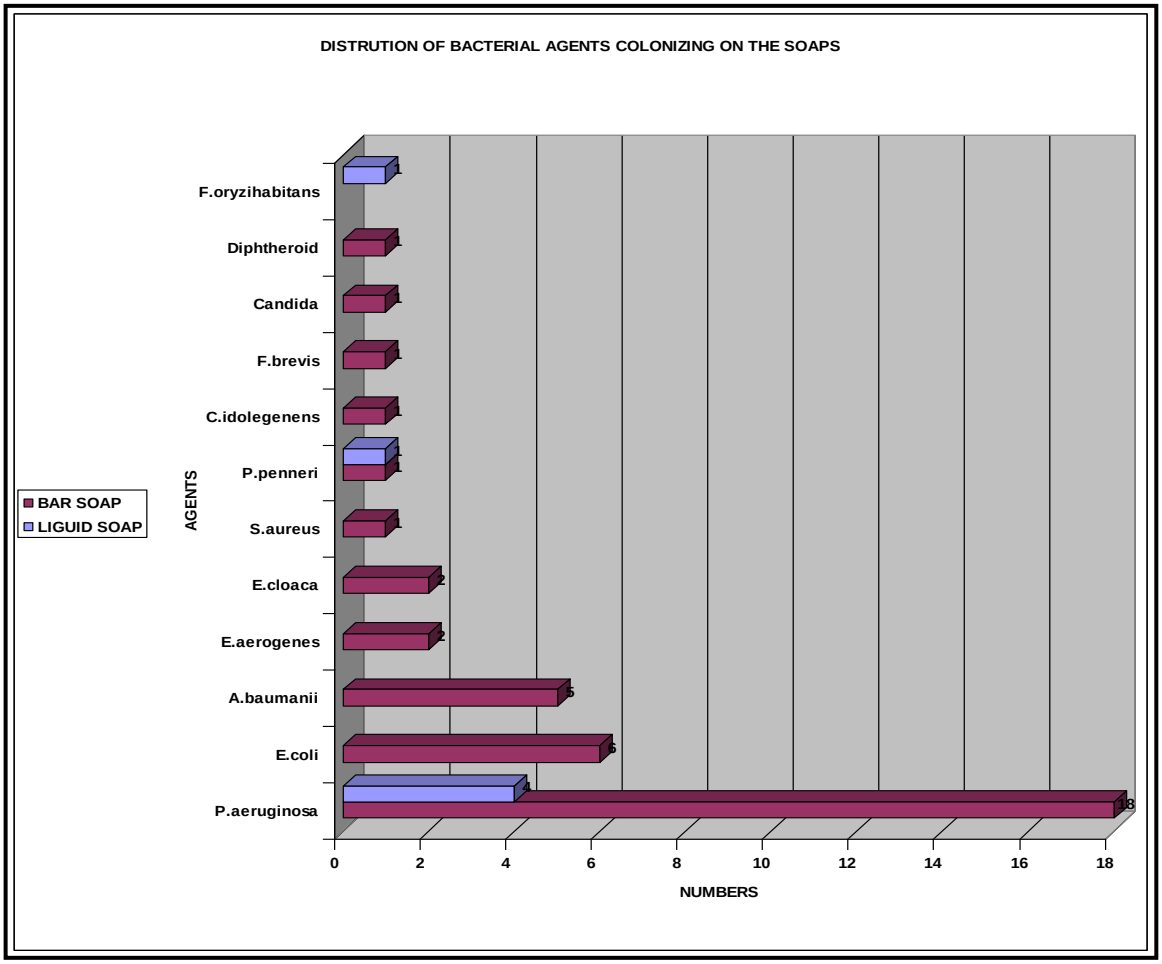

Figure 1. Distribution of bacterial agents colonizing on the soaps

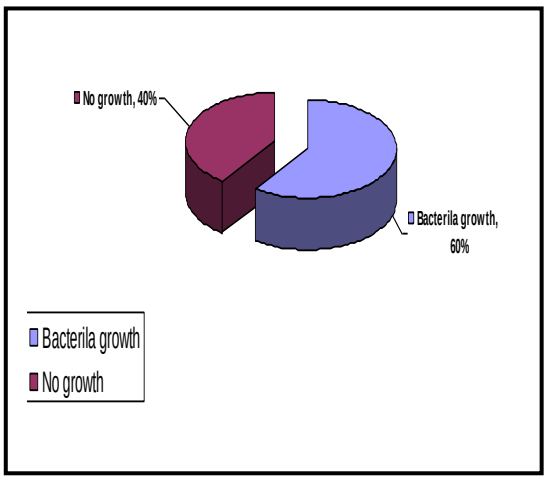

Figure 2. Bacterial colonization rates of bar soaps

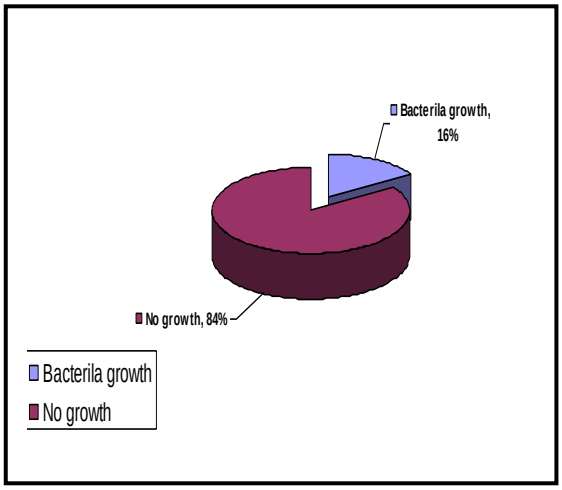

Figure 3. Bacterial colonization rates of liquid soaps

Discussion

The most common hand-cleaning agents are bar soap and liquid soap in disposable plastic containers. When in use, bar soaps are frequently misused because they are typically stored in contact with moisture and remain moist for long periods of time. It is usually kept in a container, on or next to a wash basin. More often than not, it resides in surface water. The resulting jelly mass is unsightly, difficult to use effectively. This supplies an environment which provides the perfect opportunity for bacteria and organisms to grow. Most bars of soap in communal areas are used by a number of different people. This means that one bar of soap can be in direct contact with skin bacteria from more than one person, and may harbour live pathogenic bacteria.[22] Cross infection can and does occur under these circumstances.[23] When using a bar of soap, the CDC (Centre for Disease Control) recommends placement on a drainable rack between uses.[6] Soap racks that promote drainage of all water from the bar should be installed. In addition, there should be easy access to replacements when soap is lost, dropped, melted, or consumed. Small soap bars were also recommended that can be changed and used in preference to larger bars that are more likely to melt or become colonized with bacteria.[24] Liquid soap on the other hand is much better to use. Liquid soap is dispensed straight from a plastic container. It has not been exposed to skin bacteria or other contaminants. As a result, cross contamination is not likely to occur, providing a more cleaning and more hygienic alternative.[23]McBride et al reported that bar soaps were found to have higher bacterial cultures after use than liquid soaps.[23] In another study, Kabara and Brady obtained samples from bar and liquid soaps from 26 public bathrooms which were investigated. Liquid soaps were found to be negative for bacteria, while 100% of the 84 samples obtained from bar soaps yielded positive cultures.