



**Research Article**

**IN-USE TOOTHBRUSHES: A POTENTIAL SOURCE FOR INFECTION, HOSPITAL  
BASED PILOT STUDY**

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**ABSTRACT**

**Introduction and Aim:** Toothbrushes are frequently ignored equipment of oral hygiene, which can act as fomites and play important role in causing local as well as systemic disease. This study aimed at sensitizing health care givers about proper use of toothbrushes.

**Material and Method:** This was a prospective pilot study involving 50 respiratory patients. After 7 days in-use toothbrushes were microbiologically tested and spectrum of pathogens identified.

**Results:** Finding of this study showed 98% in-use toothbrushes were contaminated. Commonest pathogens isolated were coliforms.

**Conclusion:** In-use toothbrushes can be highly contaminated after use with potentially pathogenic micro-organisms and can act as fomites for transmitting infections. Thus, proper instructions should be given to patients and public about their use especially predisposed individuals.

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**INTRODUCTION**

In medical field, basic knowledge regarding decontamination and deep cleaning of instruments and environment is well known and understood. But certain things which are ignored and practically not implemented like decontamination of in-use toothbrushes. Toothbrushes are the primary aid to oral hygiene. Toothbrushes can become contaminated during storage and also during brushing<sup>1</sup>. Transient bacteremia is induced during brushing and thus increasing risk of transmission<sup>2,3</sup>. Toothbrushes may be contaminated by microorganisms not normally associated with oral flora<sup>4</sup>. Potentially pathogenic bacteria can infect our mouth and can spread to rest of body and can cause serious systemic diseases like heart disease, arthritis, stroke<sup>5,6</sup>. Thus toothbrushes can act as reservoir of microorganisms and can cause cross infection and reinfection in both healthy and ill adults<sup>2</sup>. This study is carried out to find spectrum of microorganisms present on toothbrushes of patients admitted in pulmonary ward. Results of this study, provides frequent microbiota on in-use toothbrushes of pulmonary patients of this hospital and serve as evidence based recommendation for use of toothbrushes.

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**METHODOLOGY**

**Place of Study:** Department of Microbiology, Shri Shankaracharya Institute of Medical Science, Bhilai

**Study Design:** It was a prospective, hospital based pilot study.

**Study Period:** 1 month from 01/March/2019 to 31 /March /2019

**Place of Study:** tertiary teaching hospital.

**Study Population:** Patients admitted in pulmonary ward of Shri Shankaracharya Institute of Medical Science, Bhilai.

SAMPLE SIZE: 50

**Inclusion Criteria:**

- Patients admitted in pulmonary ward for more than 2 days.
- Giving informed consent to participate.

**Exclusion Criteria**

- Critically ill patient not able to brush
- Patients refusal to give consent for participating in the study.

**Control:** 2 new toothbrushes were used as control

**Collection of data and microbiological study:**

**Sample collection**

After taking consent, patients were given a new toothbrush and instructed to brush their teeth daily twice (morning and evening) for seven days. All participants were recommended to use toothpaste without antimicrobial components. After seven days, toothbrushes were collected by ward sisters in sterile container provided by laboratory to them and sent to microbiology laboratory for analysis.

**Investigations to be done**

In laboratory, toothbrushes head were dipped in glucose broth and incubated aerobically at 37°C for 12 hour. After that broth were inoculated on blood agar, nutrient agar, MacConkey agar and Sabourauds Dextrose agar. Media were further incubated aerobically at 37°C for 24 hrs. Sabourauds Dextrose agar were incubated for 2 weeks before considering them to be negative. The identification of organisms was done as per standard microbiological method.

**Statistical Analysis:** Latest version of EPI info was used and appropriate statistical test was applied.

**OBSERVATIONS AND RESULTS**

**Results**

In the current study; out of 50 samples processed, males and females were 37(74%) and 13(26%) respectively.

