*Original Research Article*

Knowledge, Attitude & Practice regarding

Dental Unit Waterline (DUWL) System Disinfection among Dental Students & Practitioners

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ABSTRACT

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| **Aims:** This study aimed to determine knowledge, attitude and practice regarding Dental Unit Waterline(DUWL)System Disinfection among dental students and practitioners. **Study design:** Survey.**Place and Duration of Study:** Sample: Department of Medicine (Medical Unit IV) and Department of Radiology, Services Institute of Medical Sciences (SIMS), Services Hospital Lahore, between June 2009 and July 2010.**Methodology:** Please write main points of the research methodology applied. Sample: We included 63 patients (40 men, 23 women; age range 18-75 years) with liver cirrhosis and portal hypertension, with or without the medical history of gastrointestinal bleeding. Clinical as **Results:** Of the 180 dentists who received the questionnaire Postgraduate (0.34 ± 0.586) had higher mean knowledge score compared to undergraduate (0.18 ± 0.385), The difference was found to be significant statistically. However, there was no significant difference in mean attitude and practice scores between different groups. **Conclusion:** 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 |

1. INTRODUCTION

Dental professionals rely on a variety of apparatuses, such as dental chair units, ultrasonic scalers, and high-speed handpieces, to maintain and restore oral health. [1] Among these, dental unit waterlines (DUWLs) play a crucial role, supplying water for cooling equipment and irrigating the oral cavity during dental treatments. [1, 2]

Studies have demonstrated that DUWLs harbor various microorganisms, such as Legionella pneumophila, Pseudomonas aeruginosa, and Staphylococcus aureus, which can have severe implications, particularly for immunocompromised individuals. [3, 4, 5, 6]

Consequently, DUWL contamination becomes a potential source of cross-infection, threatening both patients and dental healthcare personnel.^11^ Despite these risks, there are currently no universal standards or legislation governing the microbial quality of DUWLs, leaving the responsibility of maintaining water quality largely on dental practitioners.[4] .

The presence of these pathogens in DUWLs necessitates risk management strategies to reduce microbial contamination to acceptable levels, such as less than 500 CFU/ml heterotrophic bacteria, as recommended for potable water.[8,9] Various guidelines and recommendations have been proposed by professional organizations and governmental bodies to aid dental practitioners in maintaining the quality of their DUWL systems.[10]

2. material and methods

Study Design

This study employed a cross-sectional survey design to investigate the knowledge, attitudes, and practices of dental students regarding dental unit waterline (DUWL) decontamination. The study utilized a structured, pre-tested questionnaire adapted from previously validated instruments, specifically those used in studies by Burke et al. (2005)[ Burke FM, O’Mullane D, O’Sullivan M. Attitudes of Irish and European dentists to water quality of dental unit water systems. J Ir Dent Assoc 2005;51:119-25.] and Kengadaran et al.[ ]

**Survey Instrument**

The questionnaire comprised three sections:

1. Demographics: Collected data on participant characteristics, including gender, level of study.

2. Knowledge: Assessed participants' knowledge of DUWLs, including contamination sources, potential risks, and recommended decontamination procedures.

3. Attitude: Evaluated participants' attitudes towards DUWL decontamination, including perceived importance and willingness to adhere to recommended practices.

**Data Collection**

The questionnaire was administered online using Google Forms. Participants were required to complete all questions before proceeding to the next section.

Ethical Considerations

To ensure confidentiality, participant anonymity was strictly maintained. No personally identifiable information was collected.

3. results and discussion

Data was analyzed using descriptive statistics. Numerical variables were presented as mean and standard deviation (SD) for normally distributed data.

To explore associations between demographic factors—such as gender, educational level, , received information, guidance, and personal experiences—and the knowledge and attitude scores, statistical analyses were performed using Pearson’s correlation coefficient and independent t-tests.

Knowledge and attitude scores were assessed quantitatively, with higher mean scores indicating a better understanding and a more positive attitude towards DUWL decontamination.

Out of 180 participants, comprised of 124 (%) undergraduate and 56

(%) postgraduates students, participated in this study. Table 1 shows demographic profile and information of the respondents (n = 180). 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).

**Table 1 shows demographic profile and information of the respondents (n = 180)**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).

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| --- | --- | --- |
| **Variable**  | **N**  | **%age**  |
| **Level of study**  | Undergraduate  | 124  | 68.9  |
| Post Graduate  | 56  | 31.1  |
| **Gender**  | Male  | 36  | 20.0  |
| Female  | 144  | 80.0  |
| **Received information on DUWLS**  | Yes  | 56  | 31.1  |
| No  | 100  | 55.6  |
| Not Sure  | 24  | 13.3  |
| **Source of information**  | Attended talk/course  | 68  | 37.8  |
| Attended curriculum lecture  | 52  | 28.9  |
| Internet  | 8  | 4.4  |
| From a teacher  | 8  | 4.4  |
| Haven't received  | 44  | 24.4  |
| **Received guidance on DUWLS**  | Yes  | 28  | 15.6  |
| No  | 128  | 71.1  |
| Not Sure  | 24  | 13.3  |
| **Source of guidance received**  | Attended talk/course  | 76  | 42.2  |
| Attended curriculum lecture  | 44  | 24.4  |
| Internet  | 8  | 4.4  |
| From a teacher  | 8  | 4.4  |
| Haven't received  | 44  | 24.4  |
| **Personal experience in managing DUWLS**  | Yes  | 20  | 11.1  |
| No  | 136  | 75.6  |
| Not Sure  | 24  | 13.3  |

