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Research Article

Knowledge, attitude, and practice regarding dental unit waterline disinfection among dental practitioners of India

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ABSTRACT

Irrigating the oral cavity during dental treatment along with providing cooling to certain items of equipment such as air rotors and mechanical scalars is done by dental unit water systems. It has been revelaed out through many studies that the output water of dental units is colonized with microorganisms which serve as a potential source of infection. As per the ethics (non- maleficence), it is the duty of a dentist to ensure that dental chair units provide good quality water output. Hence, it is important to assess the knowledge, attitude, and practice regarding disinfection of dental unit waterline (DUWL) among dental practitioners. A cross-sectional study is conducted among the dental practitioners practising in Chennai, India. The sample size was calculated as $n = 114$. A pre-tested, structured questionnaire was randomly distributed to the selected number of dental professional in Chennai, India. Filled questionnaires were collected and considered for analysis. Ethical clearance was obtained before the start of the study. Of the 130 dentists who received the questionnaire and a reminder, 103 (80%) returned the completely filled forms. Postgraduate (0.34 ± 0.586) had higher mean knowledge score compared to undergraduate (0.18 ± 0.385), and academicians (0.40 ± 0.610) had higher mean knowledge score than non-academicians (0.13 ± 0.334). The difference was found to be significant statistically. However, there was no significant difference in mean attitude and practice scores between different groups. The dental practitioners who responded to this survey generally did not disinfect or test their DUWLs. However, they were concerned with the well-being of the patient and were ready to adopt an effective method of DUWL disinfection. Conduct workshop or continuing dental education programs on disinfection of DUWL may improve the attitude toward disinfection of waterlines.

Keywords: Cross-infection, dental unit waterlines, cross-infection, knowledge

Introduction

Health is defined as a state of complete physical, mental, and social well-being and not merely the absence of disease or infirmity.[1] Oral health is an integral part of general health. Oral health implies much more than healthy teeth, as the mouth is both a cause and a reflection of individual and population health and well-being.[2] The relationship between general health and oral health has been highlighted in the report given by surgeon general.[3]

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Various apparatuses are used by dentists in their offices in treating patients and restoring their oral health. This includes dental chair units, triple syringe system, high-speed handpieces, and ultrasonic scalars.[4] A dental chair unit is furnished with a system of thin, plastic tubes, called dental unit waterlines (DUWLs).[5] Dental unit water systems (DUWSs) are used to irrigate the oral cavity during dental treatment and provide cooling to certain items of equipment such as air rotors and mechanical scalars.[6] Output water from DUWLs may be a potential source of infection for both dental health-care personnel and patients. Many studies have shown that the output water of dental units is colonized with microorganisms including environmental bacteria, opportunistic and true human pathogens, and organisms commonly found in the oral cavity (e.g., *Streptococci*).[6]

The propensity of microorganisms, and especially bacteria, which colonize the surfaces of DUWL and form biofilm, is a widespread phenomenon.[7-9] The source of bacterial contamination within the dental unit water supply is thought to be due to microcolonies of proliferating microorganisms on the inner surface of the water lines.

The organisms are embedded in a matrix of extracellular polymeric substances forming a biofilm.[10] Biofilms are important because they protect organisms from the effects of heat and chemicals, thus reducing their susceptibility to disinfection processes.[10] The biofilm environment in DUWL creates conditions conducive to multiplication of viruses, bacteria, fungi, protozoa, and amoebae. As stated earlier, a single dental chair unit can be used in the treatment of many patients each day, and microbial contamination of specific component parts can be a significant potential source of cross-infection.[11]

There are currently no official standards or legislation regarding the microbial quality of DUWL. Furthermore, until recently, there has been hardly any specific guidance from dental chair unit manufacturers on dental chair unit supply water quality.[12] Actually, the responsibility for ensuring that dental chair units provide good quality water output has, by and large, been considered to rest on the shoulders of dental practitioners and/or dental clinic management.[13] Hence, it is important to assess the knowledge, attitude, and practice regarding disinfection of DUWL among dental practitioners.

Materials and Methods

A cross-sectional study is conducted among the dental practitioners practising in Chennai, India. The sample size was calculated manually as $n = 114$ based on the study done by Burke *et al*.[14] A 10% drop out rate has been considered, and the sample size was recalculated as 126 and rounded off to 130. The list of dentists practising in Chennai registered with the dental council of India was obtained. Following simple random sampling, 130 dental professionals were selected. A self-administered questionnaire was randomly distributed to the selected number of dental professional. Dentists who were not willing to participate and who were unavailable even after three consecutive visits to their clinics/hospitals were not included in the study.

