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Study of prevalence of bacterial contamination of theatre shoes and smart phones of health care personnel employed in a tertiary care hospital

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Abstract

Purpose: In clean surgical procedures, Staphylococcus aureus from the exogenous environment or patient's skin flora is the usual cause of infection. Aim was to determine whether theatre shoes and smartphones are colonised with these pathogenic microorganisms.

Material and Methods: This was a descriptive cross-sectional study. The sample size was of 30 randomly selected health care personnel working in operating theatres. Samples were taken with swab soaked in normal saline from theatre shoes and smartphones.

Result: For theatre shoes, Coagulase negative staphylococci made up majority of the isolates followed by coliforms, methicillin resistant staphylococcus aureus (MRSA) and methicillin sensitive staphylococcus aureus (MSSA) respectively. On the other hand, coagulase negative staphylococci epidermidis was isolated in majority of smart phones followed by MRSA in 05, MSSA in 04 and Escherichia coli was isolated in rest of the 02 smart phones.

Conclusion: The use of smart phones within hospital premises must be restricted. The infection control committee of each hospital needs to draw up a plan to handle infection arising out of smart phones and theatre shoes.

Keywords: Smart phones, theatre shoes, operation theatre

Introduction

Bone and joint infection continues to pose considerable challenge in orthopaedic surgery despite, numerous advances in surgical techniques and evolution of innumerable antibiotics. In orthopaedic surgery, contamination of a surgical site may lead to the development of a prosthetic joint infection (PJI), posing a serious threat to the patient [1]. It causes enhanced morbidity, mortality, extended hospital in-patient stays, and economic burden to the hospital resources [2]. The incidence of surgical-site infections (SSIs) varies from 0.5% to 15% depending on the type of operation and underlying status of the patient [3].

In recent studies, objects such as bleepers, mobile phones and theatre shoes have been shown to harbour organisms similar to those causing PJIs [4]. The first study on mobile phones was performed by Borer in 2005, and many articles have been published since [5]. In 2012, a review of the use of smartphones in orthopaedic surgery described innovative roles for smartphones in the medical sector [6]. Although smart phones have become a valuable part of everyone's life, this device has been considered as one of the most important factors that threaten human health, e.g. transmitting microbial germs from one person to another [7]. A mobile phone can harbour more microorganisms than a man's washroom seat, the sole of a shoe, or a door handle [8].

It appears that organisms accountable for wound infections might be found on theatre shoes, but there are limited studies as far as our Indian operation theatre set up is concerned.

The aim of the study was to determine the prevalence and type of bacterial contamination of smart phones and theatre shoes of health care personnel employed in orthopaedic operation theatre of a teaching government tertiary care hospital.

Material and Method

This is a descriptive cross-sectional study. The sample size was of 30 randomly selected health care personnel working in orthopaedics operating theatres of a teaching government tertiary

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care hospital in the month of November 2019. Verbal consent was taken and those who decided to take part, samples were taken from theatre shoes and smartphones. The samples were immediately anonymised.

A total of 60 swab samples (2 samples each from an individual) were collected randomly each from the mobile phones and theatre shoes of operation theatre staffs by sterile swab that were moistened moderately with 0.9 % solution of sodium chloride and rubbed over the entire surface of the mobile phone and theatre shoes. Swab samples were then inoculated on blood agar and MacConkey agar plates and incubated overnight at 37°C for 24h. Plates were examined for the growth and the identification was made on the basis of

colony morphology, gram reaction, and numerous biochemical tests.

Statistical analysis was done by SPSS version 16.0 (SPSS Inc., Chicago, IL, USA).

Results

Total of 30 theatre shoes were included in the study. 24 theatre shoes were positive for one bacterial species. There was no bacterial growth in rest of the theatre shoes. Coagulase negative staphylococci (CoNS) made up majority of the isolates followed by coliforms, methicillin resistant staphylococcus aureus (MRSA) and methicillin sensitive staphylococcus aureus (MSSA) respectively (Figure 1).