**Table 2 Sociodemographic profile and information of the respondents (n = 180)**

|  |  |  |
| --- | --- | --- |
| **Variable**  | **N**  | **%age**  |
| **Type of water supplied to dental chair unit**  | Distilled water  | 112  | 62.2  |
| Hard water  | 20  | 11.1  |
| Soft water  | 32  | 17.8  |
| Deionized water  | 16  | 8.9  |
| **Water used for DUWLS**  | Surgical  | 52  | 28.9  |
| Non-surgical  | 128  | 71.1  |
| **Biofilm formation acts as reservoir in DUWLS**  | Yes  | 56  | 31.1  |
| No  | 100  | 55.6  |
| Not Sure  | 24  | 13.3  |
| **DUWLS contains potentially pathogenic microorganisms**  | Yes  | 72  | 40.0  |
| No  | 92  | 51.1  |
| Not Sure  | 16  | 8.9  |
| **Contaminated DUWLS is dangerous to immunocompromised patients**  | Yes  | 88  | 48.9  |
| No  | 84  | 46.7  |
| Not Sure  | 8  | 4.4  |
| **Is DUWLS disinfection part of disinfection control measure**  | Yes  | 104  | 57.8  |
| No  | 68  | 37.8  |
| Not Sure  | 8  | 4.4  |
| **Frequency of DUWLS disinfection**  | Daily & weekly  | 76  | 42.2  |
| Weekly only  | 36  | 20.0  |
| Monthly only  | 28  | 15.6  |
| Yearly only  | 40  | 22.2  |

**Table 3. Knowledge of the dental students on DUWLS (n=180)**



**Table 4: Attitude of the dental students towards DUWLS (n=180)**



**Table 5: Factors associated with the knowledge on DUWLS among dental students (n=180)**



**Table 5: Factors associated with the attitude towards DUWLS (n=180)**

Discussion: Water delivered from DUWLSs is not sterile and has been shown to contain relatively high numbers of bacteria[

In our study, the comparison was done between the study subjects based on their level of education. Mean difference in knowledge on DUWLS was significant (t=6.07, p=.000) with post-graduates having higher mean score. This aligns with previous research suggesting that advanced education and specialized training contribute to a more comprehensive understanding of infection control protocols. [

In our study, the comparison was done between the study subjects based on gender. Mean difference in knowledge on DUWLS of males and females was significant (t=3.65, p=.000) with females having higher mean score.

Mean difference in knowledge on DUWLS was higher (F=18.42, p=.000) among those who received information of DUWLS than those who did not receive information.

Mean difference in knowledge on DUWLS was higher in those who had personal experience of DUWLS (F=15.63, p=.000) than those with no personal experience of DUWLS.

The independent t-test results revealed a significant mean difference in attitude towards DUWLS between undergraduate and postgraduate dental students (t=4.23, p=.000), with postgraduate students showing a higher mean score. This suggests that the level of study (undergraduate or postgraduate) was significantly associated with attitude towards DUWLS, with postgraduate students having a more positive attitude than undergraduate students.

Mean difference in attitude towards DUWLS between male and female dental students was not significant (t=0.77, p=.440 > .05), indicating no significant association between gender and attitude towards DUWLS.

Mean difference in attitude towards DUWLS between dental students who received and those who did not receive information about DUWLS was not significant (F=0.11, p=.893 > .05), suggesting that receiving information was not significantly associated with attitude towards DUWLS.

Mean difference in attitude towards DUWLS between respondents who received guidance and those who did not was not significant (F=1.66, p=.193 > .05), indicating that receiving guidance was not significantly associated with attitude towards DUWLS.

Mean difference in attitude towards DUWLS between respondents who had personal experience with DUWLS and those who did not (F=3.72, p=.026 < .05), with those having personal experience showing a higher mean score.

Despite the knowledge gap between the undergraduate and postgraduates, both groups showed a favourable attitude towards DUWLS decontamination.

4. Conclusion

Females had higher knowledge on Dental Unit Waterline (DUWL) System Disinfection, so did postgraduates. Having received information and having had personal experience further improved their knowledge. Most respondents agreed that having good knowledge on DUWLS management is important. Most respondents are interested in receiving training on DUWL disinfection. Conducting workshops and continuous professional development (CPD) on disinfection of DUWLS will strengthen the knowledge and improve the attitude toward DUWLS management.

*References*

1. Kamma JJ, Bradshaw DJ, Fulford MR, Marsh PD, Frandsen E, Ostergaard E, et al. Attitudes of general dental practitioners in Europe to the microbial risk associated with dental unit water systems. Int Dent J 2006;56:187-95.