Age range of selected patients was 25-66 years. (Table 1)

**Table 1** Descriptive statistics for age.

Age range	No (percent)
20-30	08(16)
31-40	06(12)
41-50	13(26)
51-60	16(32)
>60	07(14)
total	50

Out of 50 patients, 17 (34%) were from urban residence and 33(66%) were from rural area. Most of the participants in this study were educated.(Table 2)

**Table 2** Descriptive statistics for educational status

Education	No (percent)
Uneducated	07(14)
5 <sup>th</sup> class or below	06(12)
5-12 <sup>th</sup> class	13(26)
Graduate	16(32)
Post graduate or higher	08(16)
total	50

Out of 50 toothbrushes, 49(98%) showed growth and only 1 (2%) doesn't have growth. Out of 49 contaminated toothbrushes 43 were having polymicrobial growth while 6 were monomicrobial.

Toothbrushes showed *E.coli*, *Klebsiella Spp.*, *Pseudomonas aeruginosa*, *Proteus Spp.*, *Streptococcus*, *Methicillin sensitive Staphylococcus aureus (MSSA)*, *Methicillin Resistant Staphylococcus aureus (MRSA)*, *Coagulase negative Staphylococcus (CONS)*, *Moraxella Spp.* and *Candida spp.* Coliforms were predominant followed by *staphylococcus*, *pseudomonas aeruginosa*, *Proteus Spp.*, *streptococcus spp*, *candida*, and lastly *Moraxella spp.*(Table-3)

**Table 3** Spectrum of pathogens isolated

Organisms	Number (Percentage)
<i>E.coli</i>	36(37.5)
<i>Klebsiella Spp.</i>	11(30.6)
<i>Pseudomonas aeruginosa</i>	03(3.1)
<i>Proteus Spp.</i>	03(3.1)
<i>Streptococcus Spp.</i>	03 (3.1)
<i>Methicillin sensitive Staphylococcus aureus (MSSA)</i>	13(13.5)
<i>Methicillin Resistant Staphylococcus aureus (MRSA)</i>	07(7.3)
<i>Coagulase negative Staphylococcus (CONS)</i>	15(15.6)
<i>Moraxella Spp.</i>	02(2.1)
<i>Candida spp.</i>	03(3.1)
TOTAL	96

**DISCUSSION**

Due to limited number of studies done specifically related to contamination of toothbrush in predisposed individuals, it was necessary to conduct a preliminary evaluation. The present study showed that it is very important to disinfect the toothbrushes after use and before reuse as 98% of the samples collected yield growth of potentially pathogenic microorganisms. This is in agreement with studies done previously where all the toothbrushes samples showed contamination<sup>7,8,9</sup>. In the present study toothbrushes showed presence of *E.coli*, *Klebsiella pneumonia*, *MRSA*, *Pseudomonas aeruginosa*, *Proteus spp.*, *Streptococcus spp* and *candida spp.* which are pathogenic microorganisms and may cause systemic illness. This is in accordance with study done previously<sup>10,11,12,13</sup>. Heavy contamination with different microorganisms can be due to storage in hospital environment. Origin of different organisms can be from tap water, aerosols produced due to flushing, contaminated hands, from bathroom or other humid areas and it can be from oal flora which settles on used toothbrushes<sup>13,14</sup>. In this study, *MRSA* and *ESBL* are also isolated which may have come from hospital environment and can lead to cross infection on its use. Microorganisms can survive on used toothbrushes and can cause infection in immune compromised patients like respiratory indoor patients<sup>2,4,15,16,17</sup>. Contaminated toothbrushes can act as fomites and can transfer microorganisms by producing microscopic cuts during brushing which will act as portal of entry. In this study, coliforms were the most commonly found bacteria followed by *staphylococcus* which is in accordance to study done by Sheikh *et al.* and Snezana *et al*<sup>18,19</sup>. A study done by Denny FW, associates risk of in-use toothbrushes in transmission of respiratory infection<sup>17</sup>. All the isolated organisms have potential to cause respiratory infections, hence it is important to pay more attention towards proper use of toothbrushes. Several studies previously done, have recommended frequent change of toothbrushes<sup>20,21</sup>. But keeping in mind about the cost of changing toothbrushes regularly; other option can be disinfection of toothbrushes before its reuse.

**CONCLUSION**

This study limelight's importance of toothbrushes as fomite. Storage of in-use toothbrushes in unsanitary conditions are potential source of its contamination and can predispose to oral or general diseases especially among immunocompromised population. This study recommends health care givers to motivate patients about proper care of in-use toothbrushes.

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