The survey instrument comprised of a pre-tested, structured questionnaire which was adapted from questionnaires used previously in studies done by Burke *et al.*, 2005.[14] The survey tool consisted of several parts. The first section collected demographic information of the participants such as age, gender, level of education, and number of years of experience in clinical practice and academics. The second part of the questionnaire consisted of 16 questions to assess the participant's levels of knowledge, attitude, and practices regarding management and disinfection of DUWL.

After a brief introduction on the purpose and intent of the study, questionnaires were distributed to the dentists, and filled questionnaires were collected. Only completely filled forms were considered for analysis. A reminder was later sent to the non-respondent 1 week and 3 weeks after the supposed date of reception of the questionnaire.

Ethical clearance was obtained before the start of the study from the Institutional Ethics Committee, Saveetha University. The anonymity of the participants was maintained. Data collection was scheduled in February and March 2017. Data were entered in Microsoft Excel spreadsheet and were analyzed using SPSS software (version 17.0). A $P < 0.05$ is considered statistically significant.

Results

Table 1 shows a comparison of mean scores of knowledge, attitude, and practice scores based on educational qualification. The mean knowledge score of undergraduates (0.18 ± 0.385) and postgraduates (0.34 ± 0.586) was found to be statistically significant ($P = 0.005$). The mean attitude score of undergraduates (7.17 ± 2.89) and postgraduates (6.30 ± 2.64) was not found to be statistically significant ($P = 0.727$). The mean practice score of undergraduates (0.65 ± 0.949) and postgraduates (1.04 ± 1.037) was not found to be statistically significant ($P = 0.591$).

Table 2 shows a comparison of mean scores of knowledge, attitude, and practice based on gender. The mean knowledge score of male (0.21 ± 0.410) and female (0.33 ± 0.603) was found to be statistically significant ($P = 0.026$). The mean attitude score of male (6.67 ± 2.75) and female (6.69 ± 2.82) was not found to be statistically significant ($P = 0.881$). The mean practice score of male (0.83 ± 1.06) and female (0.91 ± 0.973) was not found to be statistically significant ($P = 0.618$).

Table 3 shows a comparison of mean scores of knowledge, attitude, and practice based on academic experience. The mean knowledge score of academicians (0.40 ± 0.610) and non-academicians (0.13 ± 0.334) was found to be statistically significant ($P = 0.001$). The mean attitude score of academicians (6.68 ± 2.90) and non-

Table 1: Comparison of mean scores of knowledge, attitude, and practice scores based on educational qualification

Scores	Qualification	*n*	Mean±SD	*P*
Knowledge score	Undergraduate	47	0.18±0.385	0.005*
	Postgraduate	56	0.34±0.586	
Attitude score	Undergraduate	47	7.17±2.89	0.727
	postgraduate	56	6.30±2.64	
Practice score	Undergraduate	47	0.65±0.949	0.591
	Postgraduate	56	1.04±1.037	

Independent *t*-test. SD: Standard deviation, *$P < 0.05$ is considered statistically significant

Table 2: Comparison of mean scores of knowledge, attitude, and practice based on gender

Scores	Gender	*n*	Mean±SD	*P*
Knowledge score	Male	53	0.21±0.410	0.026*
	Female	50	0.33±0.603	
Attitude score	Male	53	6.67±2.75	0.881
	Female	50	6.69±2.82	
Practice score	Male	53	0.83±1.06	0.618
	Female	50	0.91±0.973	

Independent *t*-test. SD: Standard deviation, *$P < 0.05$ is considered statistically significant

Table 3: Comparison of mean scores of knowledge, attitude, and practice based on academic experience

Scores	Gender	*n*	Mean±SD	*P*
Knowledge score	Academic experience	53	0.40±0.610	0.001*
	No academic experience	50	0.13±0.334	
Attitude score	Academic experience	53	6.68±2.90	0.309
	No academic experience	50	6.57±2.65	
Practice score	Academic experience	53	1.10±1.06	0.221
	No academic experience	50	0.62±0.91	

Independent *t*-test. SD: Standard deviation, *$P < 0.05$ is considered statistically significant

academicians (6.57 ± 2.65) was not found to be statistically significant ($P = 0.309$). The mean practice score of academicians (1.10 ± 1.06) and non-academicians (0.62 ± 0.91) was not found to be statistically significant ($P = 0.221$).

