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Amalgam Safety and Dentists' Attitude: A Survey Among a Subpopulation of Nigerian Dentists

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Clinical Relevance

This manuscript presents a cross-sectional survey report on amalgam use, attitudes and perception by dentists in Nigeria, a developing nation, on a subject of clinical relevance to all dentists.

SUMMARY

Objective: To investigate Nigerian dentists' perception of amalgam safety and to highlight the dentists' attitude toward amalgam.

Methods: A cross-sectional survey of all dentists in Southeastern Nigeria was done using a self-administered, structured questionnaire.

Results: The report recorded a 90.9% response rate. More specialists (95.7%) than general dentists (74.5%) agreed to the safety of amalgam. Furthermore, more patients seen by the general dentists (85.1%) than by specialists (34.88%) agreed with amalgam safety. Undergraduates' education (82.9%) was the highest source of awareness of the amalgam controversy, followed by inquires (64.3%), colleagues (47.1%), TV/radio (41.4%), conferences (27.1%) and continuing dental education (15.7%). About 37% of respondents knew all the signs and symptoms of amalgam toxicity, while 47.1% of respondents knew that the lung is the fastest route for mercury absorption. About 81.0% of dentists do not support an amalgam ban and 84.3% would not even recommend an alternative to amalgam. Amalgam is well accepted by both dentists and patients in the studied population

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INTRODUCTION

Amalgam is a product of mercury and other metals; whereas, dental amalgam, with its more than 150 years in clinical use, is a product of tin–silver alloy.[1] For a significant period of time, amalgam has been used in millions of patients[2] and has proved to be an ideal restora-

tive material, except in extremely rare cases where a heavy metal allergy is reported.[2] Furthermore, amalgam has been found to be useful in many areas, including the restoration of posterior teeth, the sealing of the apical end of apicected roots, the restoration of access cavities and to serve as a core material in post crowns. However, the use of amalgam has dramatically declined in the past 10 years,[3-4] mainly due to the concern over mercury. Some authors believe that the rate of mercury release from amalgam falls to within the acceptable threshold limit value (TLV of 50/^gm/L3).[5] This level is even lower than the environmental contribution of mercury from breathing, drinking water and food.

Amalgam, in its 150 years of existence, has many excellent attributes. Apart from lasting longer than other restorative materials, it changes over time in the presence of subgingival plaque.[6] This change, however, does not cause failure of the restoration. Furthermore, its color contrasts well at the tooth-amalgam restorative margin. Also, amalgam lacks esthetics, hence it is restricted to use in the posterior region of the mouth. However, the tooth fracture rate is less in older patients with amalgam restored teeth than in patients who have teeth restored with composite.[7] Overall, amalgam is still the most cost-effective of all restorative materials.[6]

Despite amalgam being the profession's longest-lived and most affordable material, emotional issues overwhelm the scientific data, mainly due to mercury toxicity.[8-9] Alleged adverse health effects and environmental concerns of mercury have launched controversial discussions about its continued use.[10-11] As a result, anti-amalgam forces and amalgam-free dentists claim recent studies indicate that the mercury in amalgam is hazardous. Like two forces claiming mandate in a holy war, both sides in the amalgam war claim solid science is on their side. And, despite who is right or wrong, the winner in the war could be decided by who fights the hardest or shouts the loudest.[2] The controversy has led to marked change in the use of restorative materials during the past 10 to 20 years.[12-13]

It is reported that the dentists' stand on amalgam is influenced by public and media debate.[2] In their study, Khairuldean and Sadig[14] reported that 75% of Saudi Arabian dentists were aware of the controversy surrounding amalgam safety. While 41% of these dentists were aware of all the signs and symptoms of amalgam toxicity, 85% believed that amalgam is safe and 62% knew that mercury vapor is the most toxic form of mercury.

The amalgam controversy has caused dentists throughout the world to react in diverse ways. What is the position of dentists in developing nations, such as Nigeria, on the issue? The current study provides answers to these questions. This study investigated the perception of amalgam safety by a subpopulation of Nigerian dentists and patients and highlighted the attitude of dentists toward amalgam.

METHOD

Study Population: A total of 110 dentists reside in Southeastern Nigeria. Seventy-seven of them were recruited, while 23 dentists declined to participate in the study.

Study Design: A structured, close-ended questionnaire (Table 1) was administered to respondents on a one-on-one basis between January and February 2007. Also noted were the dentists' gender and field of practice, as well as their service sector.

Statistical Analysis:

Analyses were done with SPSS (SPSS Inc, Chicago, IL, USA). Categorical variables were compared using the Chi-square test. *P*-values of less than 0.05 were taken as statistically significant.

