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Assess Knowledge, Attitudes, and Perceptions of Dental Assistants regarding Dental Asepsis and Sterilization

Mohammed Saeed Mohammed Algahtani[1], Othman Albalawi[2], Abdullah Ali Alhabdan[3], Mohasen Salem Abubaker[4], Zahra Mohammed AlShahrani[5], Hanan Nasser Mohammed Alotaibi[6], Ebtehal Saad Alqarni[7], Turki Abdullah Abdulrahman Alobaidi[8], Rawan Abdulmaghni Alshaikh[9]

[1]Dentist, Al Rabie Health Center
[2]Consultant Endodontics, Prince Mohammed bin Abdulaziz Hospital
[3]Dentist, Riyadh Second Health Cluster
[4]Dentist, Alsulimaniah Primary Health Center
[5]General Dentist, Riyadh Second Health Cluster
[6]Dentist, Riyadh second Health cluster
[7]General dentist, Riyadh First Health Cluster
[8]Dentist, Alrabee PHC
[9]Dentist, Dental Clinics Complex West Riyadh

ABSTRACT

Background

Dental professionals face significant occupational hazards due to close contact with patients and exposure to microbial and chemical risks. These hazards are exacerbated by insufficient knowledge of infection control protocols and poor adherence to sterilization practices. Dental assistants play a critical role in preventing cross-infections, yet many lack formal certification or training, which can impact their knowledge and compliance with infection control measures.

Methods

This study evaluated the knowledge, perceptions, and attitudes of dental assistants regarding asepsis and sterilization practices. A non-probability convenience sampling method was used to recruit 70 dental assistants. Data were collected using a validated questionnaire based on World Health Organization (WHO) infection control guidelines. The questionnaire included 27 questions, divided into subcategories addressing pre-sterilization practices, sterilization verification, autoclave use, and documentation. Descriptive statistics and factorial analysis of variance (ANOVA) were employed to analyze the data, with a 5% margin of error and a p-value of < 0.05 considered statistically significant.

Results

Among the participants, 44.3% were aged 21–29 years, and 85% worked in hospital settings. Only 7.14% had a formal diploma in dental assisting, but 74% had over two years of practice experience. While 91.4% of respondents regularly updated their knowledge about infection control, only 11.4% consistently labeled critical

instruments with batch control information before sterilization. Knowledge scores varied significantly by practice type and experience level, with dental assistants in private practices and those with less than two years of experience scoring higher.

Conclusion

This study highlights critical gaps in knowledge and compliance with infection control protocols among dental assistants. It underscores the need for ongoing education and training programs to improve infection control practices, promote safe sterilization techniques, and ensure adherence to waste management protocols. Enhancing training opportunities will not only protect dental personnel but also contribute to creating a safer and healthier environment for both staff and patients.

Introduction

Dental professionals face numerous occupational hazards due to the nature of their work and their close contact with patients. These risks include exposure to microbial and chemical hazards (1). The potential for occupational exposure to infectious diseases in dental practice is heightened by insufficient knowledge of infection control protocols and inadequate infection prevention practices (2). The dental workforce is particularly at risk of infections caused by blood-borne pathogens such as hepatitis B virus (HBV), human immunodeficiency virus (HIV), and hepatitis C virus (HCV) (1). Additionally, dental professionals are vulnerable to other pathogens, including streptococci and various bacterial and viral infections that colonize the oral and respiratory tracts (3, 4). Transmission routes for infections in dental settings include blood, bodily fluids, droplets, needle-stick injuries, contaminated water sources from dental units, and aerosols, as well as indirect transmission through contact with contaminated surfaces and instruments (5–7). These risks have heightened concerns about infection control and cross-infection prevention in dental settings, which have been explored extensively in various regions, including North America and Europe (8–12).

The proper implementation of infection control protocols and precautions is critical to minimizing the risk of cross-infection in dental environments (1). Adhering to infection control guidelines is essential for interrupting the transmission of communicable diseases and ensuring the safe delivery of dental care (13). The Centers for Disease Control and Prevention (CDC) initially released guidelines for infection control in dental settings in 1993, which have since been adapted and refined over time (14). These protocols were originally developed in response to the HIV epidemic of the 1980s and have evolved significantly since their initial adoption (14). Following global implementation, they became known as universal precautions, designed to prevent the transmission of blood-borne infections such as HBV, HCV, and HIV (15). The Occupational Safety and Health Administration (OSHA), a regulatory body in the United States, integrated these universal precautions into its blood-borne pathogen infection control standards after their adoption (15).

