

Knowledge, attitude and practice of dental students, interns and practitioners to the use of amalgam in a dental institution of Kathmandu, Nepal

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Abstract

Background: Dental practitioners of Nepal have been using amalgam for years for restoration, but the concern for mercury related health issues and inventions in metallurgy science have recently led to its decreased use.

Objectives: To assess the knowledge, attitude and practice of students, interns and dentists to the use of dental amalgam in a dental institution of Kathmandu, Nepal.

Methodology: A cross-sectional study was conducted in a dental institution of Kathmandu among 192 Dental students, interns, dental officers and dental specialists selected by census sampling method. Self-administered questionnaire consisting of 16 questions related to amalgam war, its use and safety was used. Data collected were analyzed using Statistical Package for Social Sciences version 20. Frequency and percentage were calculated for each response according to different professional levels.

Results: Most of the respondents including all the dental officers did not use amalgam frequently for restoration (141, 73.44%). Mercury toxicity was their major concern that restricted amalgam use (60, 31.25%). Most of them, (135, 70.31%) agreed on stopping the use of amalgam. They were comfortable to use composite resin as an alternative to amalgam (185, 96.35%). Majority (123, 64.06%) considered amalgam to be an unsafe material and were bothered about the environmental issues of mercury in the dental office (152, 79.16%).

Conclusion: This study concludes that amalgam was less frequently used for restoration due to the increasing concerns of mercury toxicity. Further studies on safety of other materials that can replace amalgam with long term follow up are necessary before they are considered as a definitive alternative for amalgam.

Key words: Amalgam; Attitude; Toxicity.

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INTRODUCTION

Amalgam has been used in dentistry as direct restorative material of posterior teeth for many years^{1,2}. It is the most cost-effective restoration³ with easy application, and has strength, durability and bacteriostatic effect⁴. However, the use of this material is decreasing these days due to the increasing concerns regarding detrimental health effects, environmental hazards and aesthetics⁵.

Although there are concerns regarding mercury toxicity, most dental institutions hold amalgam as the material of choice for undergraduate students⁶. In a study conducted in Saudi Arabia, the majority of dentists believed amalgam to be safe for dentists and patients. They selected amalgam over other contemporary materials due to its superior longevity⁷. There is a

broad consensus for continuing a minor component of teaching theoretical aspects including clinical use of dental amalgam for undergraduates⁸.

There is paucity of studies regarding dental undergraduates and practitioners' perception regarding amalgam as a restorative material in Nepal. Therefore, this study was conducted to assess the knowledge, attitude and practice of dental students, interns and practitioners working in Kathmandu Medical College to use amalgam as a restorative material.

METHODOLOGY

A descriptive cross-sectional study was conducted among 192 dental students, interns, dental officers and specialists working in Kathmandu Medical College and Teaching Hospital, Duwakot from Jan 2019 to June 2020. Ethical approval was obtained from the Institutional Review Committee (IRC) of the same institution before data collection. Census method was used for selecting the study participants including dental students, interns, dental officers and faculties present during study period and informed consent was received from them. BDS third, fourth and final year students who had clinical postings in the Department of Conservative Dentistry and Endodontics were included in the study. Students, graduates and faculties who agreed to participate and were present during the study period were included. Those who had never used amalgam as a filling material were excluded.

A 16-item structured questionnaire was developed based on the published studies on amalgam and pretested among 10 first batch Dental interns. Face and content validity of the questionnaire were checked. The questionnaire consisted of structured questions with closed ended response. Some questions were modified according to the response of the pretested questionnaire after identifying their difficulty in comprehension. Final questionnaire consisted of demographic profile and questions regarding knowledge, attitude and practice towards amalgam use and safety. The self-administered questionnaires were provided to the participants and were collected by the investigators after they were filled.

Data were entered in Microsoft Excel Sheet and analyzed according to different professional level using Statistical Package for Social Sciences version 20. Frequency and percentage were calculated for each response.

RESULTS

In this survey, 234 individuals were approached for participation and provided with the pre-tested questionnaire. However, the filled questionnaire was obtained from 192 study participants bringing the overall response rate to 82.05%. The demographic profile of the study participants is represented in table 1. Mean age of the study participants was 25.69±4.70 years and most of them were females (132, 68.8%). Majority of the study population included students (90, 46.9%) and the minority were faculties (26, 13.5%).

