

AN ASSESSMENT OF BACTERIAL LOAD OF TOOTHBRUSH KEPT INSIDE AND OUTSIDE THE BATHROOM – A COMPARATIVE INVITRO STUDY

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ABSTRACT

Oral health is an integral part of general health as it directly and indirectly reflects the overall wellbeing of an individual, thus maintaining the oral hygiene becomes a crucial factor(1). The oral cavity is free of microorganism at birth because the foetus develops in well protected environment, but later gets habituated by numerous microorganisms which may be due to exposure to polluted environment which contains various microorganisms or change in dietary habits as the child grows.

KEYWORDS: Oral Health, Toothbrush, Oral Cavity & Bacterial Load

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INTRODUCTION

Tooth brushes are the most commonly used oral hygiene aid to promote oral health and prevent dental diseases, these tooth brushes can get contaminated with microorganisms present in the oral cavity. Retention and survival of microorganism on tooth brush after brushing represents a possible cause for contamination(2)(3), since tooth brushes are the most commonly used oral hygiene aid to promote oral health and prevent dental diseases, but unfortunately proper care of tooth brush is often neglected and kept in bathrooms which is the good place to harbour millions of microorganisms. Themicroorganisms grows and flourish in warm and moist conditions and the wet environment In the bathroom where the tooth brushes are usually kept, may facilitate bacterial growth and cause contamination, especially which happens through the aerosols produced during the water passing the lavatories, enteric types from toilets and sanitary drainage.(4)

Retention and survival of microorganism on tooth brush after brushing represents a possible cause of recontamination in the mouth, hence prolonged usage of tooth brush facilitates confluent microbial growth on thebristle surface of the tooth brush, such as, streptococcus and lactobacilli species and since the tooth brushes are characterised as an environment formicrobial transport, retention and growth and also the highly contaminatedtooth brushes maybe a reason for repeated re infection, which implicates these microorganisms to cause dental caries, gingivitis and periodontal diseases, stomatitis, infective endocarditis in individuals affecting both the oral and general health.(5)

Thus with this background this study was contemplated to find out whether there exist any growth in microorganism when the tooth brush is stored in moist environment like bathroom with attached toilet or exposed to environment outside the bathroom with access to sunlight.

MATERIALS AND METHODS:

This was an invitro study, done in Ragas Dental College and Hospital, Chennai. A total of 40 children between the age group of 9 to 12 years who visited the dental department were randomly selected for the present study. Written informed

consent was taken prior to the commencement of the study from all parents and ethical clearance from institution was obtained for the same.

Subjects with history of antibiotic usage 3 months prior to the study, subjects undergoing orthodontic treatment and subjects with chronic systemic illness were excluded from the study and subjects who gave consent to participate in the study, subjects without dental caries and periodontal diseases were included in the study.

Dental hygiene instructions were explained to all the subjects after which each of them were given a uniform soft bristle sterilized tooth brush. Assuming the proportion of the infected tooth brushes to be 95% or almost all, as proved by Bhat et al., all tooth brush could get heavily infected by microorganism origination not only from the oral cavity but also from the surrounding in which they are stored.

A total of 40 children who participated in the study were given 40 sterilized soft brushes each and children were further divided into two groups, Group A (n=20) who were given 20 brushes were instructed to keep their tooth brush inside the bathroom which had an attached toilet, among group A they were divided into group A1 (n=10) who were asked to place their brush 5 inch from the faucet and group A2 (n=10), who were asked to place their brush away from the faucet and the other group B (n=20), children were asked to store their brushes outside the bathroom and they were asked to continue for 3 months, At the end of third month, the tooth brush samples are collected in a sterile container which was provided for further microbiological assay.

The microbial assay was carried out by immersing the head of the brushes containing the bristles in 10ml sterile saline and vortexed vigorously for 10mins. This 1 ml of saline suspension was serially diluted up to 10⁻⁷ solution, 100 µL of each serial dilution was plated onto nutrient agar plated using sterile L-rod and were incubated at 37 c for 24-48 hours and the number of CFU of microorganisms were calculated using digital colony counter.

