Journal of Pharmaceutical Research International

Volume 35, Issue 25, Page 19-25, 2023; Article no.JPRI.106554
ISSN: 2456-9119
(Past name: British Journal of Pharmaceutical Research, Past ISSN: 2231-2919, NLM ID: 101631759)

Incidence of Dental Caries in Permanent Mandibular First Molar among North Indian Population

Aashish Handa [a++], Komaldeep Kaur Sandhu [b], Kanwalpreet Kaur Bhullar [a#*] and Smiley Goyal [a†]

[a] Department of Conservative Dentistry and Endodontics, Sri Guru Ram Das Institute of Dental Sciences and Research, Amritsar, India.
[b] Sri Guru Ram Das Institute of Dental Sciences and Research, Amritsar, India.

Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

Article Information

DOI: 10.9734/JPRI/2023/v35i257430

Open Peer Review History:
This journal follows the Advanced Open Peer Review policy. Identity of the Reviewers, Editor(s) and additional Reviewers, peer review comments, different versions of the manuscript, comments of the editors, etc are available here: https://www.sdiarticle5.com/review-history/106554

Original Research Article

Received: 13/07/2023
Accepted: 17/09/2023
Published: 21/09/2023

ABSTRACT

Dental caries is a multifactorial condition that is influenced by a number of factors, including nutrition, bacteria, saliva, tooth shape, environment, sex, geography, dietary patterns, and genetics. Only a small number of research in India have examined the prevalence of dental caries, particularly in adults.

Aim: The purpose of the current study was to ascertain the incidence of dental caries in left and right mandibular first molars in adults attending the Out Patient Department.

Materials and Methods: The present cross-sectional research was done among the 1287 patients. Clinical oral examinations consisted of visual examination and no radiograph was taken for the

[++]*Reader;*
[#]*Professor and Head;*
[†]*Post Graduate Student;*
**Corresponding author: E-mail: drkanwalpreetbhullar@gmail.com;*

study. Chi-square test was used to statistically analyse the results. p value of <0.005 was employed throughout the study.
Results: The current study found that the youngest age group (16 to 30 years old) had the significant caries levels, followed by middle-aged and older age groups. In comparison to the right mandibular molar, the left first molar showed a higher prevalence of caries, with males showing a higher rate than females. It also demonstrated that the dental caries prevalence remains high among rural population in comparison to urban population.
Conclusion: Permanent first molar in early age group presented higher caries incidence.This finding can help in formulation of various preventive strategies.

Keywords: Oral health problem; factors; caries prevalence; age groups.

1. INTRODUCTION

Dental caries is a multifactorial condition that is influenced by a number of factors, including nutrition, bacteria, saliva, tooth shape, environment, sex, geography, dietary patterns, and genetics [1]. Numerous factors such as accumulation of food particles on the occlusal surfaces and the persistence of bacterial plaques on teeth with wide crowns, deep grooves and posterior region of the mouth raises the likelihood of tooth decay. In addition, systemic disorders, some common medications, poor oral hygiene, bad teeth brushing habits, plaque, and molar incisor hypo mineralization also predisposes permanent first molars to caries [2].

Oral health is an important contribute of general health and is imperative factor for overall wellbeing. Evidence based literature supports the vital links between the two [3]. In developing nations, dental caries impacts about 60–90% of schoolchildren and the great majority of adults, making it the most prevalent oral health problem [4]. The caries incidence was 51.9%, 53.8% and 63.1% at ages 5, 12 and 15 years respectively in various states of India [5]. There is a wide variation in the extent and distribution of dental caries across different countries and regions, even within the same country or region. Dental caries prevalence also differs with age, gender, socioeconomic position, region, dietary choices, and oral hygiene behaviours. Developing countries have a higher frequency of dental caries than industrialized countries because of various geographic, sociopolitical, economic factors as well as a lack of resources for health care. This difference is reflected in dental awareness and practice [6]. The identification of high-risk populations motivates community members to get more involved in preventive activities, raise community awareness, and refocus oral healthcare services toward prevention of dental problems and improvement prevention of dental problems and oral health improvement [7].