The participants' responses to various questions regarding use of amalgam and its alternatives are presented in table 2. More than half of the study participants did not use amalgam frequently for restoration (141, 73.44%) including all the dental officers. At times, 70 (36.46%) of them used amalgam for larger restorations. However, 80 (41.67%) never used amalgam at all. Mercury toxicity was the major concern that made them restrict the use of amalgam (60, 31.25%). However, poor aesthetics and patient's desire to use tooth colored restoration was also considered by them. However, more than half of them (113, 58.85%) disagreed on replacing a good amalgam restoration already present on tooth with composite.

Majority of respondents (135, 70.31%) agreed on stopping the use of amalgam. They were comfortable to use composite resin as a restorative material as an alternative to amalgam (185, 96.35%). The responses on amalgam war are presented in table 3. Most of the participants (147, 76.56%) were aware of amalgam controversy but 33 (17.18%) were unsure of it. Most of the study participants (123, 64.06%) considered amalgam to be an unsafe material and were bothered about the environmental issues of mercury in the dental office (152, 79.16%). However, 32 (16.66%) were uncertain of amalgam safety.

Table 1: Demographic profile of study participants

Variables	Students	Interns	Dental officers	Dental faculties	Overall
Mean age in years (SD)	23.29 (2.93)	24.67 (1.22)	26.14 (0.99)	34.96 (4.76)	25.69 (4.70)
Sex n (%)					
Male	19 (21.1)	17 (42.5)	9 (25)	15 (57.7)	60 (31.3)
Female	71 (78.9)	23 (57.5)	27 (75)	11 (42.3)	132 (68.8)
Profession n (%)					
	90 (46.9)	40 (20.8)	36 (18.8)	26 (13.5)	192 (100)

Table 2: Responses to questions related to use of amalgam and its alternatives n (%)

Question	Students	Interns	Dental officers	Dental faculties	Total
Do you use dental amalgam for restorations in your clinical practice frequently?					
Yes	37 (41.11)	12 (30)	0 (0)	2 (7.70)	51 (26.56)
No	53 (58.89)	28 (70)	36 (100)	24 (92.30)	141 (73.44)
Have you used dental amalgam for the following?					
Simple restorations	16 (17.79)	4 (10)	7 (19.44)	4 (15.38)	31 (16.15)
Large restorations	29 (32.22)	16 (40)	11 (30.56)	14 (53.85)	70 (36.46)
Core material	2 (2.22)	1 (2.5)	1 (2.78)	0 (0)	4 (2.08)
Build up material	4 (4.44)	0 (0)	2 (5.55)	1 (3.84)	7 (3.64)
Don't use at all	39 (43.33)	19 (47.5)	15 (41.67)	7 (26.93)	80 (41.67)
What are the reasons that restrict you from using dental amalgam?					
Aesthetics	9 (13.04)	3 (12.5)	4 (12.12)	2 (14.28)	18 (9.37)
Mercury Toxicity	30 (33.33)	7 (17.5)	16 (44.44)	7 (26.92)	60 (31.25)
Patient's Desire	20 (10.41)	9 (22.5)	9 (25)	4 (15.38)	42 (21.87)
Aesthetics and patient's desire/mercury toxicity	21 (23.33)	16 (40)	3 (8.33)	12 (46.15)	52 (27.08)
Other reasons	10 (11.11)	5 (12.5)	4 (11.11)	1 (3.85)	20 (10.42)
Do you agree on replacing good amalgam restoration with composite resin?					
Agree	46 (51.11)	14 (35)	12 (33.33)	7 (26.92)	79 (41.14)
Disagree	44 (48.88)	26 (65)	24 (66.66)	19 (73.07)	113 (58.85)
If a patient had defective amalgam restoration, what would you prefer changing it to?					
Amalgam	9 (10)	12 (30)	0 (0)	6 (23.07)	27 (14.06)
Composite	59 (65.56)	20 (50)	34 (94.44)	13 (50)	126 (65.62)
Any of the above	22 (24.44)	8 (20)	2 (5.55)	7 (26.92)	39 (20.31)
Do you agree on stopping the use of amalgam as a final restoration?					
Agree	66 (73.33)	26 (65)	30 (83.33)	13 (50)	135 (70.31)
Disagree	24 (26.66)	14 (35)	6 (16.66)	13 (50)	57 (29.68)
Would you recommend an alternative to amalgam?					
Yes	71 (78.888)	36 (90)	34 (94.44)	16 (61.53)	157 (81.77)
No	10 (11.11)	2 (5)	2 (5.55)	5 (19.23)	19 (9.89)
Uncertain	9 (10)	2 (5)	0 (0)	5 (19.23)	16 (8.33)
Which of the following amalgam alternatives are you comfortable working with?					
Resin composite	84 (93.33)	40 (100)	36 (100)	25 (96.15)	185 (96.35)
Glass Ionomer Cement	5 (5.55)	0 (0)	0 (0)	0 (0)	5 (2.60)
Others (Cast gold restoration/ceramic restoration)	1 (1.11)	0 (0)	0 (0)	1 (3.84)	2 (1.04)

