ORIGINAL ARTICLE

INTERNATIONAL JOURNAL OF RESEARCH IN PHARMACEUTICAL SCIENCES

Published by JK Welfare & Pharmascope Foundation Journal Home Page: https://ijrps.com

Comparison of incidence of dental caries in the mandibular first molar in teenagers versus adults

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Article History:

Received on: 13 Jul 2020
Revised on: 17 Aug 2020
Accepted on: 19 Aug 2020

Keywords:

Mandibular First Molar,
Teenagers,
Adults,
Incidence,
Dental Caries

ABSTRACT

The mandibular first molars are one of the first permanent teeth to erupt; thus, it remains the longest in terms of exposure to cariogenic pathogens. Also, its anatomical location and structure make it a prime location for dental caries (DC) but hard to access for cleaning. Thus, we aim to compare its incidence in adults and teenagers because the identification of the most susceptible age for tooth decay is key in prevention and prophylaxis against the same. A retrospective cross-sectional study was conducted by reviewing and analysing the data of 86,000 patient records from June 2019 to April 2020. Patients with treated mandibular first molars were selected from the age group of 13 and above. A Microsoft Excel 2016 data spreadsheet was used to collect data and was later exported to the Statistical Package for the Social Sciences for Windows (Version 20.0, SPSS). The number of males with DC in their mandibular first molar (59%) was higher than that of the females (41%). The highest number of cases were reported to prevail in the 'Young Adults' group, with 56.7%, followed by the 'Middle Adults' with 26%. This shows that adults have a higher incidence of DC in their mandibular first molars than teenagers. Also, there was a clear incidence of 46 having a higher incidence than caries in 36. (52.5% > 47.5%). There is an association between age and incidence of dental DC as proved by our Chi-Square Test, where we obtained a 'p' value of $p<0.05$, making it statistically significant. Once lost, our teeth cannot be naturally replaced, making prevention imperative. Thus, identifying the age in which we are most prone to decay is a great leap forward. But since the study does present with limitations, further research needs to be done to confirm the same.

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ISSN: 0975-7538

DOI: https://doi.org/10.26452/ijrps.v11iSPL3.2995

Production and Hosted by

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INTRODUCTION

Dental Caries (DC), commonly called tooth decay, is one of the most prevalent chronic diseases throughout the world with no regard to age, sex, ethnicity or location (Selwitz *et al.*, 2007). There are several factors involved in the formation of dental caries such as saliva pH, matrix metalloproteinases and substrates such as carbohydrates (Ramesh *et al.*, 2018). Because there is bacterial destruction of the hard tissues like the enamel, dentin and cementum by the production of acid, there is irreversible demineralisation and finally the loss of tooth struc-

ture. There are four main factors required for the formation of caries - cariogenic bacteria (Teja and Ramesh, 2019), fermentable carbohydrates, susceptible tooth surfaces and sufficient time (Gibbons and Houte, 1975). Across the world, 3.6 billion people have dental caries in their permanent teeth. As of recent years, they have become common in children as well as in adults (Bagramian *et al.*, 2009).

The first molar is a key to the occlusal mechanism – playing a vital role in the formation of the permanent dentition and in establishing a normal bite (Angle, 1900). They are also indispensable from a masticatory point of view. But, according to a report by Miyano *et al.,* 27.9% of the upper and 59.8% of the lower first molars are affected by caries immediately following eruption (Fukada, 1982). It is established that first molars when compared to the other teeth, takes a long time between the partial and full eruption of its crown. Thus, they are exposed to the accumulation of plaque for much longer (Siddique, 2019), making them more susceptible to caries (Sakai *et al.*, 1978). They are the largest teeth in the mouth and bear the most of the occlusal load (Yoshida, 2012). But this also provides a large surface area for caries, thus increasing its susceptibility (Noor, 2016). They also have the most root surface area, so they are undeniably the best source of anchorage. The molars also influence the height and aesthetic proportions of the maxilla and mandible. So, it is no exaggeration to say that the first permanent molar is the most important tooth in our oral cavity.

A study done by Nathaniel *et al.* shows that the mandibular molars develop caries a little before they do so in maxillary molars. The mandibular molars also display proof of maximum caries development by the age of 20 years to a greater extent than in the maxillary molars (Rowe, 1976). Using this as our justification, our study aims to compare the incidence of dental caries, specifically in the mandibular first molars in teenagers and in adults.

