

Prevalence Pattern Of Dental Caries In Rural Population Of Punjab (India)

Abstract

India being a developing country, confronts the issue of decayed teeth on a regular basis. However, baseline data on dentition status of rural population in Punjab is scarce.

Methods: A descriptive cross-sectional study was conducted to assess oral health status of 12 to 74 year old subjects in Ferozpur District.

Results: Sample consisted of 340 subjects with 55.9% (n=190) females. Mean DMFT of the sample was 5.81±7.80. Dental decay was found to occur in 67.94% (n=231) of the total population with 60.17% (n=139) females and 39.81% (n=92) males having dental decay and this difference was significant ($\chi^2=5.38$, $PX04;0.01$). A one-way between subjects ANOVA revealed that there was a significant effect of age on dental caries prevalence ($F(3,336)=17.92$, $P<0.001$). Most affected teeth by dental caries were the first and second molars and made up for more than half of the total number of decayed teeth (53.4%, n=463). 95.88% (n=326) subjects required dental treatment and almost three fourth of the sample needed one or two surface fillings (77.94%, n=265).

Conclusion: The caries experience and treatment needs of this cohort were comparative to those reported by other studies in rural India. Disproportionate distribution of dental professionals in the urban and rural areas along with lack of awareness, appear to be the prevailing causes of poor oral health.

Key Words

Prevalence, Dental Caries, Rural, Punjab, DMFT, Oral Health, Treatment Need

Introduction

Dental caries has historically been considered a significant global oral health burden and international data on caries epidemiology confirms that tooth decay is not only a significant disease of childhood but prevalence of dental caries is high among adults also.^{[1],[2]} It is important to target prevention of dental decay from an early age since it is a chronic irreversible process that once occurs, persists throughout life even though the lesion is treated.^{[2],[3],[4]} It is notable that the prevalence of dental caries among children and adults is approximately 60–65% in India.^{[5],[6],[7],[8],[9]}

In Punjab, majority population resides in the rural sector (62.52%), with a total population of 2.77 Crore, however, non-accessibility and non-affordability of dental facilities continues to be the foremost problem in rural areas of Punjab.^{[10],[11]} Currently, dental professionals in India have accessibility to the most recent advances in dental treatment and materials. Additionally, there are 289 dental institutions in total, generating more than 30,000 dental graduates each year. Nonetheless, dental caries continues to be a major public health issue in rural areas of India, with the current dentist to population ratio

being 1:2,50000 as compared to 1:10,000 in urban areas.^[12] Moreover, not only is the baseline data on prevalence of dental diseases among children in Punjab scarce, there is no published literature available on the dental status of adults in Punjab from the last three decades. Hence, the aim of our study was to assess the oral health status and corresponding treatment needs in the rural population of Ferozpur District of Punjab.

Methodology

A descriptive cross-sectional study was conducted among the rural population of the following villages of Ferozpur District of Punjab: Malwala, Kadim and Bajidpur. Places of worship and various community centres of the villages were selected as the sites for survey. Participation in the study was voluntary and an informed consent was obtained from the parents for subjects that were below 18 years of age. Information regarding demographics and oral health status was collected via questionnaire and clinical examination. World Health Organization (WHO) Oral health Assessment Form (1997) was used to assess dental caries prevalence and treatment needs.^[13] Also, all subjects participating in the study were provided

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free dental treatment. Dental status and demographic details were noted on standardized format data sheets, which were then transferred to a computer for analysis and review. Both non-parametric and parametric tests were applied to analyse the results. We used an alpha level of .05 for all statistical tests.

Results

A total of 340 subjects between the age groups of 12 to 74 years were clinically examined regarding their oral health status and treatment need. The study population consisted of both sexes with 55.9% (n=190) females and of the total sample, 24.7% (n=84) were 12-year olds (**Table I**).

Evaluation of oral health status of the study population revealed that dental caries is the most prevalent disease across all age groups. The prevalence of Decayed, Missing and Filled Teeth (DMFT) by age is given in (**Table II**). A Chi-square test of independence was performed to examine the relation

Table I - Distribution Of Sample By Age And Gender

Age in(years)	Gender		Total n (%)
	Female n(%)	Male n(%)	
12	39(46.4)	45(53.6)	84(24.7)
15	47(56.6)	36(43.4)	83(24.4)
35-44	55(61.8)	34(38.2)	89(26.2)
65-74	49(58.3)	35(41.7)	84(24.7)
Total	190(55.9)	150(44.1)	340(100)

Table II - Prevalence Of Decayed, Missing And Filled Teeth By Age

Age Group (Years)	N (%)	Dmft = 0 N(%)	Decayed N(%)	Missing N(%)	Filled N(%)
12	84(24.7)	45(53.57)	38(45.23)	3(3.57)	2(2.38)
15	83(24.4)	25(30.12)	57(68.67)	4(4.81)	4(4.81)
35-44	89(26.2)	14(15.73)	69(77.52)	27(30.33)	7(7.86)
65-74	84(24.7)	3(3.57)	67(79.76)	61(72.61)	6(7.14)
Total	340(100)	87(25.58)	231(67.94)	95(27.94)	19(5.58)

Table III - Distribution Of Dental Status And Mean Dmft By Age

Age group (Years)	N (%)	Decayed Mean(SD)	Missing Mean(SD)	Filled Mean(SD)	DMFT Mean(SD)
12	84(24.7)	1.37(2.43)	0.04(0.18)	0.05(0.34)	1.45(2.51)
15	83(24.4)	2.28(2.94)	0.07(0.37)	0.12(0.70)	2.47(3.07)
35-44	89(26.2)	3.89(3.60)	1.33(2.96)	0.27(1.46)	5.48(5.27)
65-74	84(24.7)	5.21(5.20)	8.40(10.5)	0.19(0.84)	13.81(10.40)
TOTAL	340(100)	3.20(3.96)	2.45(6.45)	0.16(0.94)	5.81(7.80)

