International Journal of Dentistry and Oral Science (IJDOS)
ISSN: 2377-8075

Effect Of Gender On The Prevalence Of Class II Restoration In Mandibular First Molars - A Retrospective Case Analysis Of 86,000 Cases

Research Article

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Abstract

Background: Dental amalgam is one of the most versatile restorative materials used in dentistry. It constitutes approximately 75% of all restorative materials used by dentists. It has served as a dental restoration for more than 165 years. There is still no adequate economic alternative for dental amalgam. The combination of reliable long-term performance in load bearing situations and low cost is unmatched by other dental restorative material.
Aim: The present study aims to evaluate the association between age and gender of patients who underwent amalgam class II restoration in mandibular first molar.
Materials and Method: The study sample consists of all patients between the age group 18-71 years who underwent amalgam class II restoration in mandibular first molar from june 2019 - april 2020 at the SDC. The data collected were analysed for the number, age, gender for amalgam class II restoration in mandibular first molar. For a comparison between different variables, statistical package IBM SPSS 20 software analyzer was used and the statistics were obtained.
Result: In this study, we can contemplate that Males(50.6%) have undergone more amalgam class II restoration in mandibular first molar when compared to females. Whereas, people of age groups 18-30 years(37%) have undergone more amalgam class II restoration in mandibular first molar. When compared to 36, more number of amalgam class II restoration was done in 46 (50.6%). There is no significant association between age, gender in patients undergoing amalgam class II restoration in mandibular first molar. Risk analysis was done. It is observed that males have higher risk when compared to females with highest confidence interval 1.490 and lowest confidence interval 0.785. (risk value - 1.082, males>females)
Conclusion: Within the limitations, the age group 18-30 years underwent more amalgam class II restoration in the mandibular first molar. The Male population seem to have undergone more amalgam class II restoration in the mandibular first molar and are at greater risk when compared to females.

Keywords: Age; Amalgam Class II Restoration; Mandibular 1st Molar; Gender.

Introduction

Dental caries is an infectious disease [1-4] that results in localised dissolution and destruction of the calcified tissues of teeth. The high prevalence of dental caries is thought to be strongly associated with dietary habits and increased consumption of sugar [4]. Dental caries is the most prevalent infectious disease in humans, affecting 97% of the population in their lifetimes [5]. It can affect various sites of the tooth. The most common sites for caries to occur are pits and fissure and proximal surfaces. These areas are more difficult to clean and thus more prone to caries. First molar is the first among the permanent teeth to erupt and get caries earlier. Proximal caries can progress silently and may take years to reach pulp.

Extensive studies of the setting reaction of dental amalgams, performed by Gayler in 1937, further elucidated the mechanism of setting of amalgam and influence of amalgam components on

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Received: September 06, 2020
Accepted: October 09, 2020
Published: October 27, 2020

Citation: Sandhya A, Surendar Sugumaran, Senthil Murugan P. Effect Of Gender On The Prevalence Of Class II Restoration In Mandibular First Molars - A Retrospective Case Analysis Of 86,000 Cases. *Int J Dentistry Oral Sci.* 2020;7(10):937-941. **doi:** http://dx.doi.org/10.19070/2377-8075-20000185

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expansion due to the gamma-1 phase (Ag–Hg) and contraction due to the formation of gamma-2 phase (Sn–Hg) [9]. Greener in 1979 claimed that there is misinterpretation of Gayler's work regarding the concentration of Cu, that the concentration of Cu above 5% produced increase expansion. What Gayler did say was that if Cu was substituted for tin so that the concentration of tin dropped below 25% expansion could occur; but if Cu was substituted for silver so that tin concentration was maintained at 27%, no excess expansion occurred. This confusion surrounding the concentration of Cu has resulted in a 25- 25–30 year delay in the development of amalgams resistant to corrosion. In 1959, Dr. Wilmer Eames recommended a 1:1 ratio of mercury to alloy, thus lowering the 8:5 ratio of mercury to alloy that others had been recommending. In 1962, a spherical particle dental alloy was introduced. This was followed in 1963 by a high copper dispersion alloy system that proved to be superior to its low copper predecessors. Although this performance was theorized to be the result of dispersion strengthening of the alloy, researchers discovered that the additional copper combined with the tin, creating a copper-tin phase that was less susceptible to corrosion than the tin-mercury (gamma-2) phase found in low copper alloys. Introduction of a new atomization process in the manufacture of dental amalgams led to a dramatic improvement in the quality and ease of manipulation with this material. This process involves spraying of the molten alloy into a chamber containing an inert gas by a patented atomization process. The molten metal forms droplets which solidify. These spheres are then subjected to some heat treatment. Thus, spherical particles are formed [6].