The data was entered and statistical analysis was carried out, using SPSS version 20. The mean CFU of bacteria formed between tooth brushes kept inside the bathroom and those kept outside the bathroom were compared.



Figure 1: The Tooth Brush Samples Kept inside the Bathroom, Outside the Bathroom and Insunlight were Immersed in Sterile Saline.

The Total Colony Forming Unit (CFU/ml) was Calculated using the Formula

$$\text{CFU/ML} = \frac{\text{Total number of colonies counted}}{\text{Dilution factor}}$$

Total viable counts of bacterial population enumerated

RESULTS

The results obtained showed that when the tooth brush was kept inside the bathroom, Too numerous to count (TNTC) CFU/mL >300 colony count/ml, 10^{-7} dilution was present, when tooth brushes placed outside the bathroom showed mild reduction in total colony count and when they were placed under sunlight, gradual reduction in total colony was present.

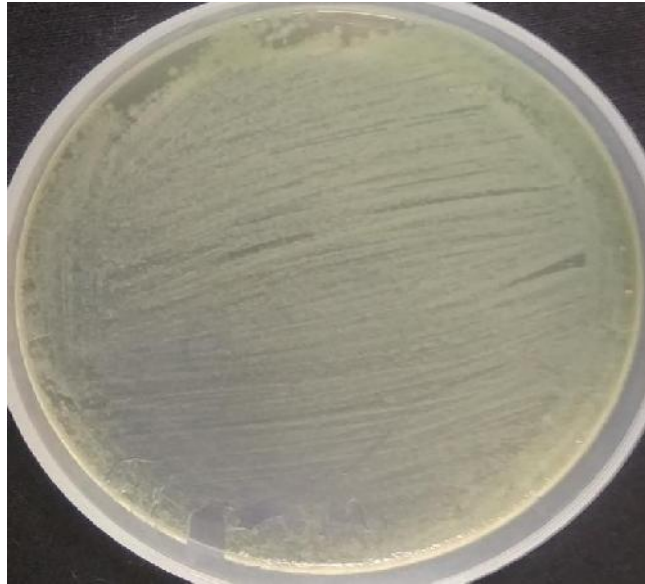


Figure 2: Inside Bathroom- Too Numerous to Count(TNTC)CFU/mL >300 Colony Count/ml,10 Dilution.

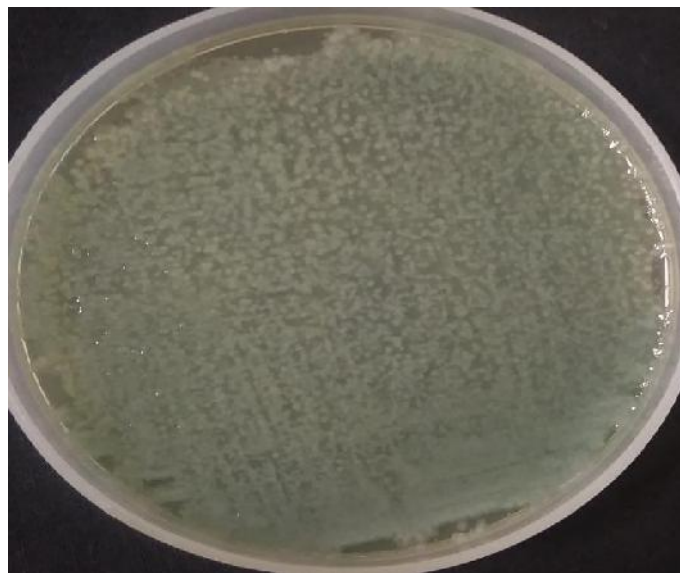


Figure 3: Outside Bathroom Showing Mild Reduction in Total Colony Count.



Figure 4: Sunlight Showing Gradual Reduction in Total Colony Count.

