Safety of Dental Restorative Materials – A Survey among Undergraduate Dental Students

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Abstract

Usage of proper dental restorative materials is very important in dentistry. One who is doing the course of dentistry should have sound knowledge on these restorative materials. Furthermore, it is important to know the view of budding young dentists about safety of dental restorative materials. The aim of present study was to assess the awareness and perception of undergraduate dental students towards safety of dental restorative materials. A study was carried out by using multiple-choice structured questionnaire among 262 students, the questionnaire was prepared in such a way that we can assess the attitude, their perception and awareness towards safety of dental restorative materials. The data was collected and statistically analysed. Although, most of the participants were having moderate level of awareness towards safety of dental restorative materials. The level of perception of some respondents towards amalgam related and other restorative materials related issues was found to be improved, participants with a better perception and attitude are having more knowledge and awareness towards safety of dental restorative materials. Within the limitations of the study, usage of alternative materials to amalgam should be improved.

Keywords: *Dental restorative materials, Dental students, Awareness, Safety*

Introduction

Two types of restorative materials are commonly used in dentistry, they are designated depending on whether they can be applied directly to the tooth or require fabrication of the restoration in the dental laboratory. Restorative materials are used to restore tooth damage that occurs as a result of dental caries. When a tooth is badly decayed or seriously infected, root canal treatment should be done.[1] Dental materials are used for direct restoration of a tooth in order to save its function while indirect materials include preformed metal crowns, dental porcelain and cast restorations. There are two main types of dental tools used for placing fillings: plastic instruments and condenser.[2] The principal material types for direct restorations are: Direct amalgam (silver-tin-copper alloy and approximately 50% mercury), Resin-based composite materials, Modifications of RBCs (poly-acid modified composites); compomers and giomers (glass filler modified composites). Glass-ionomer cements/water-based cements: Self-setting ("pure" glass ionomers) or more usually, light cured (resin modified glass-ionomers). Long-term temporary materials e.g. reinforced zinc oxide-eugenol cements. Chlorhexidine-releasing methacrylate dental composite materials have antimicrobial activity.[3]

The indications for use of restorative materials span from small cavities to extensive loss of tooth substance.[4,5] Materials are employed for cavities in primary teeth; for cavities in permanent teeth, ranging from "minimal interventions" to the need for extensive replacements and/or build-procedures; replacement or repair of failed or less satisfactory restorations, or materials are used in

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people with compromised health and having dental caries on certain locations, e.g. root caries.[6] The development of 'smart composites', Amorphous Calcium Phosphate Composites that respond to oral microflora by releasing chemotherapeutics or antimicrobials such as calcium and fluoride, may circumvent some of the shortcomings of composite restorations. Research into a material that is based on the technology of glass ionomers, low shrinking resins and high strength filters with simple handling and acceptable longevity is in progress. Glass ionomer cements exhibit a number of advantages over other restorative materials, by bonding a restorative material to tooth structure, the cavity is theoretically sealed, protecting the pulp, eliminating secondary caries and preventing leakage at the margins.[7]

The most common different types of restorative materials are: Amalgam, composites, glass ionomer, resin ionomers.[8] Amalgam are commonly used in dental fillings which are heavily loaded mostly in posterior restorations, composite are mostly used in aesthetic dental fillings and veneers. Glass ionomers are commonly used for small non load fillings, cavity liners, cements for crowns and bridges and resin ionomers are used for small non load fillings, cavity liners and cement for crowns and bridges.[9]

Dental materials which have widespread applications in dentistry, inspite of their good physical, mechanical properties and excellent esthetic characteristics, may inturn cause some side effects. Chlorhexidine has powerful antibacterial properties and can be especially helpful in maintaining a healthy mouth after procedures such as scaling and root planing.[10] The side effects of some restorative materials may lead to severe lesions in the oral cavity or far from the application place of the materials.[11,12] Dental materials maybe categorized into temporary or permanent materials and the related side effects can be studied based on clinical view, region and the type of material.