One of the key elements in the caries aetiology is the pattern of dental caries. It is widely acknowledged that comprehensive data on an individual's caries pattern may throw light on the causes of dental caries. This information is a valuable source of reference for dental administration as they choose which preventative measures to implement in order to lessen the disease burden.

Dental caries prevention has long been seen as a vital task for overall health. The understanding of the recommended methods for identifying, treating, and preventing dental caries is progressing. Modernized methods that emphasize infection control and tooth structure preservation are replacing outdated approaches to treating caries. Dental caries can be avoided by lowering demineralizing factors, such as better oral hygiene and dietary changes, and raising protective factors, including the use of pit and fissure sealants and remineralizing agents.

A thorough examination of the caries pattern literature reveals little information concerning India, with most studies focusing on the caries pattern in children and few, if any, studies on the pattern in adults, particularly the elderly. There are currently no studies or data available on the prevalence of dental caries among adults in North India, particularly in the state of Punjab.

Thus, the objective of the current research was to ascertain dental caries incidence in mandibular first molars among adults visiting the Out Patient Department of the dental institute.

2. MATERIALS AND METHODS

2.1 Study Design

The present cross-sectional research was done among the patients in out-patient section of Oral

Medicine and Radiology, Sri Guru Ram Das Institute of Dental Sciences and Research, Sri Amritsar. The study was conducted from November 2022 to May 2023.

Sample Size Calculation was according to Taro Yamane formula:

$$\text{Sample size (N)} = \frac{(Z^2)\times\sigma\times(1-\sigma)}{d^2}$$

Where

N is required sample size
Z signifies the confidence level
σ is standard deviation which is taken as 0.5 to ensure reliable sample size
'd' is the margin of error which is taken as 5 per cent of the standard deviation i.e 0.025

Recommended sample size was 1282 at 95 % confidence level.

So, 1600 patients were thus arbitrarily selected to take part in the study over the course of four months, but 1287 met the criterion and provided the consent in the same.

Hence, a total of 1287 patients participated in the study.

2.1 Inclusion Criteria

- Healthy patients older than 16 years of age
- Dentate patients who sought dental care, between ages of 18 and 60, of both sexes
- Co-operative patients after taking their consent

2.2 Exclusion Criteria

- Mentally impaired individuals.
- Those who refused to provide consent
- Patients beyond the age of sixty years old.
- Non-co-operative patients

2.3 Procedure

Clinical oral examinations consisted of visual examination using a clean mouth mirror, an explorer, cotton rolls, tweezers, and gloves with the patient comfortably sitting on a dental chair under sufficient lighting. No radiograph was taken for the study. The caries incidence and the prevailing condition of the mandibular first molar was assessed using information gathered from these individuals. Sociodemographic data of the study participants such age, gender, address, existing oral habits were collected. The International Caries Detection and Assessment System (ICDAS) criteria were used to evaluate dental caries. Sequential evaluations of each patient's teeth, starting with number 1 to 32, were part of the examination process. The presence of dental cavities was checked on every exposed and approachable surface. Examining clean, dry teeth is the main prerequisite for using the ICDAS system. In addition to checking for surface contour, minor cavitation, and sealants, any leftover plaque and debris was eliminated with a ball-ended explorer. Before the clinical evaluation, the teeth was cleaned with a toothbrush or a prophylaxis cup.

Non-parametric test such as chi-square test and z test were done to examine the prevalence in mandibular first molar. Chi-square test was used to statistically analyse the results. p value of <0.005 was employed throughout the study.