The guidelines emphasize that all work surfaces, instruments, and equipment must be cleaned and disinfected after contact with blood, saliva, and other potentially infectious materials (16). Surfaces should be disinfected before a new patient arrives

and after completing procedures on each patient (16). Additionally, mandatory vaccinations for the dental workforce have been established to protect against vaccine-preventable diseases, as some exposures are unavoidable (17). Practices such as reusing syringes, saline solutions, and vials between patients, which have caused outbreaks of HBV and HCV, are strictly prohibited (17). These comprehensive guidelines have ultimately enhanced compliance with aseptic techniques, particularly during the administration of parenteral medications (18–20).

Despite these detailed infection control guidelines, studies have identified poor compliance, particularly in certain settings (21). This issue is especially concerning in developing regions, where such protocols may not be well-documented or widely implemented (22). Many healthcare facilities lack structured infection control training programs, and there is often limited awareness among healthcare personnel (22, 23). This study aims to evaluate the knowledge, attitudes, and perceptions of dental assistants regarding dental asepsis and sterilization, with a focus on chairside dental assistants in private clinics and hospitals. Dental assistants play a pivotal role in preventing cross-infection, yet many lack formal certification, which underscores the importance of assessing their infection control practices.

Methodology

A non-probability convenience sampling method was used to recruit participants from the accessible population. The study employed a questionnaire focused on asepsis and sterilization procedures, divided into subcategories based on procedural stages. The first group of questions addressed pre-sterilization practices; the second group focused on the verification of biological processes involved in sterilization cycles; the third group pertained to the use of autoclaves, and the fourth category assessed documentation practices related to the sterilization process. A total of 27 questions were designed, largely based on the standard precautions recommended by the World Health Organization (WHO) and aligned with health standards and guidelines for dental practitioners as outlined in the LDU HSE 2012 guidelines, revised in 2014 (24).

The questionnaire was validated through a pilot test with a small sample of dental assistant trainees (n = 24). Expert opinions were sought to assess content validity, and the questionnaire underwent further refinement based on the feedback, including minor adjustments recommended by the ethical committee. The final questionnaire demonstrated average internal consistency (Cronbach's alpha = 0.68), and participants took an average of 9.3 (±2.4) minutes to complete it.

The results from the pilot survey were excluded from the final analysis. The principal investigator reached out to dental associations to facilitate the distribution of the questionnaire among dental assistants. The questionnaire, prepared in English, was disseminated both in-person and through online referrals to various dental facilities. Out of 105 dental assistants contacted, 70 completed the questionnaire, resulting in a response rate of 66.6%.

The questionnaire included three demographic-related questions. The dependent variable, knowledge, was measured as a continuous composite score derived from 24 close-ended Likert-scale questions (1 = not at all/never, 2 = very little/rarely, 3 = sometimes, 4 = to a great extent/always). This score ranged from a minimum of 24 to

a maximum of 96. The four independent categorical variables were: age (four levels), health system affiliation (private practice or hospital), possession of a dental assistant program diploma (yes or no), and years of experience in practice (three levels).

Statistical Analysis

Data analysis was performed using IBM SPSS version 24.0, with a 95% confidence interval and a 5% margin of error. The observed sample size was 70. All variables were coded and entered into SPSS for descriptive statistical analysis, including frequencies and percentages. Factorial analysis of variance (ANOVA) was employed to determine significant differences in knowledge scores across demographic groups, with a p-value of "< 0.05" considered statistically significant.

Results

The majority of participants (44.3%) were aged between 21 and 29 years, with more than 85% working in hospital settings. Despite this, only 7.14% had obtained a diploma in dental assisting, although 74% had over two years of practice experience (Table 1).

Among the knowledge-based self-reported responses, 58% of dental assistants demonstrated an understanding of the proper use of alcohol-based hand rubs; however, only 17.1% reported applying them at the appropriate times. About one-third (33%) of the participants indicated they had received training on safe practices for handling sharp objects, while 24.3% adhered to protocols for washing and disinfecting instruments. A high proportion (91.4%) of respondents reported regularly updating their knowledge about infection prevention and control strategies. Nevertheless, only 5% consistently cleaned and dried reusable items as required. Although 92.9% indicated ensuring proper validation and annual requalification for each sterilizer, just 11.4% consistently verified that critical instruments were labeled with batch control information before sterilization (Table 2).