Composition of currently used amalgam 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 the manufacturing process [7]. [8, 9] Zinc also inhibits corrosion [10]. To overcome the limitation of micro leakage with amalgams, a coating of unfilled resin over the restoration margins and the adjacent enamel, after etching the enamel, has been tried. Although the resin may eventually wear away, it delays microleakage until corrosion products begin to fill the tooth restoration interface.

Although adhesive dentistry and aesthetic restorative materials have had significant development [11], choosing the best material to restore dental structures is still controversial. A recent systematic review of the literature highlights the benefits of dental amalgam restorations in posterior teeth compared to resin composites [12]. Indeed, the dental amalgam has been the chosen material for more than 150 years, especially due to its excellent long-term clinical performance and low cost [13]. However, a gradual decrease in the use of amalgam has been noticed in some countries [14], especially because it is non-aesthetical and it is not easily available material. Besides its potential risk to human health, resin composites have become more commonly used in the last years in many places, regardless of the patients' risk management decision. On the other hand, in several countries, the amalgam is still chosen for posterior teeth. In 2003, a research carried out in the United Kingdom showed that 49% of dental surgeons used amalgam instead of resin composites as restorative material. The main reasons for choosing amalgam were its lower technical sensitivity in procedures, higher resistance to tooth wear, lower cost for patients, lower postoperative tooth sensitivity and higher clinical longevity [15].

In some previous studies, it has been indicated that more extensive resin composites restorations tend to cause more fractures than amalgam and amalgam restorations may present satisfactory clinical performance for more than 12 years [8]. Nevertheless, in relation to their clinical longevity, their great performance and success rate is well established [2]. Thus, amalgam is still a great option for some clinical cases. Despite its limited indication for posterior teeth and non- aesthetical anterior areas, its use is very important when treating special patients. In the case of elderly people, the use of amalgam can restore large tooth substance losses with simple procedures and low cost. The same reasons make it the preferred material for patients at high risk to dental caries [13], like adolescents. It presents excellent performance for occlusal cavities of pits and fissures and can help with chewing for many years. The amalgam is an adequate solution for the cervical area of posterior teeth, as it can be well polished and tolerate gingival tissues. In the anterior teeth, it can also restore the lingual face with remarkable advantages for patients that are more likely to have cavities in the cingulum. Caries lesions in the cementum area, which are a serious clinical problem, will be a source of relief for the dentist and the patient alike because they are easy to restore, as well as the restorative properties and the longevity of the amalgam.

Certain studies were done in the institution on root canal fractures, root canal irrigation [16-19]. *In vitro* studies and systematic review on storage media for avulsed tooth were also carried out. [17, 20-22]. Researches such as clinical performance of various cements in noncarious cervical lesion and advancement in LA and veneers were also conducted in the institution [23-26]. Various studies such as questionnaire based study and an invivo study on diagnostic tests for pulp vitality were also done in the institution. [27-30] The present study aims to evaluate the association between age and gender of patients who underwent amalgam class II restoration in mandibular first molar.

Materials and Method

Study setting and sampling

This study is a single-center retrospective study, carried out in the Department of Conservative and endodontic dentistry at the SDC. Our study was approved by the ethical board of Saveetha dental college – Institutional ethical committee [IEC]. Ethical approval number SDC/SIHEC/2020/DIASDATA/0619-0320. All available records of endodontic patients treated from June 2019 – April 2020, were examined and included in our data collection. A total of 154 case sheets were reviewed. Cross verification of data for error was done by presence of additional reviewers and by photographs evaluation. Simple random sampling was done to minimise sampling bias. It was generalised to the south indian population. Two examiners were involved in the study.

Data collection/Tabulation

Acquisition of data was done from the hospital digital database which records all patient details. The data were entered in the system in a methodical manner. For this study, Data on the number of patients underwent amalgam class II restoration in mandibular first molar and clinical variables such as gender, and age at the start of treatment were collected. The data was then entered in

excel manually and imported to SPSS for analysis. Incomplete or censored data were excluded from the study.