All artificial materials release substances into the oral environment and imply some risk of side effects and adverse reactions. Amalgam has been associated with general health concerns, while local oral effects from different restorative materials are reported.[13,14] The majority of the cases of side effects of dental filling materials are linked with dental amalgam. However, the reporting of composites and cements after the 2008 amalgam ban, decrease in harmful reactions has been observed.[15,16] The aim of present study was to assess the awareness and perception of undergraduate dental students towards safety of dental restorative materials.

Materials and Methods

The present study was the survey, conducted online through docs.google.com. The study was conducted among undergraduate dental students, from various places of India, and email addresses of the respondents were collected for study purposes, a list of 300 emails were collected and questionnaires were sent to them.

A self designed, close ended questionnaire consisting 10 questions was prepared. It was prepared in such a way that we can easily know the perception, attitude and awareness about safety of dental restorative materials among undergraduate dental students. The questionnaire was uploaded in Google docs. The web link was sent to 300 members in total, out of which 262 have responded. The responses were collected, compiled, and tabulated in MS Excel sheet, the data was then subjected to statistical analysis using SPSS-16, the statistical tests done are chi-square tests.

Results and Discussion

TABLE 1: Percentage distribution of responses to questions on awareness and perception level about restorative materials.

Question	Responses - Yes	Responses - No
Are you aware of amalgam controversy?	54.5%	45.5%
Would you recommend an alternative to amalgam?	81.8%	18.2%

Cont ... **TABLE 1: Percentage distribution of responses to questions on awareness and perception level about**

Are you bothered about the environmental issues of mercury in dental offices?	54.5%	45.5%
Is your patient worried about the colour of the restoration?	72.7%	27.3%
Do you prefer composite over amalgam?	81.8%	18.2%

TABLE 2: Percentage distribution of responses to questions on knowledge level about amalgam safety.

QUESTION	RESPONSES - YES	RESPONSES - NO	RESPONSES - MAYBE
Is amalgam safe to use?	27.3%	36.4%	36.4%
Do you think composite restorations are better than amalgam restorations?	54.5%	18.2%	27.3%
Do you think using amalgam causes many side effects?	45.5%	36.4%	18.2%

TABLE 3: Percentage distribution of responses to questions on knowledge level about material allergy.

QUESTION	RESPONSES - YES	RESPONSES - NO	RESPONSES - NOT AWARE
Are you aware that the methacrylate monomers are allergens in resin based materials like composites, resin modified GIC?	18.2%	54.5%	27.3%
Is there any relationship between mercury released from dental amalgam and neurological diseases?	54.5%	27.3%	18.2%