RESULTS

Out of the 77 questionnaires distributed, 70 were returned (90.9% response rate). Among generalists, 35 (74.5%) were males, while 12 (25.5%) were females. However, among specialists, 11 (47.8%) were males, while 12 (52.2%) were females. The gender distribution was significant. Only 13 generalists (27.7%) worked in the private sector, while the remainder, 34 (70.3%) worked in government-owned hospitals. However, all of the specialists worked in government-owned hospitals. More specialists (95.7) than general dentists (74.5%) affirmed that amalgam is safe, while more general dentists (14.9%) than specialists (4.3%) said that amalgam is unsafe. About 10% of general dentists were uncertain of amalgam safety, while no specialist was uncertain of amalgam safety. The difference between dentist opinion and field of practice was statistically significant ($p<0.037$), whereas the difference between toxicity awareness of amalgam and field of practice was statistically insignificant ($p=0.84$) (Table 2).

More patients who were seen by general practitioners (85.1%) than specialists (34.8%) agreed that amalgam is safe, while more of the patients seen by specialists (39.1%) than general practitioners (6.4%) were uncertain about amalgam safety. Furthermore, more patients seen by specialists (26.1%) than general practitioners felt that amalgam was unsafe. Sources of awareness by dentists about the amalgam controversy include undergraduate education (82.9%), inquiries (64.3%), colleagues (47.1%), TV/radio (41.4%), conferences (27.1%) and continuing dental education (15.7%). Distribution of sources of awareness among field of practice are inquiries (general practitioners = 71.1%, specialists = 28.9%), undergraduate education (general practitioners = 67.2%, specialists = 32.8%), conferences (general practitioners = 53%, specialists 94.7%), TV/radio (general

Table 1: *Questionnaire*

1. Sex: ____ Male ____ Female
2. Field of Practice: a) General Practitioner ____ b) Specialist ____
3. Service Sector:
   a) Private ____
   b) Tertiary hospital ____
   c) Government ____
4. Are you away of amalgam controversy?
   a) Yes ____ b) No ____ c) Uncertain ____
5. What was your source of awareness?
   a) Patient inquiries ____ b) Undergraduate education ____
   c) Conferences ____ d) TV and Radio ____
   e) Colleagues ____ f) Continuing dental education ____
6. What is your patient's opinion about amalgam safety:
   a) Safe ____ b) Unsafe ___ c) Uncertain ____
7. What is your opinion about amalgam safety?
   a) Safe ____ b) Unsafe ____ c) Uncertain ____
8. Which of the following is/are signs and symptoms of mercury poisoning?
   a) Fatigue ____ b) Headache ____ c) CNS disturbances ____ d) Psychological disorders ____
9. Is your patient concerned about the color of amalgam?
   a) Yes ____ b) No ____
10. The most toxic form of mercury is:
    a) Liquid ____ b) Old amalgam ____ c) Vapour ____ d) Particles ____
11. Mercury is absorbed most rapidly through:
    a) Lungs ____ b) Skin ____ c) Mouth ____ d) Uncertain ___
12. What is your opinion about the controversy on amalgam ban?
    a) Ban ____ b) Don't ban ____ c) Uncertain ____
13. How do you respond to a patient's request to have his/her amalgam removed based on the amalgam war?
14. Are you aware of amalgam alternatives, e.g., posterior composite, ceramic, cast gold restorations?
    a) Yes ____ b) No ____
15. Do you have access to the alternatives?
    a) Yes ____ b) No ____
16. Which of the following amalgam alternatives are you comfortable working with?
    a) Resin composite ____ b) Ceramic ____ c) Cast gold restoration ____
17. Are you bothered about the environmental issues of mercury in the dental office?
    a) Yes ____ b) No ____
18. Would you recommend an alternative to amalgam?
    a) Yes ____ b) No ____ c) Uncertain ____

Table 2: *Field of Practice by Dentists' Opinion and Awareness*

Variable	Dentists' Opinion (%)			Dentists' Awareness (%)	
	Safe	Unsafe	Uncertain	Yes	No
General Practice	35 (74.5)	7 (14.9)	5 (10.6)	44 (93.6)	3 (6.4)
Specialist	22 (95.7)	1 (4.3)	0 (0)	22 (95.7)	1 (4.3)
	χ^2 = 6.59; df = 2; p=0.04			χ^2 = 0.04; df = 1; p=0.84	

practitioners = 75.9%, specialists = 24.1%), colleagues (general practitioners = 66.7, specialists = 33.3) and continuing dental education (general practitioners = 9.1%, specialists = 90.9%).