[15] In an epidemiological study, the researchers isolated several strains of *Pseudomonas* from 45 of 353 environmental samples used by multiple providers (13%) and found that the 5 most common strains were frequently found on patients. They also affirmed that the hands are a major vehicle for the transfer of *Pseudomonas* bacteria and implicated bar soap in its spread.[14] Other groups of researchers have found that bacteria survive on soap bars in continuous use in public lavatories, even when cultured 48 hours following their last use.[15,22] The role of the soap dish in infection control has also been studied. Despite of CDC recommendations most health care settings like our hospital are using soap dishes instead of drainable racks. Jarvis et al showed that supplies used for hand washing can be contaminated with gram-negative organisms if they are not completely dried. Swabs were collected from soap dishes on 6 wards and from a bacteriology laboratory on 4 consecutive days. The sludge of the dish was found to be colonized with predominantly gram-negative bacteria. This colonization persisted, even when medicated iodophor bar soap was used.[25] In our study, dishes were found wet, and surfaces of soaps were generally covered by squashy mass and bars were found heavily contaminated (%88). This study revealed quite lower contamination rate in liquid soaps compared with bar soaps, although they didn't include suggested antibacterial agents for hand antisepsis such as triclorasan or chlorhexidine. However, liquid soaps would be expected to be sterile. So, there should be problems with the handling. Honestly, in this study any strict procedures had not been followed in the wards for the how often liquid dispensers should be cleaned, disinfected or exchanged. After the results were obtained, procedures were described for handling and usage of liquid soaps and dispensers immediately. In conclusion, correct use of hand washing materials is more important choosing kind of soaps. Hypothesis of transferring microorganisms to healthcare workers' hands via contaminated soap bars have not confirmed, antibacterial or not, liquid soaps seem more suitable alternative for hygienic hand washing. Proper handling of liquid soap should be implemented wherever they are used in the hospital. Compliance of the hand washing is more important than the kind of the soap.

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