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Short research communication

Salman Khan,[1] Naima Khalid,[2] Obaid Bajwa,[3] Taha Qamar,[4] Ali Kazmi[4] and Amina Tariq[5]

[1]Department of Operative Dentistry; [2]Periodontology Department; [3]Operative Dentistry Department; [4]Department of Prosthodontics, University Dental Hospital;
[5]
Research Cell, University College of Dentistry, University of Lahore, Lahore, Pakistan (Correspondence to: Obaid Bajwa: obaid.bajwa@gmail.com)

Abstract

Background: Amalgam has been the gold standard for restorations in posterior teeth. Mercury, a major component of dental amalgam, is considered an environmental pollutant. The Minamata Convention on mercury recomends a reduction in the use of mercury-containing products. Since Pakistan is a signatory to the Convention, the same amalgam phase-out limitations are implemented in Pakistan.

Aims: To identify and assess the use of amalgam and its waste management by dentists in Pakistan post-Minamata Convention guidelines.

Methods: A cross-sectional study was conducted in Lahore among 520 general dental practitioners in 2019.

Results: The sample size for the study was calculated as 500; the questionnaire was distributed among 550 dentists. Dental amalgam was used by only 41.6% of the dentists in their practice; 55.0% perceived it to be a health risk. Most of the dentists (76.3%) were unaware of the proper disposal protocols for dental amalgam and 76.5% were unaware of any guidelines

regarding amalgam use and disposal.

Conclusion: Although there is a gap in knowledge among the dentists regarding amalgam disposal, dentists in Pakistan are reducing their use of dental amalgam in accordance with the guidelines of the Minamata Convention.

Keywords: dental amalgam, mercury, Minamata Convention, waste management, Pakistan,disposal

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Introduction

Amalgam has been the gold standard for restorations in posterior teeth. It provides higher survival rates, increased longevity and performs better under occlusal loads (1). A number of studies reveal that amalgam is one of the longest lasting direct restorative materials (1–3). According to the American Dental Association, “dental amalgam is considered a safe, affordable and durable material” (4). Regulating authorities such as the American Dental Association, the United States Centers for Disease Control and Prevention and the United States Public Health Service have authorized the use of dental amalgam as a restorative material under strict observance of waste management protocols (5). Although dental amalgam is safe to use, it does contribute to the mercury waste in the environment.

Mercury poisoning can result from inhalation of mercury vapour, mercury ingestion, mercury injection, and absorption of mercury through the skin. The Minamata Convention on Mercury is an agreement addressing activities contributing to mercury pollution. Implementation of this

agreement will help reduce global mercury pollution. A decline in the use of amalgam has been seen in response to the Minamata Convention (6). The convention addresses mercury-added products, including dental amalgam, which is made up of approximately 50% elemental mercury by weight, and proposes numerous measures to phase down the use of dental amalgam (7). According to Mackey et al., around 270–348 tons of mercury is used in dental procedures globally, 70–100 tons of which enters the solid waste stream worldwide (8).

The use of amalgam is being phased out around the world following the guidelines presented by the Minamata Convention. A 2015 study conducted in Pakistan measured the environmental mercury levels in various dental institutions and clinics (9). The results showed that mercury levels in the air were more than 1000 ng/m3 in most areas that were inspected whereas the maximum acceptable level is 300 ng/m3 according to the United States of America (USA) Environmental Protection Agency (9). Some research has been published outlining the perception of dentists in Pakistan regarding the use of amalgam before the guidelines put forward by the Minamata Convention which indicated that amalgam was one of the most commonly used restorative materials (10).

The aim of this study was to identify current trends (post-Minamata Convention) of dental amalgam use among general dental practitioners in Lahore, Pakistan.

Methods

This cross-sectional study was conducted in Lahore between August 2019 and November 2020. A structured questionnaire was designed and distributed among general practice dentists in Lahore. Sample selection was carried out using a one-stage cluster technique. The city is divided into nine zones administratively; four zones were randomly selected by lottery method and the practising dentists in these areas were approached. Those willing to participate were included in the study.

Inclusion criteria for the participants were: certified Pakistan Medical Council/Pakistan Medical and Dental Council dentists who were practising general dentistry. Those excluded from the study were house officers and dentists who were not practising dentistry.