MATERIALS AND METHODS

Study Design and Setting

This retrospective study examined the records of 86,000 patients from June 2019 to April 2020 undergoing treatment at Saveetha Dental College, Chennai. Ethical approval was obtained from the Institutional Ethics Committee. The study population included patients with established dental caries in their mandibular first molars from the age of 13 onwards. They were separated according to their sex, age and tooth affected. Mentally or physically disabled individuals were excluded from the study due to their difficulties in maintaining a standard level of oral hygiene.

Data Collection

The patient records of 86,000 patients who visited the hospital from June 2019 to April 2020 were analysed and were used to identify 3371 patients in the hospital database undergoing treatment for dental caries in their mandibular first molars. Relevant data such as patient age, sex and tooth number involved was recorded. Repeated patient records and incomplete entries were excluded. The data obtained was verified by an external reviewer.

Statistical Analysis

Data were recorded in Microsoft Excel 2016 (Microsoft Office 10) and was later exported to the Statistical Package for the Social Sciences for Windows (Version 20.0, SPSS, Inc., Chicago, USA) and was then subjected to statistical analysis. Chi-square test was used with the level of significance set at $p<0.05$.

RESULTS AND DISCUSSION

The final dataset consisted of 3371 patients of predominantly South Indian origin undergoing treatment for established dental caries in their lower left (LL 36) and lower right (LR 46) mandibular first molars. There was a clear prevalence of males (59%) when compared to females (41%) of the sample size, as seen in Figure 2 and Table 2. The young adults present in the study (56.7%) had the highest incidence of dental caries followed by middle-aged adults (26%), teenagers (12.1%) and lastly, the old adults (5.2%). There was a noteworthy difference in the incidence of dental caries based on the tooth number as well, with 52.5% of the cases occurring in 46 as opposed to the 47.5% occurring in 36. There was also a similar trend observed in every age group, and not just an overall increased incidence of dental caries in 46, meaning that 46 was vastly more affected in terms of incidence when compared to 36 in all age groups (Figure 3 and Figure 4).

There was a statistically significant difference between the age group and the incidence of dental caries in the mandibular first molars ($p<0.05$) as inferred from Figure 1 and Table 1, with patient frequency in the 'y' axis and age in the 'x' axis (Chi-Square Test, $p<0.05$).

In the age group of teenagers (13-18) years, 186 cases of affected 36's and 221 cases of affected 46's were established. In the age group of young adults (19-35) years, 926 cases of affected 36's and 987 cases of affected 46's were established. In the age group of middle adults (36-55) years, 420 cases of

Table 1: Chi-square test showing the statistically significant (p<0.05) cross-tabulation between age and the incidence of DC in the mandibular first molars

Count		Tooth Number		Total	P-Value
		36 (LL)*	46 (LR)**		
Age	Teenagers - (13-18)	186	221	407	
	Young Adult - (19-35)	926	987	1913	
	Middle Adult - (36-55)	420	455	875	0.000
	Old Adult - (Above 55)	70	106	176	
	Total	1602	1769	3371	

*Lower Left **Lower Right

Table 2: Chi-square test showing the statistically significant (p<0.05) cross-tabulation between gender and the incidence of DC in the mandibular first molars

Count		Tooth Number		Total	P-Value
		36 (LL)*	46 (LR)**		
Gender	Male	942	1047	1989	
	Female	660	722	1382	0.000
	Total	1602	1769	3371	

*Lower Left **Lower Right

Table 3: Overall Chi-square test statistics with statistically significant results of (p<0.05)

Value Type	Age	Gender	Tooth Number
Chi-Square	2113.211[a]	109.300[b]	8.273[b]
df	3	1	1
Atap. Sig.	0.000	0.000	0.004

[a] 0 cells (0.0%) have expected frequencies less than 5. The minimum expected cell frequency is 842.8
[b] 0 cells (0.0%) have expected frequencies less than 5. The minimum expected cell frequency is 1685.5

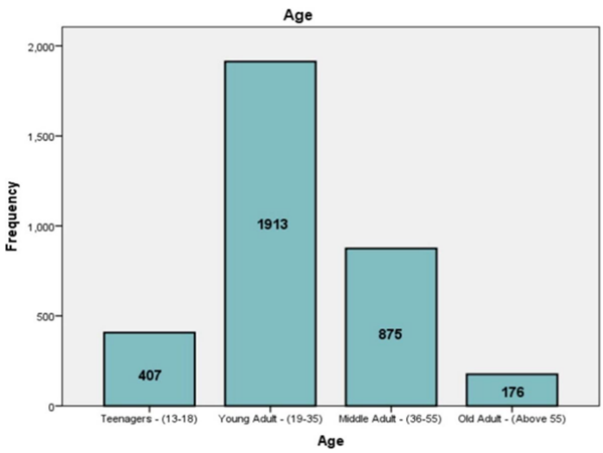

Figure 1: Bar chart showing the distribution of age groups where the incidence of DC is highest in (19-35) years