3. RESULTS

The study included 1287 patients who were at least 16 years old in total. Of these, 653 (50.7%) were from the urban and 634 (49.3%) were from the rural area. There were 666 (51.7%) males and 621 (48.3%) females. The number of patients examined were below 30 years, above 30 years and above 50 years. As shown in the contingency table below, the frequency of caries was maximum among younger age groups (46.03%), followed by middle age groups (29.63%) and older age groups (24.34%). The findings of the current study revealed that the left mandibular first molar had a higher incidence of caries (n=674, 15.17%) than the right mandibular first molar (n=497, 13.66%). Males were also affected more frequently than females; 780 males had carious lesions on their permanent mandibular first molars, compared to 391 females. When compared to the urban population (27.67%), the caries frequency in rural populations (72.33%) was significantly greater.

4. DISCUSSION

The prevalence of caries in left and right mandibular 1st molars was found to be 52% and 38% respectively. In left mandibular first molars, 674 patients had caries while 613 patients were caries free and it was considered statistically

Table 1. Number and percentage of the patients checked for the presence of dental caries in the three different age groups

Age (in years)	Number of patients examined	Percentage (%)
16-30	457	35.5%
31-50	427	32.7%
>51	409	31.8%
Total	1287	100%

Table 2. Incidence of caries in left and right mandibular first molars

	Patient with left mandibular 1st molar caries (36)		Patient with right mandibular 1st molar caries (46)	
	Frequency	Percentage	Frequency	Percentage
Caries present	674	52.37	497	38.62%
Caries Free	613	47.63	790	61.38
Total	1287	100%	1287	100%
Chi square	2.891		66.705	
p-value	0.089		<0.001	

Table 3. Incidence of mandibular first molar caries on the basis on age

Age group (years)	Patient with left mandibular 1st molar caries (36)		Patient with right mandibular 1st molar caries (46)		Total	
	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage
16-30	304	45.10%	235	47.28%	539	46.03%
31-50	198	29.38%	149	29.9%	347	29.63%
>50	172	25.52%	113	22.74%	285	24.34%
Total	674	100.00%	497	100.00	1171	100.00
Chi square	43.525		47.437		89.858	
p-value	<0.001		<0.001		<0.001	

Table 4. Incidence of mandibular first molar caries on the basis on gender

Gender	Patient with left mandibular 1st molar caries (36)		Patient with right mandibular 1st molar caries (46)		Total	
	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage
Male	449	45.10%	235	47.28%	539	46.03%
Female	225	29.38%	149	29.9%	347	29.63%
Chi square	74.445		54.779		129.224	
p-value	<0.001		<0.001		<0.001	

Table 5. Incidence of mandibular first molar caries on the basis on location

Location	Patient with left mandibular 1st molar caries (36)		Patient with right mandibular 1st molar caries (46)		Total	
	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage
Rural	480	71.22%	367	73.84%	847	72.33%
Urban	194	28.78%	130	26.16%	324	27.67%
Chi square	121.40		113		233.6	
p-value	<0.001		<0.001		<0.001	

insignificant (p=0.089). However, in case of right mandibular first molar caries, majority of patients (61.38%, n=790) were caries free while only 38.62% of them had caries and was statistically

significant (p<0.001). This could be likely as a result of most of the participants in the study brushing their teeth with the left hand or the fact that most of the them utilised their left side for mastication. It is in accordance with the observations conducted by Shaffer et al. [8] and Omer et al. [9]. In contrast to this, Adeyemi et al. [10] revealed that right mandibular first molar depicted the greatest caries frequency (3.5%) in permanent dentition.

The highest caries incidence was seen in age groups of 16-30 years old (46.03%) which was statistically significant (p<0.001) than that of other age group that is 31-50 and above 51 years. This could be due to the majority of these youngsters having excessive consumption of sugary food stuffs such as chocolate, ice creams, candies, jellies, sugary drinks, etc. which may be one of the key causes of the high caries experience in this group. This might also be because of inadequate oral hygiene and morphological features of the molar amongst younger age group. Various Studies [11-13] have revealed that youngsters aged 12-19 years had the maximum number of dental caries followed by adults due to increased consumption of sugar among younger generation. Also, the incidence of caries decreased as the age increases. However, it is in contrast with other researches' [14,15] results demonstrating that the prevalence of caries rises with age. This is accurate since, with age, tooth loss becomes more common compared to prevalence than decaying or filled teeth.