Six (8.6%) of the dentists said they would not oblige patients' requests to have their amalgam removed, compared with 10 (14.2%) who agreed that they would oblige, and 27 (38.6%) who were of the opinion that they would only oblige after explaining their belief.

All dentists knew about amalgam alternatives. All 23 specialists (32.9%) and 10 generalists (21.3%) felt comfortable working with amalgam alternatives, such as posterior resin composite, ceramic and cast gold restorations.

All general dentists had their undergraduate dental training locally, while 4 specialists (17.4%) were trained abroad. Most generalists (83.0%) and all specialists were concerned about environmental issues and mercury in the dental office. Only 20 general dentists (28.6%) were concerned about the color of amalgam.

DISCUSSION

Though the response rate was high, the study may be limited, because only a select population of Nigerian dentists was studied. Furthermore, being a questionnaire-based epidemiological survey, there might be some elements

of under-reporting bias in the study. Consequently, the data may not be a true representation of all Nigerian dentists.

In the current study, the number of dentists who agreed on the safety of amalgam was slightly lower than that reported by Khairuldean and others.[14] However, in the current study, higher numbers of dentists agreed that amalgam is unsafe. The reason for the disparity may be due to the types of population studies and/or the level of awareness of the dentists. In the same vein, and for the same reason adduced above, fewer dentists were aware of the amalgam controversy in the dental literature. It would appear that preference in choosing amalgam is driven by cost and the easy availability of amalgam in Nigeria.

Fewer patients believe that amalgam is unsafe compared with previous studies.[14-15] According to Khairuldean and others,[14] patients' concern is usually media dependent, and the patients are usually positively or negatively influenced, depending on whether it is the pro- or anti-amalgamists who fight the hardest or longest.[2]

The pattern of acquisition of information on the amalgam controversy among Nigerian dentists contrasts that reported by Khairuldean and others.[14] These patterns may be influenced by the literacy level in the population, the level of media development and freedom. In Nigeria, dentists are usually well tutored in their undergraduate dental education. Also, the high figures recorded were comparable to colleagues, and inquiries as sources of information may suggest a high level of socialization and professional collaboration among Nigerian dentists. Furthermore, greater sources of information from conferences and continuing dental education noted among specialists compared to general dentists are in agreement with their calling and training, as they are more exposed to conferences and updates in the course of their specializations. In Nigeria, there are two post-graduate colleges for the training of dental specialists. Both organize update courses biannually for dentists as part of their specialist training. These updates are usually highly interactive in nature, and participants are exposed to the latest development in their specialty.

Compared to previous reports,[14] the current study reveals that fewer dentists would oblige patients' requests to have their amalgam removed. This might reflect patients' level of knowledge of their rights. This factor may also be dentist-dependent. As part of a lack of information, patients have no knowledge that they have the right to a clinic for their treatment. On the other hand, dentist-dependent means that the dentist must allow patients to participate in an informed consent process before amalgam removal.[14]

As expected, the greater percentage of specialists than general dentists who knew all the signs and symptoms of mercury toxicity in the current study may be explained by their level of access to conferences, collaboration among professionals and update courses. Out of 60% of the respondents who were aware of mercury vapor being the most toxic form of mercury, this higher figure accounted by general dentists was a paradox. The current study cannot propose a reasonable explanation for this paradox. More to that effect, further study is necessary.

The greater number of dentists who oppose amalgam ban in the current study is instructive and is in agreement with the findings of Khairuldean and others.[14] The high percentage of figures in both studies demonstrate the acceptability and reliability of amalgam over the other alternatives as a tested restorative material. The greater opposition from general dentists compared to specialists may be due to the type of sampled population; perhaps conservative dentists did not receive the survey. The distribution of patients and the location of a practice may also be factors. In the study of Southeastern Nigerian dentists, the majority of dentists were general dentists, as a very limited number pursue specialization. In addition, even among the specialists, the majority of those dentists specialize in oral and maxillofacial surgery rather than conservative dentistry. It is noteworthy that all specialists who participated in the study were in different dental specialties.

CONCLUSIONS

Within the limitations of this study, amalgam is well accepted by both dentists and patients and the dentists would not recommend an alternative to amalgam. Also, the majority of respondents were aware of the amalgam war and all the signs and symptoms of amalgam toxicity. Based on the findings of this study, amalgam is still a popular contemporary restorative material. It is also recommended that, for the results to be truly representative, all Nigerian dentists should be surveyed.

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