Assessment of Microbial Load in the Dental Chair Waterlines Using Bio Luminometer

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ABSTRACT: Introduction: The microbiological quality of dental unit waterline is considered to be important as the water enters the oral cavity of the patients and the quality of the water should be suitable for consumption.Pathogens present in the dental chair waterlines can be transmitted to patients or the doctor and cause some major threat to patients or the doctor and cause some major threat to immunosuppressive patients,
Aim: To assess the microbial load in the dental chair waterlines.
Materials and methods: Ultrasnap ATP device is used with a hygienic bio luminometer. Assessment of microbial load is done before and after the disinfection of dental chair waterlines.Sodium hypochlorite is used as disinfecting agent.Results are analyzed using T-test.
Result and Discussion: Before disinfection the microbial load was 85RLU which reduced down to 49RLU shows the effectiveness of disinfection by bringing down by 42%. From this study we can conclude the effectiveness of the disinfection process and its necessity.

Keywords: Novel method, bio luminometer, innovative technique, microbial load, dental chair.

1. INTRODUCTION

The dental unit waterline is outfitted with a system of thin plastic tubes known as Dental chair waterline which delivers water to the various handpieces.Water is used to cool high speed handpieces and is required in water syringes and ultrasonic scales.The water may be circulated in an open system where it is drawn from a municipal water supply or in a closed system where it drains into container(1)

Microbial studies of Dental Unit Waterline samples from 150 surgeries revealed the widespread and unacceptable level of contamination prevailing among dental clinics. Formation of biofilm in the wall of the fine bore waterline is the primary reason for contamination of DUWs.(1,2)
Alternative faster technologies for evaluating the microbial load have been developed in the recent decades.One of the approach is based on measuring the

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bioluminescence generated by firefly luciferase by oxidative decarboxylation. Luceferin in presence of ATP is a chemical found in both life and food as non microbial ATP. Our team has extensive knowledge and research experience that has translate into high quality publications (3–12))((13–22).

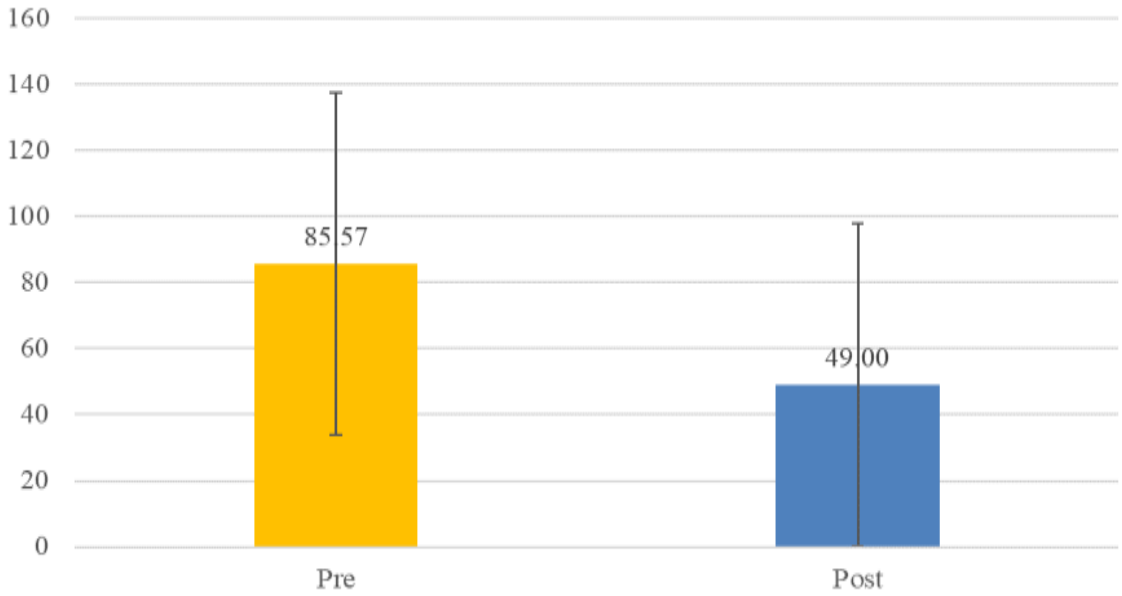
Biofilms are a collective of one or more types of microorganisms that can grow on many different surfaces. Biofilms usually builds up on the interior of DUWL very quickly after the first use.The biofilms are the most significant cause of DUWL water contamination.If the microbial content vastly exceeds the microbial quality criteria sensitivity hosts may become ill nonetheless, the overall health concerns associated with DUWL water quality are likely to be minor.(23). The aim of this study is to assess the microbial load in the dental chair waterlines.