Table 3: Responses regarding amalgam war n (%)

Are you aware of amalgam controversy?					
Yes	61 (67.67)	34 (85)	30 (83.33)	22 (61.11)	147 (76.56)
No	9 (10)	0 (0)	0 (0)	3 (11.53)	12 (6.25)
Uncertain	20 (22.22)	6 (15)	6 (16.66)	1 (3.84)	33 (17.18)
What was your source of awareness?					
Patient enquiries	1 (1.6)	0 (0)	0 (0)	1 (4.5)	2 (1.4)
Undergraduate education	35 (57.4)	22 (64.7)	24 (80.0)	5 (22.7)	86 (58.5)
Conferences	4 (6.6)	1 (2.9)	3 (10.0)	6 (27.3)	14 (9.5)
Colleagues	0 (0)	2 (5.9)	0 (0)	1 (4.5)	3 (2.0)
Continuing dental education	21 (34.4)	9 (26.5)	3 (10.0)	9 (40.9)	42 (28.6)

Table 3 cont ...

What is your opinion about amalgam safety?					
Safe	19 (21.11)	4 (1)	2 (5.55)	12 (46.15)	37 (19.27)
Unsafe	55 (61.11)	28 (70)	30 (83.33)	10 (38.46)	123 (64.06)
Uncertain	16 (17.77)	8 (29)	4 (11.11)	4 (15.38)	32 (16.66)
What is your patient's opinion about amalgam safety?					
Safe	6 (6.66)	6 (15)	2 (5.55)	3 (11.53)	17 (8.85)
Unsafe	11 (12.22)	4 (1)	8 (22.22)	1 (3.84)	24 (12.5)
Uncertain	73 (81.11)	30 (75)	26 (72.22)	22 (84.61)	151 (78.64)
How do you respond to a patient's request to have his/her amalgam removed based on amalgam war?					
Agree	47 (52.22)	18 (45)	17 (47.22)	8 (30.76)	90 (46.88)
Disagree and explain	43 (47.78)	22 (55)	19 (52.77)	18 (69.23)	102 (53.12)
What is your opinion about the controversy on amalgam ban?					
Ban	43 (47.77)	18 (45)	26 (72.22)	9 (34.61)	96 (50)
Don't ban	27 (30)	10 (25)	2 (5.55)	12 (46.15)	51 (26.56)
Uncertain	20 (22.22)	12 (30)	8 (22.22)	5 (19.23)	45 (23.44)
Is dental amalgam an occupational risk factor at your workplace?					
Yes	75 (83.33)	28 (70)	30 (83.33)	14 (53.84)	147 (76.56)
No	15 (16.66)	12 (30)	6 (16.66)	12 (46.15)	45 (23.43)
Are you bothered about the environmental issues of mercury in the dental office?					
Yes	72 (80)	34 (85)	28 (77.77)	18 (69.23)	152 (79.16)
No	7 (7.77)	2 (5)	2 (5.55)	5 (19.23)	16 (8.33)
Not sure	11 (12.22)	4 (10)	6 (16.66)	3 (11.53)	24 (12.5)

DISCUSSION

There is a continuous debate since years on use of dental amalgam, degree of mercury release and its potential health effects although many reports on scientific evidence demonstrate amalgam to be a safe and effective restorative material⁹. There is also a larger concern for mercury toxicity during amalgam restoration in children due to their developmental immaturity¹⁰. However, there are several big national and international dental organizations stating that mercury fillings are stable¹¹. This study was conducted to assess the knowledge, attitude and practice of students, interns and dentists to the use of dental amalgam in a dental institution of Kathmandu, Nepal.

In the present study, a larger number of study population did not use amalgam frequently for restoration (141, 73.44%), including all the dental officers. Among different groups of study participants, amalgam was used mostly by students (37, 41.11%). Students frequently used this material because they have specified a quota for amalgam restoration to be fulfilled in their BDS curriculum under Kathmandu University. Majority of participants

(80, 41.67%) did not use amalgam at all. The amalgam users preferred this material for large restorations (70, 36.46%) as conventional cavity preparation can be done in a larger cavity without cutting excess tooth material. Amalgam can provide satisfactory performance even for larger restorations and can be retained for a longer duration of time without any mechanical failure¹².