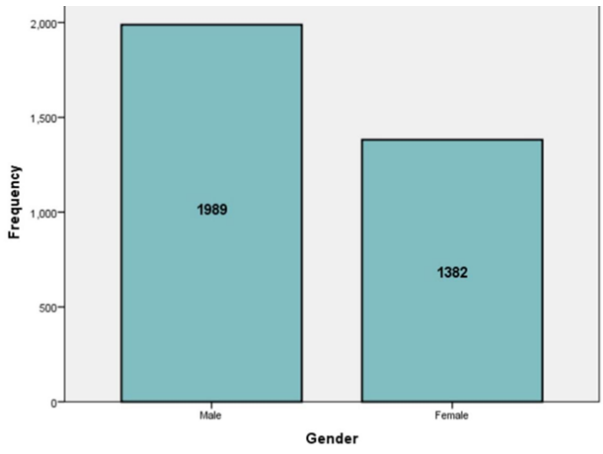

Figure 2: Bar chart showing the distribution of gender

affected 36's and 455 cases of affected 46's were established. In the age group of old adults (Above 55) years, 70 cases of affected 36's and 106 cases of affected 46's were established. 'Young Adults' had the highest incidence of dental caries in mandibular first molars and there was a predilection towards 46 in every age group. (Figure 4), (36 - turquoise, 46 - yellow) with patient frequency in the 'y' axis and age in the 'x' axis. (Chi-Square Test, p<0.05) (Table 3).

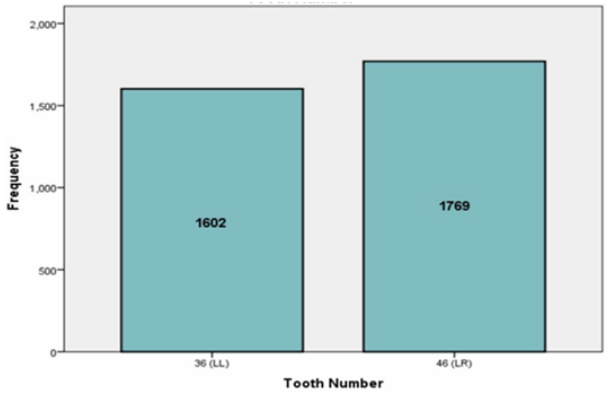

Figure 3: Bar chart showing the distribution of involved tooth number with a predilection towards 46 (52.5%)

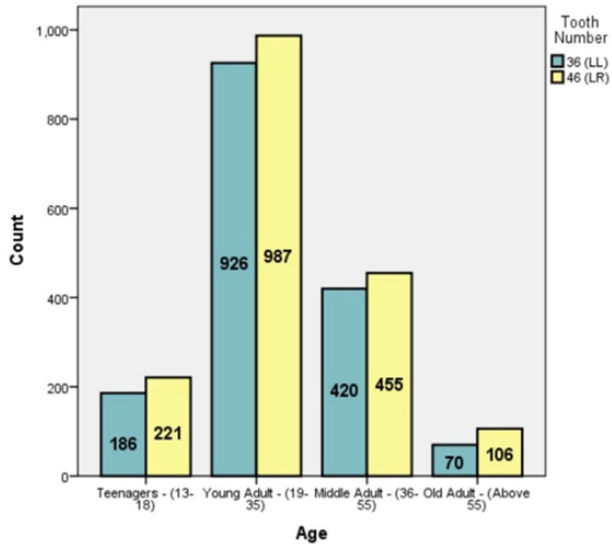

Figure 4: Bar chart showing the association between age and incidence of DC

Figure 2, with a male predilection of 59% across the scale of patient frequency in the 'y' axis and gender in the 'x' axis. (Chi-Square Test, $p<0.05$).

Figure 3, with frequency in the 'y' axis and tooth number in the 'x' axis. (Chi-Square Test, $p<0.05$).

The data for this retrospective study was based on the residents of South Indian cities seeking treatment at Saveetha Dental College, Chennai, India. Currently, there are no studies directly seeking to identify the same – the comparison of the incidence of dental caries in mandibular first molars in different age groups. Since there was no filtration process involved, this study mostly remains free of bias in regard to the selection of patients – except for the exclusion of patients below the age of 13 and those with mental and physical disabilities.