To analyze differences in knowledge scores across various demographic and practice-related groups (age, practice type, possession of a diploma, and years in practice), factorial ANOVA was used after confirming the appropriateness of a parametric test. The Shapiro-Wilk test of normality was insignificant ($p > 0.05$), and the equality of the mean (74.54), median (75.00), and mode (75.00) further validated the use of parametric testing. The histogram also indicated a normal distribution of knowledge scores.

The analysis showed that dental assistants working in private practices (mean score: 76.30) had higher knowledge scores than those in hospital settings. Experience levels also influenced knowledge scores, with those having less than two years of experience scoring higher (mean: 75.61) compared to those with two to five years of experience (Table 3). A box plot revealed that dental assistants in private clinics with less than two years of experience had the highest knowledge scores and the lowest variability. Conversely, those working in hospitals with two to five years of experience scored the lowest, with the highest variability observed in this group.

Table 1. Demographic characteristics of dental assistants (*n* = 70).

Characteristics	Count (%)
Age	
19–20 years	22 (31.40)
21–29 years	31 (44.30)
30–39 years	15 (21.40)
40–49 years	2 (2.90)
Health system affiliation	
Private practice	10 (14.29)
Hospital	60 (85.71)
Had a diploma in dental assistant program	
Yes	5 (7.14)
No	65 (92.86)
Years of experience in practice	
Less than 2 years	18 (25.70)
2–5 years	28 (40.00)
More than 5 years	24 (34.30)

Table 2. Knowledge, attitudes, and perception of dental asepsis and sterilization among dental assistants.

Select knowledge questions	Count (%)
Correct techniques for use of alcohol-based hand rub	
To great extent	41 (58.58%)
Somewhat	29 (41.42%)
Application of hand rub techniques at the correct times	
Always	19 (27.14%)
Sometimes	51 (72.86%)
Do you ensure all critical items are packaged and labeled with batch control identification information before sterilization?	
Always	08 (11.42%)
Sometimes	59 (84.28%)
Rarely	03 (4.30%)
Do you ensure all instruments are cleaned and disinfected, as defined within the practice standards?	
Always	17 (24.28%)
Sometimes	53 (75.72%)
Do you maintain and refresh your knowledge on infection, prevention, and control measures annually?	
Yes	64 (91.42%)
No	06 (8.58%)

Ensure all contaminated reusable items properly cleaned and dried	
Always	05 (7.14%)
Sometimes	65 (92.86%)
Trained in safe practices for the handling and disposal of sharp objects	
To great extent	23 (32.86%)
Somewhat	47 (67.14%)
Ensure appropriate storage and handling of critical items to maintain their sterility until point of use	
Always	05 (7.14%)
Sometimes	43 (61.42%)
Rarely	22 (31.44%)
Ensure equipment and materials, which have been in contact with the patient's mouth, are handled appropriately	
Somewhat	62 (88.58%)
Very little	08 (11.42%)
Do you ensure validation and annual performance requalification are properly performed for each sterilizer?	
Yes	65 (92.86%)
No	05 (7.14%)

Table 3. Analysis of variance for age, health system affiliation, diploma, and years of experience according to mean knowledge score.

Independent variables	**Knowledge score (mean)**	***p* value (<0.05)**
Age		
19-20	75.23	
21–29	74.10	
30–39	74.33	
40–49	75.50	0.237
Health system affiliation		
Private practice	76.30	
Hospital	74.25	0.005
Having diploma in dental assistant program		
Yes	74.20	
No	74.57	0.709
Years of experience in practice		
Less than 2 years	75.61	
2–5 years	73.96	
More than 5 years	74.42	0.031

Discussion

The findings of this study reveal that dental assistants possess limited knowledge in several critical areas, including infection control, sterilization, waste management, and related practices. Reliable data on the number of registered and practicing dental assistants is scarce, as many are uncertified. There is a notable lack of structured education and training programs for dental assistants, and much of the training occurs on the job in clinical or hospital settings (25). Interestingly, dental assistants with less than two years of experience demonstrated higher knowledge scores compared to their more experienced counterparts, possibly reflecting the increasing emphasis on infection control protocols in recent years. No significant differences in knowledge scores were observed based on age or possession of a diploma in dental assisting, which could be attributed to the homogeneity of the sample, with most participants being under 40 years old and only a small proportion (7%) holding relevant diplomas (26). Similar studies have linked compliance with infection control protocols to factors such as age, department, patient frequency, knowledge, and willingness to treat certain patient groups, providing valuable direction for future research (26).