Statistical analysis

Descriptive statistics were used to summarise the demographic information of the patients included in this study. Descriptive statistics is used for the acquisition of frequency of distribution of the data.The number of patients underwent amalgam class II restoration in mandibular first molar and clinical variables such as gender, and age at the start of treatment were collected. For a comparison between different variables, Statistical Package IBM SPSS version 21.0 software analyser was used. The data was analyzed using a chi- square test. The p value of less than 0.05 was considered to be statistically significant. Risk analysis was also done to interpret the study population.

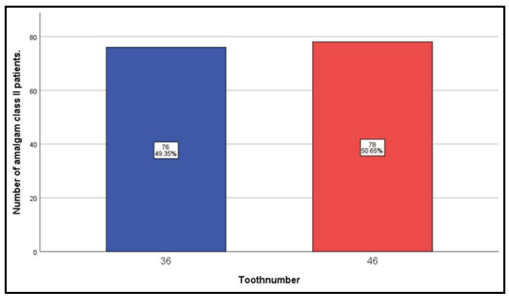
Result and Discussion

Increasing number of amalgam class II restoration is done in 46 (50.65%) when compared to 36. (GRAPH 1) It is observed that people of age group above 30 years(64.94%) have undergone more amalgam class II restoration in the mandibular first molar when compared to 18-30 years of age group. (GRAPH 2) The graph shows that 50.65% of males and 49.35% of females have undergone amalgam class II restoration in mandibular first molar. From which it is observed that, males have undergone more amalgam class II restoration in the mandibular first molar when compared to females. (GRAPH 3) It is observed that females (25.32%) have undergone more amalgam class II restoration in 36 than males (24.03%). The male population(26.62%) have undergone more amalgam class II restoration in 46 than the female population(24.03%). (GRAPH 4) Between the age group 18-30 years(green) 16.23% of them have undergone amalgam class II restoration in 36 and 18.83% of them have undergone amalgam class II restoration in 46. Above 30 years of age group(yellow) 33.12% of them have undergone amalgam class II restoration in 36 and 31.82% of them have undergone amalgam class II restoration in 46. From the chart it is observed that patients above 30 years of age group have undergone more amalgam class II restoration in mandibular first molar. (GRAPH 5) Risk analysis was also done to interpret the study population. It is observed that males have higher risk when compared to females with highest confidence interval 1.490 and lowest confidence interval 0.785. (TABLE 1)

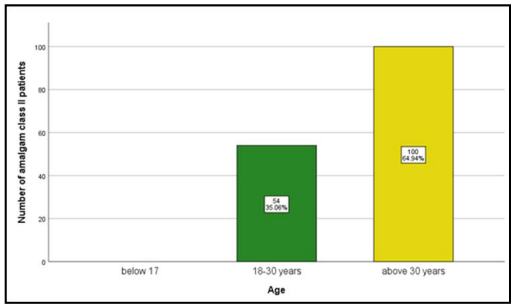
In this study male population had more prevalence of class II dental caries. This can be attributed to poor usage of interdental brush/ other cleaning aid. A study by yamamoto et al states that interdental brushes or other interdental cleaning aids can reduce caries incidence in proximal surfaces of the teeth [31]. bharti et al stated that the use of amalgam can be continued as a material of choice if esthetics is not a concern [6].

In some previous studies, it has been indicated that more extensive resin composites restorations tend to cause more fractures than amalgam and amalgam restorations may present satisfactory clinical performance for more than 12 years [32]. Amalgam restorations are also likely to fail in the daily practice. According to Healy and Phillips, the failures can be attributed to the preparation of cavities (56%) and incorrect manipulation of the material, while only 4% of those failures have been associated with other factors. Despite the long history and popularity of dental amalgam as a restorative material, there have been periodic concerns regarding the potential adverse health effects arising from exposure to mercury in amalgam. In this study, the age group of 18-30 years have more class II Cries and have undergone class II amalgam restoration. This can be overcome by usage of proper

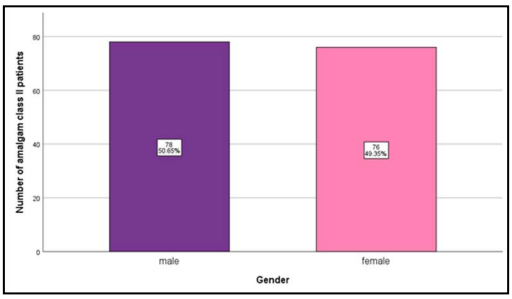
Graph 1. The Bar graph showing frequency of tooth wise distribution of study population based on number of amalgam class II patients. X axis represents the tooth number - 36 & 46. Y Axis represents the number of amalgam class II patients. It is observed that high prevalence was noted in 46 - 50.65% than 36 - 49.35%.