DISTRIBUTION SHOWING THE MICROBIAL LOAD IN CFU/ML AT 10⁻⁷ DILUTION

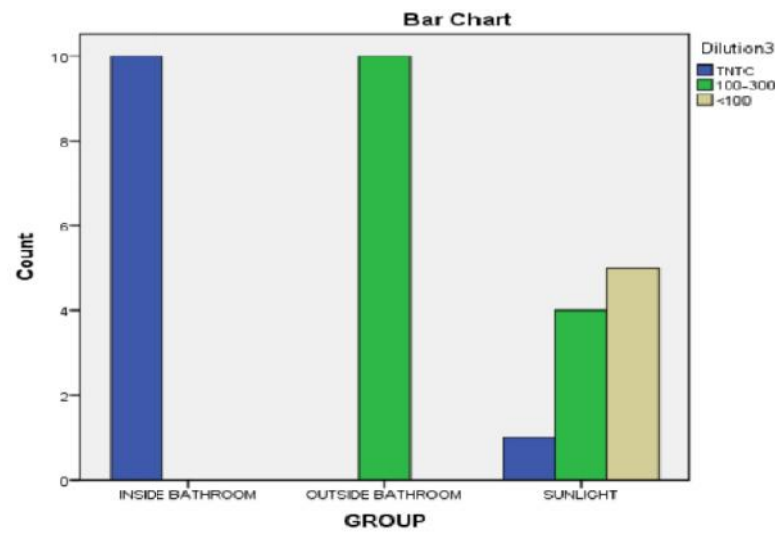


Figure 5

DISCUSSIONS

Tooth brushing is indispensable in tooth plaque care and serves as a basic method to prevent oral diseases and it is the most common method of delivering and maintaining good oral hygiene.

Oral cavity is a place with the highest concentration of different microbial population (more than 700 species) which is especially colonized by streptococcus species, staphylococcus sp., Bacteroides sp., Actinomyces sp., Treponema sp., Mycoplasma sp., which can settle on the tooth brushes. The contamination with enterobacteria and pseudomonas is due to incorrect keeping of tooth brushes, usually out of cupboards or above the sinks, where the aerosols from toilet can easily reach them.

As for tooth brush storage, location general bacteria were found more often when toothbrushes are stored in a humid environment than in a dry environment.

Pesveska et al studies showed that 85% of participants who stored tooth brushes in bathroom with toilets had more pathogenic microbial contamination of tooth brush than remaining 15% of participants who stored tooth brush in bathroom without toilets. In the present study, tooth brush was found to be extensively contaminated with a variety of microorganisms. The results of the present study are in comparison with a study by Naik et al (2015). The significance of storing and maintaining tooth brush such as disinfecting it at regular intervals is important for wellbeing of an individual.

G N Karibasappa et al (2011) study showed that *S.mutans*, *S.aureus*, *Pseudomonas*, *Lactobacilli*, *Klebsiella*, *Candida* were isolated in the 1 and 3 months used tooth brushes kept in bathroom without attached toilet and *E.coli* was found in 3 months used tooth brush kept in bathroom with attached toilet which was relevant to the present study.

A study done by Swathi Naidu et al (2015) revealed that Bacteria and viruses falling from the toilet spray remain air-borne long enough to settle on the surfaces throughout the bathroom, hence tooth brushes are responsible for cross contamination which was in relevance to this study

A study at American society for microbiology reported that 60% of shared bathroom toothbrushes contain fecal matter. Furthermore, Contreras et al 2010 concluded that closeness to the toilet, aerosols created during toilet flushing and humid environment of the bathroom may facilitate the tooth brush contamination. This study showed difference between the number of microbial contaminants between the tooth brush stored inside the bathroom with combined toilet and those kept outside the bathroom under natural sunlight. Further studies with larger sample sizes would be beneficial in future studies.

CONCLUSIONS

There is significant reduction in the microbial growth in the toothbrushes which were kept under sunlight compared to the toothbrushes stored inside and outside the bathroom.

LIMITATIONS

- Smaller sample size.
- Only toothbrushes used for 3 months were examined.
- In between assessments of 15 days, 1, 1.5, 2, 2.5 months should have been conducted to know the pathogenicity of microorganisms and to evaluate the occurrence of any infections in subjects following the use of contaminated toothbrushes.