According to most studies, females are reported to have a higher incidence of dental caries when compared to males. But one study states that there is not much of a sex difference except possibly in white children (Rowe, 1976). This could perhaps explain our incidence of a larger male population. Also, the lack of a gender-wise population distribution leading to a larger number of males in the study size could be another possibility to explain why 1989 males as opposed to 1382 females out of 3371 patients were affected by dental caries (Figure 2). Different groups of teeth are affected differently by the carious process. A number of studies have proved that age is an important factor that influences the structural and chemical composition of hard dental tissues. As a result of ageing, the entire enamel structure changes (Belenova *et al.*, 2003). A national epidemiological dental survey conducted by the WHO criteria in the years 2007-2008 reported that caries of the primary teeth was found in 84% of the children of the Russian Federation aged 6, 72% of caries in children aged 12 and in 99% - 100% of the adults (Kunin *et al.*, 2015). Similarly, our study establishes that dental caries is highly prevalent among the adult population as opposed to the teenage population. Poor oral hygiene can occur at any age - both in youngsters as well as in adults. Systemic diseases that affect the balance between the demineralisation and remineralisation process, however, are more prone to affect the elderly population as opposed to the younger age groups (Nasim and Nandakumar, 2018). Also, a national epidemiological survey showed a 6% - 13% reduction in dental caries intensity in children over a ten-year period. This increase in oral hygiene awareness can be attributed to the numerous promotions done in schools and by programmes (Admakin and Mamedov, 2004) aimed at children (Alimskij *et al.*, 2004). It should be noted that the reduction of caries is much less in adults and elderly patients, possibly due to the lack of programmes catering to adult awareness (Manohar and Sharma, 2018).

According to a few studies (Demirci *et al.*, 2010), the younger age group is at a higher risk of developing caries (Shakoor and Iqbal, 2017). The difference in conclusions could be because our study excludes the younger child population and begins with the lowest age being 13. Also, children are attributed to a higher caries susceptibility (Kleemola-Kujala and Rasanen, 1982) than adults because of their unhealthy eating habits and unlidded consumption of sweets especially in those of higher socioeconomic statuses (Zhang, 2014). As our study sample falls to the lower end of the socioeconomic scale, that could be why the teenagers among our study population have a lower incidence of mandibular

first molar caries as opposed to young adults (19-35) years and middle adults (36-55) years, (Skafida and Chambers, 2018). When comparing our findings to a more adult-oriented study, our results are correlative in the fact that the adult population is at high caries risk (Akhtar *et al.*, 2015).

From the results of our study and as evident from Figure 3 and Figure 4, it is clear that there is a higher incidence of dental caries in 46 (52.5%) in both teenagers, young, middle and old adults as when compared to 36 with an incidence of 47.5%. This is contradictory to the findings of Banga *et al.,* which suggests that the most commonly treated tooth was 36, followed by 46 (Banga *et al.*, 2018). This (Ramamoorthi *et al.*, 2015) could be because of the difference (Ramanathan and Solete, 2015) in age selection (Ravinthar and Jayalakshmi, 2018) of the sample and the difference in sample size (Rajendran *et al.*, 2019). There is also a statistically significant ($p<0.05$) association between age and the incidence of dental caries in the mandibular first molars. Since our maximum prevalence was found to be in the young adult's age group (19-35) years, we believe that dental intervention is needed during or slightly before the attainment of this age. Although most dental practitioners are well trained to restore lost tooth structure (Janani *et al.*, 2020) resulting from caries, avulsion (Rajakeerthi and Nivedhitha, 2019) and tooth fracture (Kumar and Antony, 2018), prevention (Jose *et al.*, 2020) rather than restoration (Nasim *et al.*, 2018) must be our area of focus (Otsu, 2014).

CONCLUSION

Within the limits of the study, there is an existing association between age and incidence of dental caries in the mandibular first molar and it is statistically significant. There is also a higher incidence of caries in 46 when compared to 36. With this knowledge, further research must be facilitated to establish and procure more proof of the existence of such a connection to better the prophylactic standards concerning the mandibular first molar, the gem of the oral cavity. As there is currently no known method to grow back lost natural teeth , studies must be carried out to save rather than to restore.

ACKNOWLEDGEMENT

The authors of this study would like to thank the editors and the authors of the journal – the source of scientific compilation for this research article.

Funding Support

The authors declare that they have no funding support for this study.

Conflict of Interest

The authors declare that they have no conflict of interest for this study.

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