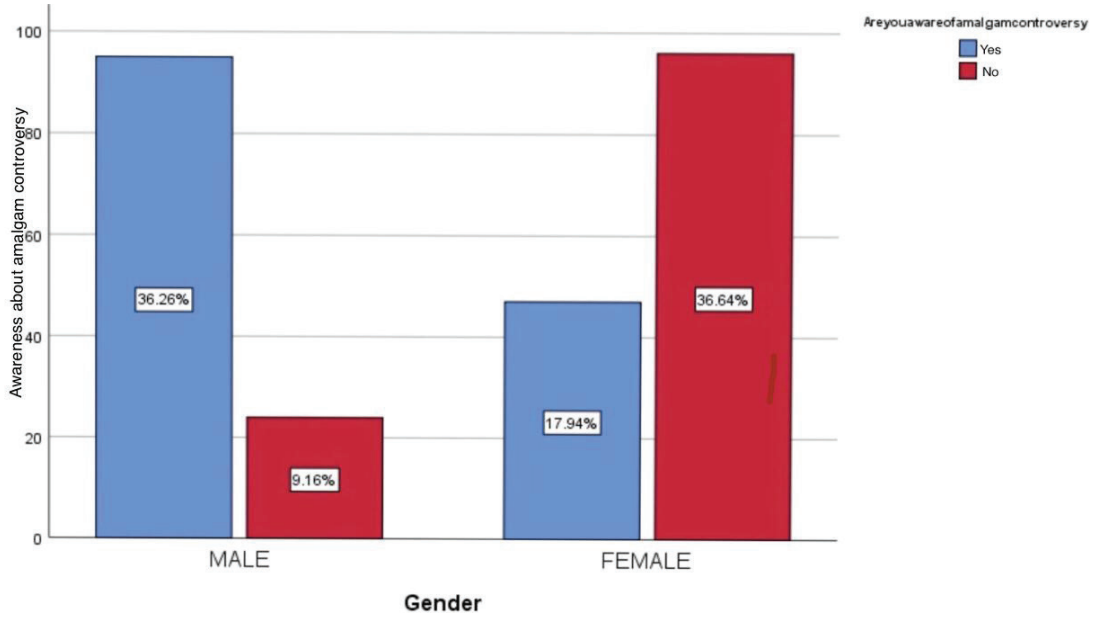

Figure 1: Bar chart showing association between gender of students and responses to the question, Are you aware of amalgam controversy. X axis represents the gender and the Y axis represents the number of responses. Blue represents yes and red represents no. 36.26% of males reported yes and 9.16% of males reported no. 17.94% of females reported yes and 36.64% of females reported no. Male participants are more aware regarding the controversy of amalgam compared to females. Chi square test; p value=0.00 (<0.05) indicating statistically significant.

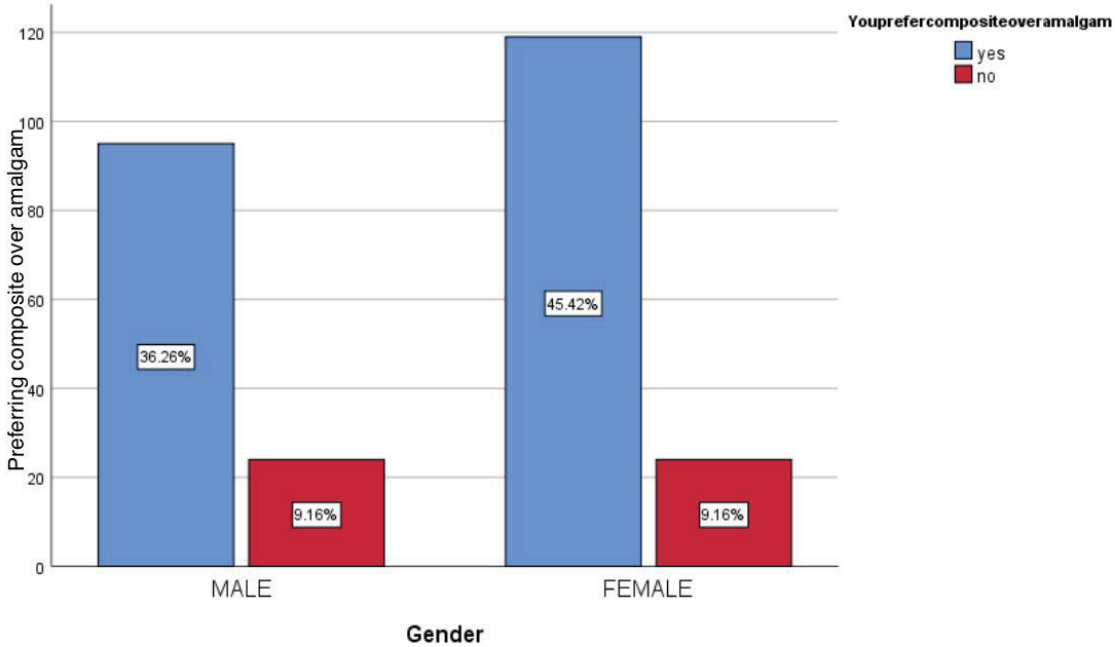

Figure 2: Bar chart showing association between gender of students and responses to the question, Would you recommend composite over amalgam. X axis represents the gender and the Y axis represents the number of responses. Blue represents yes and red represents no. 36.26% of males reported yes and 9.16% of males reported no. 45.42% of females reported yes and 9.16% of females reported no. Female participants prefer composite over amalgam compared to males. Chi square test; p value=0.481 (>0.05), indicating statistically not significant.