1. 2. Szymanska J. Control methods of the microbial water quality in dental unit waterlines. Ann Agric Environ Med 2003;10:1-4.]

2. 3. Oppenheim BA, Sefton AM, Gill ON, Tyler JE, O'Mahony MC, Richards JM, Dennis PJ, Harrison TG. Widespread Legionella pneumophila contamination of dental stations in a dental school without apparent human infection. Epidemiol Infect. 1987 Aug;99(1):159-66. doi: 10.1017/s095026880006698x. PMID: 3609170; PMCID: PMC2249186.

3.

1. 4. Kotaka CR, Garcia LB, Ito FA, Fuganti MR, Carnio J, Pelayo JS. Evaluation of the level of microbial contamination and prevalence of gram-negative non-fermentative rods in dental unit waterlines. RSBO 2012;9:245-53.

2. 5 Pasquarella C, Veronesi L, Napoli C, Castiglia P,

Liguori G, Rizzetto R, et al. Microbial environmental

contamination in Italian dental clinics: A

multicenter study yielding recommendations for

standardized sampling methods and threshold

values. Sci Total Env. 2012;420:289–99. doi:

10.1016/j.scitotenv.2012.01.030.

7. 6.Siang MM, Yunus Z, Yunus ARM, Ahmad Z, Toosa

H. The microbiological quality of water from

dental unit waterlines in Malaysian Armed Forces

dental centres. Arch Orofac Sci. 2012;7(1):1–7

Kengadaran, Shivashankar; Vikraman, Rakshagan1; Indumathi, K.P2; Sundaragopal, Arun Kumar3; Adiraju, Vani Anusha4; Anusha, Divvi. Microbial Contamination of Dental Unit Waterlines among Dental Clinics of India- An In vitro Study. Indian Journal of Dental Research 35(1):p 80-83, Jan–Mar 2024. | DOI: 10.4103/ijdr.ijdr\_463\_22

3. 7. Coleman DC, O'Donnell MJ, Shore AC, Swan J, Russell RJ The role of manufacturers in reducing biofilms in dental chair waterlines. J Dent 2007; 35: 701–11.

8. Kamma JJ, Bradshaw DJ, Fulford MR, Marsh PD, Frandsen E, Ostergaard E, et al. Attitudes of general dental practitioners in Europe to the microbial risk associated with dental unit water systems. Int Dent J 2006;56:187-95.]

9. 8.Kohn WG, Collins AS, Cleveland JL, Harte JA,

Eklund KJ, Malvitz DM. Guidelines for Infection

Control in Dental Health-care Settings-2003. Morb

Mortal Wkly Rep. 2003;52(17).

9. Oral Health Division. Guidelines on Maintaining

Quality of the Dental Unit Water System. Putrajaya:

Ministry of Health Malaysia; 2010.

11. 10 American Dental Association Council on Scientific Affairs. Dental unit waterlines. J Am Dent Assoc. 2018;149(8):720-2. doi: 10.1016/j.adaj.2018.05.019.

12. Organization for Safety, Asepsis and Prevention. Best practices for dental unit waterlines. https://www.osap.org/ Accessed April 12, 2025.

13.

Knowledge and attitudes of dental students towards infection control procedures: a systematic review. J Dent Educ. 2014;78(1):1-16.Hilly, M., Adams, M. L., & Nelson, S. C. (2002). A study of digit fusion in the mouse embryo. Clinical and Experimental Allergy, 32(4), 489-498.

Saha, M., Adams, M. L., & Nelson, S. C. (2009). Review of digit fusion in the mouse embryo. Journal of Embryology and Experimental Morphology, 49(3), (In press).

Forneau, E., & Bovet, D. (1933). Recherches sur l'action sympathicolytique d'un nouveau dérivé du dioxane. Archives Internationales de Pharmacodynamie, 46, 178-191.

Rang, H. P., Dale, M. M., Ritter, J. M., & Moore, P. K. (2003). Pharmacology (5th ed.). Edinburgh: Churchill Livingstone.

Beers, M. H., Porter, R. S., Jones, T. V., Kaplan, J. L., & Berkwits, M. (Eds.). (2006). The Merck manual of diagnosis and therapy (18th ed.). Merck Research Laboratories.

Glennon, R. A., & Dukat, M. (2002). Serotonin receptors and drugs affecting serotonergic neurotransmission. In D. A. Williams & T. L. Lemke (Eds.), Foye's principles of medicinal chemistry (5th ed., pp. xx-xx). Philadelphia: Lippincott Williams & Wilkins.

Hugo, J. T., & Mondal, S. C. (2006). Parallels between tissue repair and embryo morphogenesis: A conceptual framework. Global Health, 16, 4. <https://doi.org/10.1186/1744-8603-1-14>

Anonymous. (2006). Parallels between tissue repair and embryo morphogenesis: A conceptual framework. Globalization and Health, 16(4). <http://www.globalizationandhealth.com/content/1/1/14>

Diabetes Prevention Program Research Group. (2009). A study of digit fusion in the mouse embryo. Journal of Embryology and Experimental Morphology, 49(2), 259–276.