

# Dentists attitude towards amalgam restoration and its safety measures - KAP survey

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## ABSTRACT

**Introduction:** Dental amalgam which is not a tooth-colored restorative material has been used for many years in the treatment of dental cavities and it is still used in case of deep cavities, due to its excellent mechanical properties and durability. Dental amalgam is a combination of alloy particles and mercury that contains about 50% of mercury in the elemental form. Mercury is a toxic heavy metal, especially the vapor and organic mercury compounds are both neurotoxin and nephrotoxic. Long-term exposure to mercury vapor may increase the risk of mercury poisoning. It is important to know the safety measures of amalgam to protect both the patient and the dentist from mercury poisoning. **Materials and Methods:** This is a cross-sectional study which was conducted between November and December 2016 to determine the dentists' attitude toward amalgam restoration and its safety measures. The study consists of 132 dentists which included general practitioners and specialists working in clinics. A questionnaire with 15 questions was made on amalgam restoration and its safety measures and a survey was conducted among dentists between September and October 2017. **Results:** From the present study, 52% of the general practitioners and 90% of the specialists were aware about the safety measures of amalgam restoration. **Conclusion:** From the present study, it is important to know the safety measures of amalgam to protect both the patient and the dentist from mercury poisoning.

**KEY WORDS:** Amalgam, Mercury, Mercury poisoning, Safety measures

## INTRODUCTION

Dental amalgam is the most versatile restorative materials that are used widely all over the world. It has served as a dental restoration for more than 165 years despite periods of controversy. This substance is known as a toxic material due to the presence of 50% elemental mercury in it.<sup>[1]</sup> Worldwide, publicity of such controversy has given rise to the current concerns regarding the safety of dental amalgam.<sup>[2]</sup> Mercury is a toxic heavy metal which causes increase of some human diseases through the effects on the cardiovascular and nervous system and other organs of the body.<sup>[3]</sup> As a result, anti-amalgam forces and amalgam-free dentists claim recent studies indicate that the mercury in amalgam is hazardous.<sup>[4]</sup> Furthermore, amalgam lacks esthetics; hence, it is restricted to use in the posterior region of the mouth. Overall, amalgam is still the most cost-effective

of all restorative materials.<sup>[5]</sup> Utilization of amalgam is expected to diminish as a result of public pressure and concerns over the potential risk of amalgam. Preventive dentistry has dramatically dropped the use of dental amalgam.<sup>[6]</sup> Dental amalgam fillings interact in a complex way with the oral environment as they are subjected to chemical, biological, mechanical, and thermal forces. Since dentists work continually with amalgam, they usually have higher risk and level of mercury than the general population. The level of mercury in urine and blood arises from the time when dental students first work with amalgam and lasts throughout their experience.<sup>[1]</sup> Local adverse effects in the oral cavity are occasionally seen with dental amalgam fillings including allergic reactions and an association with clinical features characteristic of lichen planus, but the incidence is low and usually readily managed. Regarding systemic effects, elemental mercury is a well-documented neurotoxicant, especially during early brain development. Inorganic mercury also constitutes a hazard to kidney function. In some scientific reports, the presence of dental amalgam

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has been suggested to be associated with a variety of systemic adverse effects, particularly developmental neurotoxicity as well as neurological and psychological or psychiatric diseases. However, the evidence for such effects due to dental amalgam is weak.<sup>[7]</sup> Hence, the aim of this study is to determine the dentists' attitude toward amalgam restoration and its safety measures and to highlight the dentists' attitude toward amalgam and to investigate about the safety measures of amalgam.

### Composition of Amalgam Alloy

Composition of currently used alloy is silver 40–70%, tin 12–30%, and copper 12–24%. It may also include indium 0–4%, palladium 0.5%, and zinc up to 1%. Zinc prevents the oxidation of other metals in the alloy during manufacturing process.<sup>[8]</sup> Zinc also inhibits corrosion.<sup>[9]</sup> Some researchers believe that if zinc-containing amalgam is contaminated with moisture, it causes delayed expansion.<sup>[10]</sup> Indium-containing admixed high-copper amalgam exhibited a reduction in creep and increase in strength. Youdelis also found that less mercury is required for mixing amalgam when it contains indium in concentration up to 10%. The reason for lower mercury emission is that amalgam prepared with indium rapidly forms indium oxide and tin oxide films which reduce mercury release. Palladium reduces tarnish and corrosion.<sup>[11]</sup>

## MATERIALS AND METHODS

This is a cross-sectional study which is conducted between November and December 2016 to determine the dentists' attitude toward amalgam restoration and its safety measures. The study will comprise of 132 dentists which included general practitioners and specialists working in clinics. Data were collected by a structured questionnaire which was designed in English using the sources, results of other studies, and references. The questionnaires were consisted of two parts; the first part involved questions about the dentist demographic information (such as sex, field of practice, and years of professional activity) and the second part included questions related to knowledge and attitude toward amalgam restoration and its safety measures between January and February 2017.