Materials and methods:

Bioluminometer is the fastest device used to asses the microbial load of a swab in seconds. In this study we have used Hygenia bio luminometer and ultrasnap ATP device. First set of swabs are taken from disinfected waterlines on the dental chairs. Swabs are taken by fully immersing the ATP device and the top is squeezed and shaken for 5 seconds to activate the ATP device. Initial reading of the swabs are taken and noted. Before taking the next set of readings the units are disinfected with sodium hypochlorite.Readings are taken and the means of pre and post disinfectants are differentiated using T-test. Statistical analysis are done using SPSS version 23.0.

2. RESULT AND DISCUSSION

Figure 1 : Graph depicting contamination before and after disinfection



From figure 1 we can observe that disinfection of dental chair waterlines with sodium hypochlorite effectively reduces the microbial load by 36% from 85RLU to 49RLU.RLU means to measure the contamination. RLU stands for Relative Light Units.This study shows the importance of disinfecting the dental chair waterlines.

Several factors can have an impact on Dental unit water line water quality.(D.C. Coleman et al.) In current circumstances students violating protocols is the most reason for contamination of DUWL quality

criteria.However due to limited human capacity and the size of the dentistry school, infection control personal cannot provide 100 percent control system.As a result teachers in student clinics were actively involved in guiding students through daily and routine phases.
Several variables can impact the DUWL water quality. In a prior survey research it is revealed how difficult it is for a student to follow infection control standard (Ibrahim AliAhmad et al,2013). According to european survey on general dentistry practioner's attitude on microbiological danger associated with DUWLs. Majority of the dentists did not clean, disinfect or assess the microbial load in the DUWLs.In 2013 a random sample of 116 DUWLs in netherlands found that only 34% of the DUWLs scored less than 200 cfu/ml which was the criteria at that time. Our team has extensive knowledge and research experience that has translate into high quality publications (24), (25), (26), (27), (28,29), (30), (31), (32), (33), (34), (35), (36), (37).

Main disadvantages of ATP bio luminometer to be considered are availability of non microbial sources of intrinsic or somatic ATP which might increase the observed light intensity.In many circumstances designed sample pretreatment can address the problem. Particularly for matrices containing high level of interfering somatic ATP such as meat, fruit juices and these assay procedure include steps to either separate microbial from somatic ATP so that all remains in the sample is associated with microbial contamination through these steps increase assay time and decrease the sensitivity.

3. CONCLUSION

From this study we can conclude the importance of the disinfection process and the disinfection with sodium hypochlorite seems to be effective for disinfection of dental unit waterlines.

Conflict of Interest :
The authors hereby declare that there is no conflict of interest in this study.

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Author Contribution :
A) Santhosh S - contributed in designing the study, execution of the project, statistical analysis, manuscript drafting.
B) Dr. Jayalakshmi - contributed in designing the study, execution of the project, statistical analysis, manuscript drafting.
C) Dr.V.Vishnupriya - contributed in study design, guiding the research work, manuscript correction.
D) Dr. Gayathri R - study design, statistical analysis, manuscript proofreading and correction.
E) Dr. Kavitha S - study design, statistical analysis, manuscript proofreading and correction.

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