The study assessed infection control practices across four key areas: predisinfection, sterilization, waste management, and compliance with protocols. Predisinfection is the initial phase of decontamination, involving the removal of visible debris and microorganisms to facilitate effective sterilization. However, knowledge and application in this area were suboptimal among participants, with only 7.1% consistently cleaning and drying instruments before reuse. Furthermore, just 11.4% ensured critical items were labeled and packaged with batch control information before sterilization (26).

Sterilization aims to completely eliminate microorganisms, including bacterial spores, typically using steam under pressure. Despite advancements in infection control research, implementation of sterilization protocols remains limited. In this study, approximately 90% of dental assistants reported updating their knowledge on infection prevention and sterilization annually, but practical adherence to standards requires further improvement (34).

Effective waste management is essential for infection control. It involves proper handling, segregation, and disposal of hazardous materials, such as sharps and biological waste. About 50% of participants in this study reported ensuring the safe handling of hazardous waste, a relatively low figure compared to other regional studies. For instance, sharp objects should be stored in puncture-resistant containers and labeled accordingly, while infectious waste must be segregated in color-coded bags and processed via incineration or autoclaving before disposal. However, only 32.9% of respondents were trained in sharp object handling and disposal, highlighting a critical area for improvement (30, 36).

The findings underscore the need for improved compliance with infection control protocols. Previous research suggests that many practices lack adequate record-keeping and testing for equipment used in sterilization and decontamination processes. For instance, critical devices are often not maintained or monitored at recommended intervals, leading to gaps in adherence to infection control guidelines (40, 42). Establishing standardized procedures for training, testing, and maintenance could

significantly enhance the reliability of infection control measures. Moreover, dental teams should receive detailed guidelines to address these deficiencies and ensure both cost-effectiveness and health protection in their practices.

Conclusion

This study provides valuable insights into asepsis and sterilization practices among dental assistants in various healthcare settings. It serves as an initial step in assessing the gaps in knowledge and practice. There is a clear need for improved adherence to recommended infection control and waste management protocols among dental assistants. Ongoing education and training programs focused on infection control awareness are essential to enhance practices related to sterilization, cross-infection prevention, and hazardous waste management. Such training initiatives would not only enhance the safety of dental personnel but also contribute to maintaining and restoring a healthier environment.

References

Atesagaoglu A., Omurlu H., Ozcagli E., Sardas S., and Ertas N., Mercury exposure in dental practice, *Operative Dentistry*. (2006) **31**, no. 6, 666–669, https://doi.org/10.2341/05-128, 2-s2.0-33845351305.

Ayatollahi J., Ayatollahi F., Ardekani A. M et al., Occupational hazards to dental staff, *Dental Research Journal*. (2012) **9**, no. 1, 2–7, https://doi.org/10.4103/1735-3327.92919.

Bentley E. M. and Sarll D. W., Improvements in cross-infection control in general dental practice, *British Dental Journal*. (1995) **179**, no. 1, 19–21, https://doi.org/10.1038/sj.bdj.4808808, 2-s2.0-0029639548.

Bourgeois D., Dussart C., Saliasi I., Laforest L., Tramini P., and Carrouel F., Observance of sterilization protocol guideline procedures of critical instruments for preventing iatrogenic transmission of creutzfeldt-jakob disease in dental practice in France, 2017, *International Journal of Environmental Research and Public Health*. (2018) **15**, no. 5, https://doi.org/10.3390/ijerph15050853, 2-s2.0-85046139414.

Boyce R. and Mull J., Complying with the occupational safety and health administration: guidelines for the dental office, *Dental Clinics of North America*. (2008) **52**, no. 3, 653–668, https://doi.org/10.1016/j.cden.2008.03.002, 2-s2.0-43849087315.

Cannata S., Bek M., Baker P., and Fett M., Infection control and contaminated waste disposal practices in southern Sydney area health service dental clinics, *Australian Dental Journal*. (1997) **42**, no. 3, 199–202, https://doi.org/10.1111/j.1834-7819.1997.tb00122.x, 2-s2.0-0031156040.

Chartier Y., *Safe Management of Wastes from Health-Care Activities*, 2014, World Health Organization, Geneva, Switzerland.