### Sample Size Determination

$$N = \frac{Z\alpha^2 PQ}{L^2}$$

$$Z\alpha^2 = 3.84$$

$$P = 74.5$$

$$Q = 25.5$$

$$L = 7.45$$

$$N = \frac{3.84 \times 74.5 \times 25.5}{(7.45)^2}$$

$$N = 132$$

## RESULTS

In this study group, 132 dentists participated of these 70 were general practitioners and 62 were specialists. On the basis of gender, 57 were male and 75 were female. Of the whole, 40% have experience more than 5 years.

### Awareness about Amalgam Controversy

From this study, we came with the result that 90% of the general practitioners and 100% of the specialists were aware about amalgam controversy.

### Has the Controversy Affected the Use of Amalgam

About 48% of the general practitioners and 45% of the specialists said that the controversy affected the use of amalgam, and 51% of the general practitioners and 55% of the specialists said that the controversy did not affect their use of amalgam. From this, we came with the result that overall 42% said that the controversy affected the use of amalgam and 57% said that the controversy did not affect their use of amalgam.

### Attitude toward Amalgam Safety

About 44% of the general practitioners and 61% of the specialists said that amalgam fillings are safe. Overall, 50% said that amalgam fillings are safe.

### Most Toxic form of Mercury

About 45% of the general practitioners and 60% said that vapor is the most toxic form of mercury. Overall, 53% said that vapor is the most toxic form of mercury.

### Awareness about Amalgam Alternatives

About 63% of the general practitioners and 56% of the specialists said that composite is better alternative for amalgam [Figures 1-6].

### Safety Measures of Amalgam

#### *Mercury contamination*

About 54% of the general practitioners and 85% of the specialists were aware about the control of mercury contamination.

#### *Safe removal of amalgam*

About 52% of the general practitioners and 90% of the specialists were aware about the safe removal of amalgam.

#### *Management of mercury spillage*

About 42% of the general practitioners and 83% of the specialists were aware about the management of mercury spillage.

## DISCUSSION

In this study, the number of dentists who agreed on the safety of amalgam was slightly lower than that

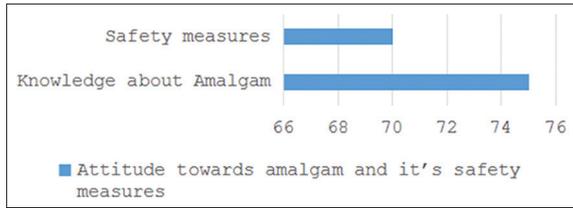


Figure 1: Attitude towards amalgam and it's safety measures

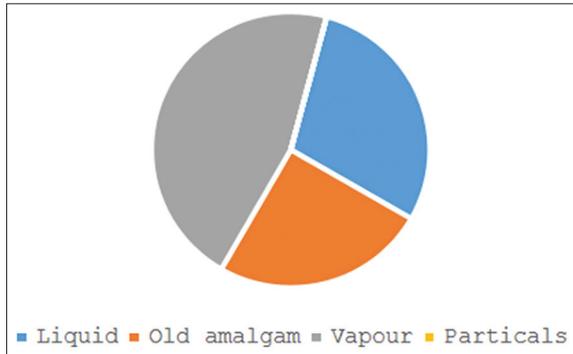


Figure 2: Most toxic form of mercury

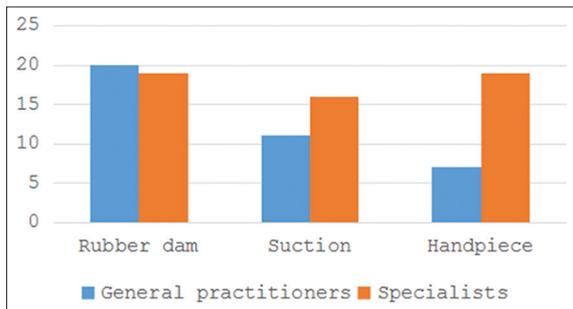


Figure 3: Safe removal of dental amalgam

reported by Khairuldean and others. However, in the current study, higher numbers of general practitioners agreed that amalgam is unsafe. The reason for the disparity may be due to the level of awareness.<sup>[12]</sup> The majority of the dentists felt that amalgam possessed greater longevity and superior mechanical properties, required less time to place and less patient cooperation, and was more economical for the patient than tooth-colored restorations.<sup>[13]</sup>