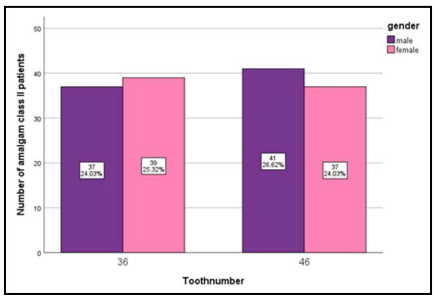
Graph 2. The Bar graph showing frequency of age wise distribution of study population based on number of amalgam class II patients. X Axis represents the age group ranging - below 17 years; 18-30 years & above 30 years. Y Axis represents the number of amalgam class II patients. The highest frequency was noted at the age group above 30 years - 64.94%followed by 18-30 years - 35.06%



Graph 3. The Bar graph showing frequency of gender wise distribution of study population based on number of amalgam class II patients. X Axis represents the gender - males and females. Y Axis represents the number of amalgam class II patients. The highest frequency was observed in males 50.65% than females 49.35%.



Graph 4. TheBar chart depicting the association of gender and teeth number. X Axis represents the tooth number and Y Axis represents the number of amalgam class II patients. It is observed that a higher number of male patients have undergone more amalgam class II restoration than females. There was no significant difference between gender and tooth number.(Chi-Square test, p value: 0.630 (p>0.05 statistically non significant)).



Graph 5. TheBar chart represents the association of age and tooth number. X Axis represents the tooth number and Y Axis represents the age of amalgam class II patients. Out of 154 patients there were no patients below the age group of 17 years. People of age group above 30 years have undergone more amalgam class II restoration followed by 18-30 years. There was no significant difference between tooth number and age of the amalgam class II patients.(Chi-Square test, p value: 0.577 (p>0.05 statistically non significant)).

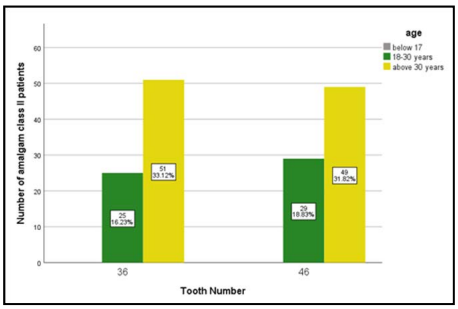


Table 1. The table shows the risk analysis of gender on the prevalence of amalgam class II restoration in the mandibular first molar. It is observed that males have higher risk when compared to females with highest confidence interval 1.490 and lowest confidence interval 0.785. (risk value - 1.082, males > females).

Risk Estimate			
	Value	95% Confidence Interval	
		Lower	Upper
Odds Ratio for tooth number (36/46)	1.168	0.621	2.198
For cohort gender = male	1.082	0.785	1.49
For cohort gender = female	0.926	0.678	1.266
N of Valid Cases	154		

cleaning technique, Imai et al stated that interdental brush is easy to use and has high patient compliance [33]. Thus it is important to educate the patient on the same.

In a study by kilpatrick et al [34] he stated that Amalgam remains an appropriate choice of material for the restoration and also added that the factors other than durability are increasingly influencing its use in clinical practice. The pros of the study includes, flexibility of the study, less time consumption and accessibility. The cons of the study are limitations in the population group. Future studies should focus on various factors that influence amalgam class II restoration in conservative dentistry, larger sample size on

varied population and long term follow up is needed.

Conclusion

Within the limitations the age group 18-30 years underwent more amalgam class II restoration in the mandibular first molar. The Male population seem to have undergone more amalgam class II restoration in the mandibular first molar. There is no significant association between the gender and age group with amalgam class II restoration in the mandibular first molar.

Authors Contribution

First author, sandhya performed the data collection by reviewing patient details, filtering required data, analysing and interpreting statistics and contributed to manuscript writing.

Second author, Dr. Surendar contributed to conception of study title, study design, analysed the collected data, statistics and interpretation and also critically revised the manuscript.

Third author, Dr. SenthilMuruganP participated in the study and revised the manuscript. All the three authors have discussed the results and contributed to the final manuscript.

Acknowledgement

This research was supported by saveetha dental college and hospital. We thank the department of Conservative and Endodontic Dentistry, Saveetha Dental College for providing insight and expertise that greatly assisted this research.

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