The questionnaire was designed by partially modifying the questionnaire used by Mumtaz et al. in 2010 to include the current trends and knowledge base regarding amalgam and the guidelines for amalgam use (11). It comprised 17 questions divided into three parts: demographic data, use of dental amalgam and knowledge about dental amalgam waste

management. The participants were asked to respond to each item according to the response format provided in the questionnaire. No identifiable data such as name or email address were obtained from the participants to preserve their confidentiality. Written consent was obtained from all survey participants.

Sample size was calculated using OpenEpi calculator online at 500 with 95% confidence interval, 5% margin of error and 51% population of general dentists who used amalgam (12). With a 99% confidence interval, the questionnaire was distributed to 550 dentists and 520 completed questionnaires were returned.

The data were compiled and analysed using SPSS, version 25. For descriptive statistics, frequencies and percentages were calculated. For inferential statistics, Pearson's chi-squared test was used to compare the scores of the samples with year of practice of general dentists. P-value ≤ 0.05 was considered statistically significant.

Approval for the study was obtained from the ethics and research committee of the University of Lahore College of Dentistry (Ref: UCD/ERCA/19/04).

Results

Background information

A total of 520 general dentists participated in the study, of whom 332 (63.8%) were males and 188 (36.2%) were females (Table 1). Most of the dentists in our study were 25–30 years old; 354 (68.1%) had obtained the Bachelor of Dental Surgery degree, 114 (21.9%) were postgraduate trainees and 52 (10%) were specialist dentists.

Amalgam use

Only 218 (41.9%) of the participants in the study used dental amalgam in their practice and 302 (58.1%) stated that they did not use it. Among the 218 who used dental amalgam, the strength and long life of the material were most often cited as the reasons for use (Figure 1). When asked about the safety of dental amalgam, 284 (54.6%) participants stated that dental amalgam was unsafe while 236 (45.4%) considered it safe.

Amalgam hazards

When asked about the possible hazards relating to mercury in dental amalgam, 178 (32.2%) of

the participants stated that they were unaware whereas the rest mentioned mercury toxicity, organ damage, allergic reaction and carcinogenesis (Figure 2). Mercury toxicity and organ damage were the most commonly cited hazards – 239 (43.4%) participants.

Just 48 (9.2%) out of the 520 participants mentioned disposing of amalgam in amalgam containers; the rest did not mention the proper way of disposal of dental amalgam (Table 1). No specific precautionary measures against amalgam hazards were used by 236 (45.4%) dentists; 222 (42.7%) had installed ventilation equipment and the rest relied on personal protective equipment and separate disposal bins.

Knowledge about guidelines for amalgam use

There were 122 (23.5%) participants who said they were aware of the recent guidelines. Among these, 38 (31.3%) specifically mentioned Minamata Convention guidelines, whereas 84 (68.9%) mentioned others (Table 2).

Discussion

In this cross-sectional study, we aimed to determine the use and disposal practices for dental amalgam among practising dentists in Lahore, Pakistan. The age group with the highest number of participants was 25–30 years, which shows the presence of younger dentists in the dental community, a reflection of the age demographics in Pakistan (13). Around 32% of the participants were either enrolled in specialization programmes or had completed their postgraduate degree.

A 2010 study conducted in Islamabad by Mumtaz et al. reported the use of amalgam to be more than 90% among dentists of Pakistan (10), which is significantly higher than in our study in which almost 40% of the dentists used amalgam in their practices. Tooth preparation for dental amalgam is technique-sensitive. The same is not the case for adhesive resin restorations, which may be the cause of the decline in dental amalgam use (14). As reported by Mumtaz et al., the dentists were not aware of the environmental risks associated with dental amalgam use. That study also showed that the financial constraints of the patient was the foremost reason for the use of amalgam. In our study, various other reasons for amalgam use were mentioned including financial concerns, its superior physical properties and its longevity. In both studies, most of the dentists mentioned disposing off the amalgam waste with the general waste and not in a separate sealed amalgam container.

The European Union has also implemented the phase-down strategy inhibiting the use of dental

amalgam in pregnant and nursing patients along with children less than 15 years old (15). These same restrictions were implemented in Pakistan as of 2018. The results of our study show that the general dentists are gradually refraining from dental amalgam use. This is in line with the current policy by the Government of Pakistan and the worldwide trend. There have been almost no amalgam restorations done in the Scandinavian countries whereas resin restorations are more commonly used than dental amalgam in the United Kingdom (UK) and the USA (16). Thus, Pakistan seems to be standing with the UK and USA, where the use of amalgam is still prevalent but is being gradually phased out in line with the Minamata Convention guidelines.