Computational Fluid Dynamics, *Recommendations for Prevention of HIV Transmission in Health-Care Settings*, 1987, US Department of Health and Human Services, Public Health Service, Centers, Washington, DC, USA.

Computational Fluid Dynamics, *Summary of Infection Prevention Practices in Dental Settings: Basic Expectations for Safe Care*, 2016, US Department of Health and Human Services, Centers for Disease Control and Prevention, Atlanta, GA, USA.

Computational Fluid Dynamics, *Update: Universal Precautions for Prevention of Transmission of Human Immunodeficiency Virus, Hepatitis B Virus, and Other Bloodborne Pathogens in Health-Care Settings*, 1988, Centers for Disease Control, Atlanta, GA, USA.

De Jonge S., Boldingh Q., Solomkin J., Dellinger P., Egger M., and Salanti G., Conference on prevention & infection control, *International Conference on Prevention & Infection Control (ICPIC 2019)*, September 2019, Geneva, Switzerland.

Department of Labor, 29CFR Part 1910.1030, occupational exposure to bloodborne pathogens; final rule, *Federal Register*. (1991) **56**, 64004–64182.

DiAngelis A. J., Martens L. V., Little J. W., and Hastreiter R. J., Infection control practices of Minnesota dentists: changes during 1 year, *The Journal of the American Dental Association*. (1989) **118**, no. 3, 299–303, **https://doi.org/10.14219/jada.archive.1989.0106**, 2-s2.0-0024636542.

Directive CJOJoEU. 32/EU (2010), Implementing the framework agreement on prevention from sharps injuries in the hospital and healthcare sector, concluded by HOSPEEM and EPSU, 2010.

Gerbert B., AIDS and infection control in dental practice: dentists' attitudes, knowledge, and behavior, *The Journal of the American Dental Association*. (1987) **114**, no. 3, 311–314, **https://doi.org/10.14219/jada.archive.1987.0078**, 2-s2.0-0023302046.

Gibson G. B., Mathias R. G., and Epstein J. B., Compliance to recommended infection control procedures: changes over six years among British Columbia dentists, *Journal (Canadian Dental Association)*. (1995) **61**, no. 6, 526–32.

Gordon B. L., Burke F. J. T., Bagg J., Marlborough H. S., and McHugh E. S., Systematic review of adherence to infection control guidelines in dentistry, *Journal of Dentistry*. (2001) **29**, no. 8, 509–516, **https://doi.org/10.1016/s0300-5712(01)00043-4**, 2-s2.0-0035515477.

Hashim R., Mahrouq R., and Hadi N., Evaluation of dental waste management in the Emirate of Ajman, United Arab Emirates, *Journal of International Dental and Medical Research*. (2011) **4**, no. 2.

Khader Y. S., Airan D. M., and Al-Faouri I., Work stress inventory for dental assistants: development and psychometric evaluation, *Journal of Public Health Dentistry*. (2009) **69**, no. 1, 56–61, **https://doi.org/10.1111/j.1752-7325.2008.00094.x**, 2-s2.0-61849126717.

Kohn W. G., Collins A. S., Cleveland J. L., Harte J. A., Eklund K. J., and Malvitz D. M., Guidelines for infection control in dental health-care settings-2003, 2003.

Kumar S., Sharma J., Duraiswamy P., and Kulkarni S., Infection control practices among undergraduate students from a private dental school in India, *Revista Odonto Ciência*. (2009) **24**, no. 2, 124–128.

Kurdy S. and Fontaine R., Survey on infection control in MOH dental clinics, Riyadh, *Journal of Saudi Epidemiology Bulletin*. (1997) **3**, no. 4.

Lin S. M., Svoboda K. K., Giletto A., Seibert J., and Puttaiah R, Effects of hydrogen peroxide on dental unit biofilms and treatment water contamination, *European Journal of Dentistry*. (2011) **5**, no. 1, 47–59.

McCarthy G. M. and Britton J. E., A survey of final-year dental, medical and nursing students: occupational injuries and infection control, *Journal (Canadian Dental Association)*. (2000) **66**, no. 10.

Merchant V. A., Herpesviruses and other microorganisms of concern in dentistry, *Dental Clinics of North America*. (1991) **35**, no. 2, 283–298.