A study carried out on 99 self-patients in a national hospital, Oslo, Norway. Patients in their knowledge were of the opinion that dental amalgam fillings were the cause of physical symptoms from all body regions generalized anxiety, pain neuroticism, and chronic fatigue syndrome.<sup>[14]</sup> Another study showed that 98% of the dentists were aware of the controversy. Those who had a positive attitude toward amalgam were 89%. Those who had a negative attitude toward amalgam were 10.4%. 97% of the dentists still used amalgam as a material of choice for posterior restorations. The major problem with amalgam was esthetics followed by fear for risk of an allergic reaction.<sup>[15]</sup> A study by Kulkarni

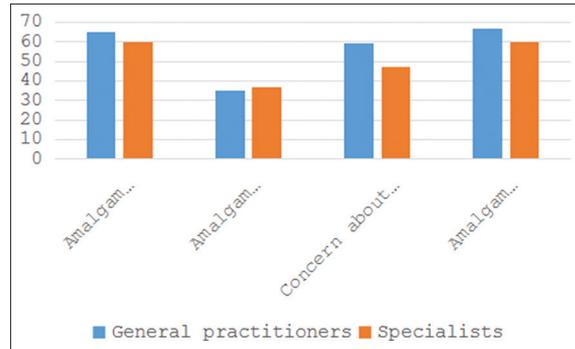


Figure 4: Knowledge about Amalgam

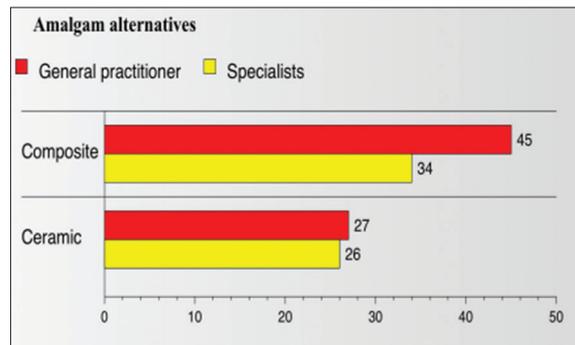


Figure 5: Alternatives to Amalgam

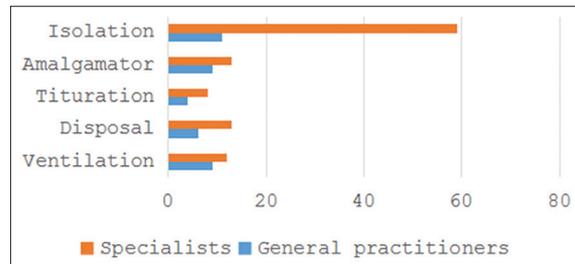


Figure 6: Measures taken to control mercury contamination

*et al.* showed that 1.8% of students and 6.9% of dentists always used rubber dam, whereas 76.5% of students and 69% of dentists have never used. Regarding the use of high volume suction, 11.7% of students and 12.1% of dentists always used high volume suction. More than 90% of the study individuals followed the universal recommendations.<sup>[6]</sup>

The World Health Organization in its review in 2003 estimated daily mercury exposure to range from 3 Ng to 9 Ng/day.<sup>[16]</sup> According to ADA classification, a spill is considered small if >10 g of mercury is present, whereas a large mercury spill has more than 10 g of mercury. Acute inhalation of mercury vapor may result in toxicity which leads to fever including chills, nausea, general malaise, and tightness in the chest, dyspnea, cough, stomatitis, gingivitis, salivation, and diarrhea.<sup>[17]</sup> Our study showed that overall 33% of the dentists told sulfur powder is used for the management of mercury spillage and 30% of the dentists told that

the use of rubber dam is the precaution taken to control mercury contamination and to remove dental amalgam safely. The response rate obtained in the present study was 72.5% losses and refusals were reduced. Results revealed that the 96.4% of the dentists take care of proper ventilation and fresh air exchange at their clinics, but it is reported that air-conditioning filters were not replaced periodically. Such conditions lead to increased possibility of indirect mercury exposure.<sup>[18]</sup>

## CONCLUSION

Based on this survey, it is clear that majority of them were aware about the controversy in regard to amalgam safety. Dentists were more knowledgeable about the risk and safety of amalgam toward their health. If the recommended mercury hygiene protocols are followed, the risks of adverse health effects in the dental office could be minimized.

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