The long-term impact of age on the occurrence of dental caries in the community, however, has to be examined in more detail and over a longer period of time. Different study criteria could be the cause of discrepancies in the prevalence rates. It may be possible to establish and implement oral health strategies that take into consideration population disparities due to geography and socioeconomic status based on observed differences in the prevalence of caries in the adult population.

While comparing the genders the frequency of dental caries was higher in the male population as compared to female population and was statistically significant(p<0.001) which could be ascribed to differing perspectives of men and women towards dental care since generally females are more health conscious and also variegated dietary habits. Additionally, although women take great care to maintain good oral hygiene, several earlier research have revealed that women have a higher caries ratio than men. This is in accordance with the numerous studies [9,12,13,15,16] conducted. Menghini et al. [17] also reported that male gender has increased prevalence of caries. But a study by Patro et al. [18] showed no significant difference between males and females with caries. More studies are needed to identify sex differences in dental caries in the general population.

On comparing caries in rural and urban areas, high prevalence of first molar caries was found in rural area as compared to urban area which could be result of inadequate oral health education, their insufficient oral hygiene practice, dearth of awareness, incorrect dietary consumption and low domestic status and socioeconomic status of people residing in rural areas. Additionally, poor utilization of oral care services in rural locations has been linked to barriers to treatment inaccessibility, low literacy rates, and the concentration of dentists in metropolitan areas. The higher rates of caries prevalent amongst rural population in India confirm the problem of oral diseases in rural locations and are similar with finding of Ashwini et al. [19] and Shetty et al. [20] Therefore, it is crucial to promote oral health and boost access to dental care in India.

5. CONCLUSION

The current study found that the youngest age group (16 to 30 years old) had the significant caries levels, followed by middle-aged and older age groups. In comparison to the right mandibular molar, the left first molar showed a higher prevalence of caries, with males showing a higher rate than females. It also demonstrated that the dental caries prevalence remains high among rural population in comparison to urban population. High caries prevalence suggests severe oral health issues and inadequate oral health awareness; as a result, it is crucial to educate the general public about the value of practicing excellent oral hygiene habits in an effort to lessen the likelihood of caries.

6. LIMITATIONS

Limitations of this study were as follows;

- Findings can't be generalised to the whole population of the state of Punjab.

- Other aspects such as dietary preferences, dental hygiene practices, financial status, and social norms were not taken into account.
- More strata were required to be included.
- Operator bias involved since caries determination was done by visual inspection.

ETHICAL APPROVAL

As per international standard or university standard written ethical approval has been collected and preserved by the author(s).

CONSENT

As per international standard or university standard, patient(s) written consent has been collected and preserved by the author(s).

COMPETING INTERESTS

Authors have declared that no competing interests exist.