Table 4 depicts the correlation between knowledge and attitude regarding DUWL disinfection among dental practitioners. There was a positive correlation found in between the knowledge and attitude (0.035). However, it was not statistically significant ($P = -0.740$).

Discussion

DUWSs are used to irrigate the oral cavity during dental treatment and provide cooling to certain items of equipment such as air rotors and mechanical scalars. Water delivered from these devices is not sterile and has been shown to contain relatively high numbers of bacteria.[6]

This questionnaire study was carried out to highlight the level of knowledge, attitude, and practices regarding disinfection of DUWL system among dental professionals in Chennai. Of the 130 dentists who received the questionnaire and a reminder, 103 (80%) returned the completely filled forms of which 47 (45.6%) of the study subjects were undergraduate and 56 (54.4%) were postgraduate. A reminder was later sent to the non-respondent 1 week and 3 weeks after the supposed date of reception of the questionnaire.

In this study, majority of the units were fed by booster bottle or individual water bottle reservoir (80.6%), followed by main tap water (14%) and tank water (5.4%) as a source for dental unit, whereas, in the study conducted by Kamma *et al.*,[6] majority of units (64%) were fed by mains water, and only 9% by tank and 27% by independent water bottle reservoirs. In Greece and Germany, all systems were mains fed, and in Ireland, the majority were tank-fed, whereas in Spain, there was a mixture of mains, bottle, and tank.[6]

As far as hardness of the water is concerned, majority of the study participants (44.1%) did not know the type of water they were using, followed by 19.4% using soft water, 14% using hard water, 13% using distilled water, and 2% were using filtered drinking water for their dental unit, whereas in the study conducted by Kamma *et al.*,[6] 40% of the units were supplied by hard water, 29% by soft water, and 31% by deionized water. A study done by Burke *et al.*[14] revealed that 42% of dental units in Ireland are fed with distilled or deionized water.

Table 4: Correlations between knowledge, attitude, and perception scores

Mean scores	Knowledge score	Attitude score
Knowledge score		
Correlation		0.035
P		0.740
n		
Attitude score		
Correlation	0.035	
P	0.740	
n		

Pearson's correlation

The vast majority of subjects (89.4%) did not have any microbiological analyses carried out on their water among which 44.7% did not have any idea about the microbial analysis of DUWLs which was in hand with the study conducted by Kamma *et al.*,[6] and Burke *et al.*[14]

A very few number of study subjects (12.6%) disinfected their DUWLs on a regular basis. The materials used to disinfect were glutaraldehyde, chlorinated water, sodium hypochlorite, and dettol for which the average expenditure was around 1000 INR and average time taken was 35 min.

In our study, the comparison was done between the study subjects based on their level of education. There was a significant difference in the mean knowledge score of undergraduate (0.18 ± 0.385) and postgraduate (0.34 ± 0.586) which was found to be statistically significant ($P < 0.005$). However, the difference in mean attitude and practice scores between undergraduate and postgraduate was not found to be statistically significant. The reason for increased knowledge among postgraduate may be that more emphasize was given on sterilization and disinfection on their postgraduate curriculum.

In our study, the comparison was done between the study subjects based on gender. Female (0.33 ± 0.603) had higher knowledge than male (0.21 ± 0.410) which was found to be statistically significant ($P = 0.026$). However, there was no significant difference in the attitude and practice scores between the genders.

In the current study, the comparison was done between the knowledge, attitude, and practice scores among academicians and non-academicians. The difference in mean knowledge score of academicians (0.40 ± 0.610) and non-academicians (0.13 ± 0.334) was found to be statistically significant ($P = 0.001$). Despite the increase in the knowledge scores, there was no significance in attitude and practice scores among the academicians and non-academicians.

All the study subjects were concerned about the quality of water and ready to implement DUWL disinfection in their clinics. The availability of simple and rapid methods to assess water quality and monitor the effectiveness of treatments would play an important role in achieving this goal. On an average, the study subjects were ready to spend around 1350 INR on DUWL disinfection.

Conclusion

The dental practitioners who responded to this survey generally did not disinfect or test their DUWL. However, they were concerned with the well-being of the patient and were ready to adopt an effective method of DUWL disinfection. Conduct workshop or CDE programs on disinfections of DUWL may improve the attitude toward disinfection of waterlines.

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