Further research into the declining use of amalgam is needed as most of our participants were unaware of the Minamata Convention. Amalgam waste management should be an integral component of the undergraduate dental curriculum.

This study was conducted in the capital of the largest province of Pakistan. The results may not be generalizable to the whole of the country.

Conclusion

There is a lack of awareness among general dental practitioners that inappropriate dental amalgam handling can contribute to environmental health hazard. National guidelines on dental amalgam waste disposal need to be formulated and implemented.

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Competing interests: None declared

Élimination progressive des amalgames dentaires, une préoccupation de sécurité environnementale : étude transversale parmi les dentistes généralistes au Pakistan

Résumé

Contexte : L'amalgame dentaire a été le matériau de référence pour les restaurations des dents postérieures. Le mercure, composant majeur des amalgames dentaires, est considéré comme un polluant environnemental. La Convention de Minamata sur le mercure impose de

réduire l'utilisation des produits qui en contiennent. Le Pakistan étant signataire de ladite Convention, les mêmes limitations relatives à l'élimination progressive des amalgames dentaires lui sont appliquées.

Objectifs : Identifier et évaluer l'utilisation de l'amalgame dentaire et la gestion des déchets qui en résultent par les dentistes au Pakistan suite aux directives de la Convention de Minamata.

Méthodes : Une étude transversale a été menée à Lahore auprès de 520 dentistes généralistes en 2019.

Résultats : La taille de l'échantillon pour l'étude a été fixée à 500 ; le questionnaire a été distribué à 550 dentistes. Les amalgames dentaires n'étaient utilisés que par 41,6 % des dentistes dans leur pratique ; 55,0 % estiment qu'ils représentent un risque pour la santé. La plupart des dentistes (76,3 %) ne connaissaient pas les protocoles d'élimination des amalgames dentaires et 76,5 % ne connaissaient aucune directive concernant l'utilisation et l'élimination des amalgames.

Conclusion : Bien que les connaissances des dentistes en matière d'élimination des amalgames soient insuffisantes, les dentistes pakistanais réduisent leur utilisation des amalgames dentaires conformément aux directives de la Convention de Minamata.

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Environ. 2014 Feb 15;472:125–9. doi:10.1016/j.scitotenv.2013.10.115

9. Khwaja MA, Abbasi MS. Mercury poisoning dentistry: high-level indoor air mercury contamination at selected dental sites. Rev Environ Health. 2014;29(1–2):29–31. doi:10.1515/reveh-2014-0010

10. Global mercury assessment 2013: sources, emissions, releases, and environmental transport. Geneva: United Nations Environment Programme; 2013 (http://wedocs.unep.org/handle/20.500.11822/7984, accessed 24 June 2021).

11. Mumtaz R, Khan AA, Noor N, Humayun S. Amalgam use and waste management by Pakistani dentists: an environmental perspective. East Mediterr Health J. 2010 Mar;16(3):334–9. PMID:20795451

12. Bakhurji E, Scott T, Mangione T, Sohn W. Dentists' perspective about dental amalgam: current use and future direction. J Public Health Dent. 2017 Jun;77(3):207215. doi:10.1111/jphd.121985

13. Lone MA, Lone MM, Lone MA, Shaikh MS, Khan F, Soomro AH. Motivational factors for pursuing dentistry as a profession in colleges of Karachi, Pakistan. J Pak Med Assoc. 2020 Aug;70(8):1393–7. doi:10.5455/JPMA.33126

14. Correa MB, Peres MA, Peres KG, Horta BL, Barros AD, Demarco FF. Amalgam or composite resin? Factors influencing the choice of restorative material. J Dent. 2012 Sep;40(9):703–10. doi:10.1016/j.jdent.2012.04.020

15. European Parliament, Council of the European Union. Regulation (EU) 2017/852 of the European Parliament and of the Council of 17 May 2017 on mercury, and repealing Regulation (EC) No 1102/2008. In: Official Journal of the European Union, ed. Luxembourg: Publications Office of the European Union; 2017:21.

16. Heintze SD, Rousson V. Clinical effectiveness of direct class II restorations – a meta-analysis. J Adhes Dent. 2012 Aug;14(5):407–31. doi:10.3290/j.jad.a28390

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