RECOMMENDATIONS

- Change of toothbrushes after every 3 months as per ADA recommendation.
- Those subjected to major surgery are to change brushes everyday and those sick should change at the beginning of illness, when they first feel better and when they are completely well.
- Toothbrushes should not be kept in bathrooms especially those which have combined toilet which harbor potential pathogens. Flush the toilet with the lid closed.

- Toothbrushes can be dried in the windows or balcony under sunlight and it acts as a natural method of post rinsing storage environment.
- Lot of brushes should not be kept in one container, they will rub against each other and spread germs.
- Toothbrushes should not be exchanged between individuals.
- Use of antimicrobial solutions, air drying, sanitizers and homemade microbial solutions like 3% neem and salt water may be recommended by dentists as part of routine oral hygiene instructions.

REFERENCES

1. Chirag M. Raiyani, Ruchi Arora, Deepak P. Bhayya, Subha Dogra, Abhinandan A. Katageri and Vikram Singh: assessment of microbial contamination on twice a day used toothbrush head-an in vitro study: *Journal of natural science biological medicine*, 2015 August; 6 (Supplement 1): S44-S48
2. Pesevska S, Ivanovski K, Mindova S, Kaftandzieva A, Ristoska S, Stefanovska E et al. Bacterial Contamination of The Toothbrushes. *Journal of International Dental and Medical Research (J Int Dent MedRes 2016; 9: (1), pp. 6-12.*
3. Mehta A, Sequeira PS, Bhat G. Bacterial contamination and decontamination of toothbrushes after use. *N Y State Dent J 2007;73:20-2*
4. Taji S.S & Rogers A.H. The microbial contamination of toothbrushes. A pilot study. *Australian Dental Journal. 1998 ;43 :2):128-30*
5. Nascimento AP, Watanabe E, Ito IY. Toothbrush contamination by *Candida* spp and efficacy of mouth rinse spray for their disinfection
.Mycopathologia. 2010;169(2):133-8
7. Seung-Geun Lee, Bo - Ram Kang, Han-Sol Kim, Hyuk-Hyun Park, Hye-Ran Park, Seul-Ki Yoon, Seoul-Hee Nam: changes in number of bacteria in the toothbrush according to the management method: *Biomedical research-India 2017/ volume 28 Issue 16.*
8. Nilofer Sultan Sheikh, Neelima S. Rajhans, Nikesh Moolya, Nilkanth Mhaske, Gabrielaa Jude Frenandes and H.M Sudeep: Bacterial contamination of toothbrushes and their disinfection by EDTA, sodium perborate, 3% neem- A clinico-microbiological study: *The journal of dentist, 2014 volume2, number2.*
9. Orogu J.O and Ehiwario M.J: Comparative study of bacteriological examination of daily use toothbrushes stored in bathroom and room: *Journal of science and research 26 July 2016.*
10. Cai Z, Chattoadhyay N, Liu WJ, Chan C, Pignol JP, Reilly RM (November 2011): "optimized digital counting colonies of clonogenic assay using image J software and customized macros: comparison with manual counting". *International journal of radiation biology. 87(11):1135-46.*
11. Kauffman JH- a study of toothbrush *Dental cosmos 1929:71:132-14-140.11. Goldman, Emanuel; Green, Lorrence H: Practical handbook of microbiology. USA: CRC*
12. Karibasappa G N, Nagesh L, Sujatha B K. Assessment of microbial contamination of toothbrush head: An in vitro study. *Indian J Dent Res 2011;22:2-5.*
13. Yadav S. Toothbrushes in Bathroom-Clean before you clean. *J Adv MedDent Scie Res 2015;3(5):S57-S59.*

14. Naik R, Ahmed Mujib B R, Telagi N, Anil B S, Spoorthi B R. Contaminated tooth brushes-potential threat to oral and general health. *J Family Med Prim Care* 2015;4:444-8.
15. Contreras A, Arce R, Botero JE, Jaramillo A, Betancourt M. Tooth brush contamination in family members. *Revista clinica de periodoncia, implantologia rehabilitacion oral*.2010;3(1):24-6