Out of 300 students approached, 262 have responded and the responses are statistically analysed. In this study, 54.5% of the respondents are aware of amalgam controversy, and the rest 45.5% are not aware (Table-1), more percentage of the respondents are aware about the amalgam controversy when compared to the study done by JE Dodes in 2001 and Simon JF in 2011.[17,18] 36.4% of students think that amalgam is unsafe, 36.4% students are uncertain whether amalgam is safe or unsafe, 27.3% of students think that amalgam is safe (Table-2). Dental amalgam contains elemental mercury. It releases low levels of mercury in the form of a vapor that can be inhaled and absorbed by the lungs. High levels of mercury vapor exposure are associated with adverse effects in the brain and the kidneys.[19,20] 81.8% of students recommended an alternative to amalgam and 18.2% don't recommend an alternative to amalgam (Table-1). When compared to the study done by Balevi B in 2014, more percentage of the respondents recommended an alternative to amalgam.[21,22] 54.5%of the students are bothered about environmental issues of mercury in dental offices and the 45.5% are not aware **(**Table-1**)**, when compared to the study done by keenan jr, more percentage of students are bothered about environmental issues of mercury in dental offices.

54.5% of the respondents think that composite restorations are better than amalgam restorations 18.2% of students think that it's not. 27.3% students opted for maybe (Table-2**)**. Composite filling is the better choice because it supports the natural tooth structure and in the process makes it stronger.[23] 45% of students think that using amalgam causes many side effects. 36.4% don't think that and the rest 18.2% opted the option maybe (Table-2), compared to previous study done by Hariyani M, more percentage of the respondents think that amalgam causes side effects.[24]

72.7% of respondents agreed that their patients are worried about the colour of restoration and the rest 27.3% did not agree, amalgam restorations look odd on the tooth, it is not an aesthetic material (Table-1). 54.5% of students don't think that methacrylate monomers are allergens in resin based on materials like composite and resin modified GIC, 27.3% are not aware of and the rest 18.2% agreed that methacrylate monomers are allergens (Table-3). Awareness about methacrylate monomers need to be improved. 81.8% of students prefer composite over amalgam and the rest 18.2% don't prefer (Table-1), compared to previous studies, more percentage of respondents prefer composite over amalgam.[25] 54.5% students think that, there is the relation between mercury released from dental amalgam and neurological diseases, 27.3% don't think that and the rest 18.2% are not aware (Table-3). Currently, there is no evidence that dental amalgam causes any severe neurological diseases. [26]

The response rate of the study is pretty much satisfactory, the study may be limited because only a selected population of Indian undergraduate students were studied. Consequently the data may not be a true representation of all undergraduate students. In the current study the number of undergraduate dental students who agreed on the safety of amalgam was slightly lower than that reported by kharirulden and others.[27] However, in the current study, a higher number of students agreed that amalgam is unsafe. Fewer patients believe that amalgam is unsafe compared with previous studies. [28]

The association between gender of students and responses to the question, Are you aware of amalgam controversy was done. 36.26% of males reported yes and 9.16% of males reported no. 17.94% of females reported yes and 36.64% of females reported no. Male participants are more aware regarding the controversy of amalgam compared to females. Chi square test; p value=0.00 (<0.05). Hence, it is statistically significant (Figure 1). The association between gender of students and responses to the question, Would you recommend composite over amalgam was done. 36.26% of males reported yes and 9.16% of males reported no. 45.42% of females reported yes and 9.16% of females reported no. Female participants prefer composite over amalgam compared to males. Chi square test; p value=0.481 (>0.05). Hence, it is statistically not significant (Figure 2). Compared to previous reports[29], the current study reveals that fewer undergraduate dental students would oblige, requesting patients to get their amalgam removed. This matter may also be dentist dependent. The rate of agreeing that their patients are worried about the colour of restoration is higher than the previous studies.[30] In present study, 54.5% of the students were bothered about mercury issues in dental office, this is also higher than the previous study done by mantyla et al in 1976.[31,32]

Conclusion

There is a need for improvement of usage of alternatives to amalgam and awareness about restorative materials and safety also should be improved. Within the limitations of the study, a moderate level of awareness about restorative materials was observed among the undergraduate dental students.

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