REFERENCES

1. Staufenbiel I, Adam K, Deac A, Geurtsen W, Günay H. Influence of fruit consumption and fluoride application on the prevalence of caries and erosion in vegetarians—a controlled clinical trial. European journal of clinical nutrition. 2015 Oct;69(10):1156-60.
2. Yadav K, Prakash S, Khanal S, Singh JK. Prevalence of dental caries among adolescence of Dhanusha district, Nepal. Janaki Medical College Journal of Medical Sciences2015;3(2):29-37.
3. Grossi SG, Genco RJ. Periodontal disease and diabetes mellitus: A two-way relationship. Annals of Periodontology. 1998 Jul;3(1):51-61.
4. The World Oral Health report; 2003.
5. National oral health care program implementation strategies. DGHS MOH and FW; Govt. of India; 2004.
6. Karunakaran R, Somasundaram S, Gawthaman M, Vinodh S, Manikandan S, Gokulnathan S. Prevalence of dental caries among school-going children in Namakkal district: A cross-sectional study. Journal of Pharmacy & Bioallied Sciences. 2014 Jul;6(Suppl 1):S160.
7. Llompart G, Marín GH, Silberman M, Merlo LI, Zurriaga O. Oral health in 6-year-old schoolchildren from Berisso, Argentina: falling far short of WHO goals. Medicina oral, patologia oral y cirugia bucal. 2010;15:101–105.
8. Shaffer JR, Leslie EJ, Feingold E, Govil M, McNeil DW, Crout RJ, Weyant RJ, Marazita ML. Caries experience differs between females and males across age groups in Northern Appalachia. International Journal of Dentistry. 2015 May 27;2015.
9. Omer SA, Mirza D, Ahmed I, Moosani O, Shah SM. Frequency of dental caries and status of permanent mandibular first molar in young adults. Journal of Bahria University Medical and Dental College. 2016 Jun 6;6(2):106-9.
10. Adeyemi BF, Kolude BM, Lawal AO. The knowledge and experience of personal and professional oral care among secondary school students in Ibadan. Odonto-stomatologie Tropicale Tropical Dental Journal. 2012 Mar 135(137):5-11.
11. Frencken JE, Sharma P, Stenhouse L, Green D, Laverty D, Dietrich T. Global epidemiology of dental caries and severe periodontitis–a comprehensive review. Journal of clinical periodontology. 2017 Mar;44:S94-105.
12. Gupta V, Vishwanath P, Tripathi N. Pattern of dental caries among adults in parts of eastern Uttar Pradesh, India - A retrospective study. Int J Dent Sci Innov Res. 2020 July; 3: 476-84.
13. Maru AM, Narendran S. Epidemiology of dental caries among adults in a rural area in India. J Contemp Dent Pract. 2012 May 1;13(3):382-8.
14. Demirci M, Tuncer S, Yuceokur AA. Prevalence of caries on individual tooth surfaces and its distribution by age and gender in university clinic patients. European journal of dentistry. 2010 Jul;4(03):270-9.
15. Baranwal HC, Pandiar D, Singh TB. Pattern of Dental Caries among Adults in Purvanchal Region of Uttar Pradesh, India. International Journal of Science and Research. 2015;4(6):323-26.
16. Kulak-Özkan Y, Ozkan Y, Kazazoglu E, Arikan AY. Dental caries prevalence, tooth brushing and periodontal status in 150 young people in Istanbul: A pilot study. International Dental Journal. 2001 Dec 1;51(6):451-6.
17. Menghini G, Steiner M, Thomet E, Roos M, Imfeld T. Caries prevalence in 2-year-

old children in the city of Zurich. Community Dent Health. 2008 Sep 1;25(3):154-60.

18. Patro BK, Kumar BR, Goswami A, Mathur VP, Nongkynrih B. Prevalence of dental caries among adults and elderly in an urban resettlement colony of New Delhi. Indian Journal of Dental Research. 2008 Apr 1;19(2):95.
19. Ashwini.K.S , Darshana D, Hegde MN, Yelapure M, Sadananda V. Prevalence of Caries in First Permanent Molars in Dakshina Kannada population in Karnataka, INDIA 2017. International J of Emerging technologies and Inovative Research. 2018;5(10):135-139.
20. Shetty M, Kumar P, Prabhu UM, Bola VK, Shetty SK. Prevalence of Dental Caries and Treatment Needs among Adult Population of Mangalore Taluk-A Pilot Survey. Journal of Evolution of Medical and Dental Sciences. 2020 Jul 20;9(29): 2068-72.

Peer-review history:
The peer review history for this paper can be accessed here:
https://www.sdiarticle5.com/review-history/106554