Milward M. R. and Cooper P. R., Competency assessment for infection control in the undergraduate dental curriculum, *European Journal of Dental Education*. (2007) **11**, no. 3, 148–154, **https://doi.org/10.1111/j.1600-0579.2007.00439.x**, 2-s2.0-34748849528.

Morris E., Hassan F. S., Al Nafisi A., and Sugathan T. N., Infection control knowledge and practices in Kuwait: a survey on oral health care workers, *Saudi Dental Journal*. (1996) **8**, no. 1, 699–703.

Nagao Y., Matsuoka H., Kawaguchi T., Ide T., and Sata M., HBV and HCV infection in Japanese dental care workers, *International Journal of Molecular Medicine*. (2008) **21**, no. 6, 791–799, **https://doi.org/10.3892/ijmm.21.6.791**.

Pankhurst C. L. and Coulter W. A., *Basic Guide to Infection Prevention and Control in Dentistry*, 2017, John Wiley & Sons, Hoboken, NJ, USA.

Roebuck E. M., Strang R., Green I., Smith A., and Walker J., The availability and content of dental instrument manufacturers' decontamination information, *British Dental Journal*. (2008) **204**, no. 8, **https://doi.org/10.1038/sj.bdj.2008.322**, 2-s2.0-42549130847.

Scotland N., Sterile services provision review group, *Survey of Decontamination in General Dental Practice*, 2004, The Stationery Office, Edinburgh, UK.

Sebastiani F. R., Dym H., and Kirpalani T., Infection control in the dental office, *Dental Clinics of North America*. (2017) **61**, no. 2, 435–457, **https://doi.org/10.1016/j.cden.2016.12.008**, 2-s2.0-85015657438.

Shah R., Collins J. M., Hodge T. M., and Laing E. R., A national study of cross infection control: "are we clean enough?, *British Dental Journal*. (2009) **207**, no. 6, 267–274, **https://doi.org/10.1038/sj.bdj.2009.824**, 2-s2.0-70349510232.

Sheridan C., Gorman T., and Claffey N., Dental nursing education and the introduction of technology-assisted learning, *European Journal of Dental Education*. (2008) **12**, no. 4, 225–232, **https://doi.org/10.1111/j.1600-0579.2008.00523.x**, 2-s2.0-61449286035.

Siegel J. D., Rhinehart E., Jackson M., and Chiarello L., 2007 guideline for isolation precautions: preventing transmission of infectious agents in health care settings, American Journal of Infection Control, **35**, no. 10.

Singh A., Purohit B. M., Bhambal A., Saxena S., Singh A., and Gupta A., Knowledge, attitudes, and practice regarding infection control measures among dental students in Central India, *Journal of Dental Education*. (2011) **75**, no. 3, 421–427, **https://doi.org/10.1002/j.0022-0337.2011.75.3.tb05055.x**.

Smith A. J., Hurrell D., Bagg J., McHugh S., Mathewson H., and Henry M., A method for surveying instrument decontamination procedures in general dental practice, *British Dental Journal*. (2007) **202**, no. 8, **https://doi.org/10.1038/bdj.2007.125**, 2-s2.0-34248356022.

Smith A., Dickson M., Aitken J., and Bagg J., Contaminated dental instruments, *Journal of Hospital Infection*. (2002) **51**, no. 3, 233–235, **https://doi.org/10.1053/jhin.2002.1213**, 2-s2.0-0036636892.

Sobayo E. I., Nursing aspects of infection control in developing countries, *Journal of Hospital Infection*. (1991) **18**, 388–391, **https://doi.org/10.1016/0195-6701(91)90046-b**, 2-s2.0-0025899114.

Thompson N. D., Perz J. F., Moorman A. C., and Holmberg S. D., Nonhospital health care-associated hepatitis B and C virus transmission: United States, 1998–2008, *Annals of Internal Medicine*. (2009) **150**, no. 1, 33–39, **https://doi.org/10.7326/0003-4819-150-1-200901060-00007**, 2-s2.0-58149384017.

Treasure E. T. and Treasure P., An investigation of the disposal of hazardous wastes from New Zealand dental practices, *Community Dentistry and Oral Epidemiology*. (1997) **25**, no. 4, 328–331, **https://doi.org/10.1111/j.1600-0528.1997.tb00948.x**, 2-s2.0-0031201518.

Treasure P. and Treasure E. T., Survey of infection control procedures in New Zealand dental practices, *International Dental Journal*. (1994) **44**, no. 4, 342–348.