Mercury toxicity was the major concern that made the study participants restrict the use of amalgam (60, 31.25%). Mercury toxicity may result from the inhalation of mercury vapors. Therefore, amalgam containing mercury should be handled with extreme care. The amalgam wastes should not be incinerated or autoclaved because mercury volatilized forming mercury vapors and entering the atmosphere, risking mercury toxicity¹³. Improper handling and disposal of amalgam may lead to substantial threat of the hazardous conditions¹⁴. Therefore, all the individuals handling dental amalgam should be informed regarding the potential hazards of mercury vapour and trained for good mercury hygiene practices¹⁵. The risks of adverse health effects in the dental office can be minimized by following the recommended

mercury hygiene protocols¹⁶. Poor aesthetics and patient's desire to use tooth colored restoration were also considered by the study participants. More than half of them (147, 76.56%) including most of the students (75, 83.33%) and dental officers (30, 83.33%) considered amalgam as an occupational risk factor at their workplace and agreed to replace amalgam with other restorative materials (113, 58.85%).

There are many factors influencing the choice in posterior restoration material, like funding, time expenditure, experience, clinical outcomes and pre-existing attitudes. A study done by Gilmour, Evans and Addy highlighted the fact that placing composite would take longer time in posterior teeth and are more expensive than amalgam¹⁷. In contrast, most of the study participants in this study would prefer changing a defective amalgam restoration to composite (126, 65.62%). More than half of them (135, 70.31%) agreed on stopping the use of amalgam as a final restoration. They were comfortable to use composite resin as a restorative material as an alternative to amalgam (185, 96.35%).

Majority of the study participants in the current study were aware of amalgam controversy (147, 76.56%). Most of them had learned about amalgam war in their undergraduate education (86, 58.5%) which is similar to the source of awareness reported in a study done by Udoye and Aguwa where 82.9% had gained knowledge about it through education in undergraduate program¹⁸.

In this study, most of the study participants (123, 64.06%) considered amalgam to be an unsafe material. Only a few participants (37, 19.27%) thought this material to be safe and 32 (16.66%) were uncertain about it. This finding is similar to a study done by Pooja and Delphinepriscilla Antony, where most of the general dental practitioners responded amalgam to be unsafe¹⁹. Among the participants responding to amalgam as a safe material, majority (12, 46.15%) were dental specialists, followed by dental students (19, 21.11%), dental officers (2, 5.55%) and interns (4, 1%). However, in a study done by Natarajan K and Ranjan M, 13% of third years, 7% of final years and 9% of interns considered amalgam as a safe material and 4%, 10% and 5% were uncertain of amalgam safety¹⁶. When asked about their patients' opinion, patients of most of the study participants' from all four groups were uncertain about amalgam safety. This result is in contrast to a study done by Udoye and Aguwa where 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 safety¹⁸.

The environmental effects of mercury component in dental amalgam have been highlighted lately. Environmental authorities have provided laws and recommendations due to which there is increasing installation of amalgam separators in dental units during the past decade²⁰. However, in dental set ups of a developing country like Nepal, separators are barely found connected. In the present study, majority of respondents (152, 79.16%) were bothered about the environmental issues of mercury in the dental office and would recommend an alternative to amalgam (157, 81.77%). Their concern would mostly be due to improper disposal of amalgam that affects the surroundings. A published study has also shown that practice of waste segregation and amalgam disposal in dental practice is poor²¹.

Half of the study participants (96, 50%) including most of the dental officers (26, 72.22%) were in favor of banning amalgam use in dentistry. However, when their patients requested to have his/her amalgam removed due to amalgam war, most of them (102, 53.12%) disagreed to do so and explained to them that amalgam may be more hazardous during removal than in placed condition.

This study has some limitations. The study was conducted in a single dental institution only and the sample was selected by convenience sampling method due to which the responses obtained cannot be generalized to the opinion of all the dental faculties, dental officers, interns and students of Nepal. The comparative assessment could not be computed to statistical analysis and interpreted because of uneven distribution of study participants in different groups.

CONCLUSION

This study concludes that amalgam was less frequently used for restoration due to the increasing concerns of mercury toxicity. Composite resin was preferred as an alternative to amalgam. However, participants did not want to replace the tooth already filled with good amalgam restoration to composite. Further studies on safety of other materials that can replace amalgam with long term follow up are necessary before they are considered as a definitive alternative for amalgam.

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