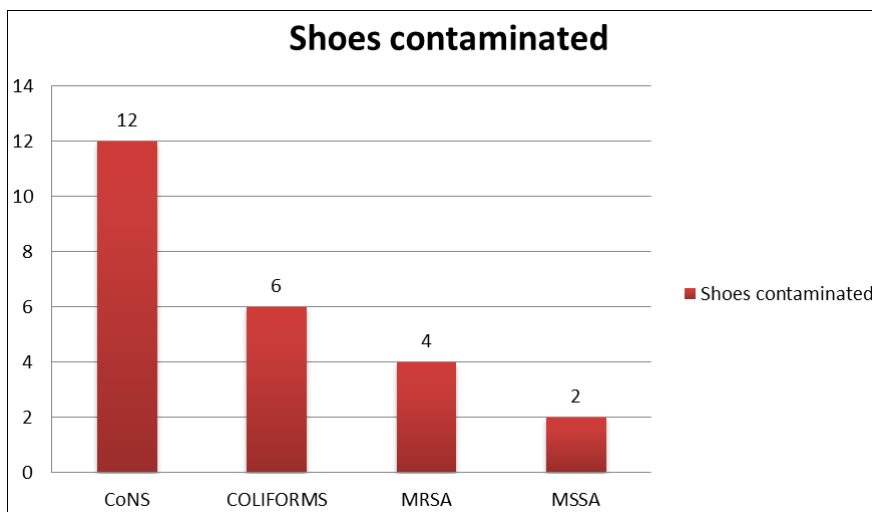


Fig 1: Proportion of shoes contaminated and micro-organisms cultured.

Total of 30 smart phones were included in the study. Coagulase negative Staphylococci epidermidis was isolated in 16 (59.25 %) smart phones while MRSA was isolated in 05 (18.51 %) and MSSA in 04 (14.81 %). Escherichia coli was isolated in rest of the 02 smart phones (7.40 %). No growth was noted in 03 smart phones (Table 1).

Table 1: Infection details from the smart phones of the health care workers.

Type of bacteria growth	Smart phones (n=30)
Coagulase negative staph. epidermidis	16
MRSA	05
MSSA	04
Escherichia coli	02
No growth	03

Discussion

Post-operative wound infection still remains one of the most important causes of morbidity and is the most common nosocomial infection in surgically treated patients [9]. The presence of foreign material, such as implants, results in a 6-fold reduction in the quantity of inoculates required to initiate infection, such that only a few bacterium may result in sepsis [10]. Implant material also increases the risk of sepsis from bacteria of low pathogenicity which are not otherwise associated with wound infection [11].

Our study revealed high prevalence of bacterial colonisation of smart phones (n=27, 90%). In study done by Bodena *et al.*, in 2019 the rate of bacterial colonisation was close to our rate with 94.2% [12]. In another study done by Jaya Lakshmi in 2008 [13], 91.6% of the samples were positive while Zakai *et al.* [14] revealed 96.2% of smart phones contamination.

For smart phones the most common bacteria isolated were Coagulase negative staph. Epidermidis (n=16) followed by MRSA (n=5), MSSA (n=4), and Escherichia coli (n=2). Our results are similar to the ones found by Zakai *et al.* where Coagulase negative Staphylococci epidermidis were the most common isolates 68% [14]. Even Ulger *et al.* in 2009 [15] concluded that Staphylococci epidermidis was the most predominant followed by staphylococcus aureus.

Our finding correlates well with the results of other researchers like Jayalakshmi *et al.* [16], Akinoyemi *et al.* [17] and Chawla *et al.* [18].

Simple measures such as hand hygiene practices and regular cleaning of the mobile phones with alcohol wipes may reduce the risk of infection caused by these devices [19]. In 2011, NHS recommended, regular cleaning of phones and hand hygiene have been introduced as main factors for prevention of spreading mobiles-related pathogens in hospital environments [20].

In our study, 40 % of the theatre shoes harboured CoNS, followed by coliforms in 20 %, MRSA in 13.33 % & and MSSA in 6.66 % respectively. Our results are similar to the one done by Rouin amirfeyz *et al.* in 2007 [21].

Although there are numerous measures to check spread of contamination in operation theatres but inadequate attention is being paid to check its enforcement. Now a day, disposable theatre gowns are being used and are discarded between the cases thereby minimising risk of transmission. But, a system to check spread of infection through theatre shoes is lacking. Chlorhexidine wipes can be used to wipe out shoes between the cases. Another alternative is use of over shoes. But literature is ambiguous over its outcome [22-23].

Conclusion

The use of smart phones in healthcare has been a boon but its use within hospital premises must be restricted. The infection control committee of each hospital need to draw up a plan to handle infection arising out of smart phones and theatre shoes.

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