Table VI - Distribution Of Treatment Need By Gender

Treatment need	Female n(%)	Male n(%)	N(%)	p-value
One-surface filling	128(61.5)	80(38.5)	208(61.17)	0.006*
Crown	43(64.2)	24(35.8)	67(19.7)	0.08
Two-surface filling	37(64.9)	20(35.1)	57(16.76)	0.08
RPD/IMPLANT	28(57.1)	21(42.9)	49(14.41)	0.48
Extraction	22(52.4)	20(47.6)	42(12.35)	0.37
Other care	16(41)	23(59)	39(11.47)	0.03*
No treatment needed	7(50)	7(50)	14(4.11)	0.42
Pulp treatment	4(57.1)	3(42.9)	7(2.05)	NA
Veneer	4(100)	0(0)	4(1.17)	NA

* Chi-Sq Test was applied and difference was significant at $p < 0.05$ level
† Groups are not mutually exclusive

between gender and dental decay. The relation between these variables was significant ($c^2 = 5.38$, $P < 0.01$). Dental decay was found to occur in 67.94% ($n = 231$) of the total population and males were less likely to have decayed teeth (39.81%, $n = 92$) as compared to females (60.17%, $n = 139$). Also, females were significantly more likely to have atleast one decayed, missing or filled tooth (DMFT=1) as compared to males ($c^2 = 4.65$, $P < 0.02$).

A one-way between subjects Analysis of Variance (ANOVA) was conducted to compare the effect of age on dental caries prevalence in all four age groups. There was a significant effect of age on dental caries prevalence at the $p < 0.05$ level for

Table IV - Distribution Of Number Of Decayed Teeth By Tooth Type

Arch	1st Molar n(%)	2nd Molar n(%)	1st Bicuspoid n(%)	2nd Bicuspoid n(%)	Cuspid n(%)	Central & Lateral incisor n(%)	Total n(%)
Maxillary	88(10.1)	97(11.1)	63(7.2)	77(8.8)	35(4.0)	59(6.8)	419(48.3)
Mandibular	131(15.1)	147(16.9)	49(5.6)	69(7.9)	23(2.6)	29(3.3)	448(51.6)
Total	219(24.9)	244(28.1)	112(12.9)	146(16.8)	58(6.6)	88(10.1)	867(100)

*Third molars have been excluded

Table V - Distribution Of Treatment Need By Age Group

Age Group (Years)	No Treatment	One Surface Filling	Two Surface Filling	Crown	Veneer	Pulp Treatment	Extraction	Rpd/Implant	Other Care
12	0	38	6	4	0	0	3	0	31
15	0	55	11	4	1	1	5	0	4
35-44	0	62	21	19	0	5	10	14	3
65-74	14	53	19	40	3	1	24	35	1
Total	14(4.1)	208(61.2)	57(16.7)	67(19.7)	4(1.2)	7(2)	42(12.3)	49(14.4)	39(11.4)

the four age groups ($F(3,336) = 17.92$, $P < 0.001$). Post hoc comparisons using the Tukey HSD test indicated that the mean score for the 12-year-old subjects ($M = 1.37$, $SD = 2.43$) was significantly different than that in the 35-44 years ($M = 3.89$, $SD = 3.60$) and 65-74 years age groups ($M = 5.21$, $SD = 3.96$). However, the 12 year olds did not significantly differ from the 15 year olds ($M = 2.28$, $SD = 2.94$). Mean score for dental caries in the 15-year-olds was significantly different than that in the 35-44 years and 65-74 year old age groups also. Specifically, our results suggest that when the sample population increases in age, there is an increase in the mean number of decayed teeth in the subjects. However, it should be noted that there must be a sizeable age difference between the groups in order to see an effect.

It is noteworthy that only 25.58% ($n = 87$) of the sample had no decayed, missing or filled teeth (DMFT=0) and the filled component was almost negligible (5.58%, $n = 19$). Also, 30.3% ($n = 103$) of the sample had a mean DMFT ranging from one to three while 44.1% ($n = 150$) had a mean DMFT value of four or more. The overall mean DMFT of the sample was observed to be 5.81 ± 7.80 with the mean DMFT ranging from 1.45 ± 2.51 in the 12 year olds to 13.81 ± 7.80 in the age group of 65-74 years due to the presence of edentulous subjects in the older age group (Table III). Additionally, in a total of 231 subjects with dental caries, 1072 teeth were found to be carious. The most affected teeth by dental caries were the first and second molars and made up for more than half of the total number of decayed teeth (53.4%, $n = 463$). Overall teeth in the mandibular arch (51.6%, $n = 448$) were more affected as compared

to the maxillary arch (48.3%, $n = 419$) (Table IV).

Oral health examination showed that a total of 95.88% ($n = 326$) subjects required dental treatment and out of those needing treatment, 83% required atleast three treatment items (Table V). Grossly decayed and damaged teeth with poor prognosis were considered as those recommended for extraction. Out of a total of 67.94% ($n = 231$) subjects that had dental caries, 18.18% ($n = 42$) required tooth extraction. Gross dental decay was found to be more prevalent in the age group of 35-44 years and 65-74 years. One-surface filling was the maximum treatment need followed by the need for a crown with a total of 61.17% ($n = 208$) and 19.7% ($n = 67$) subjects requiring it respectively. Pulp treatment was required by only 2% ($n = 7$) of the subjects and this could be due to no radiological examinations being done. It was interesting to note that the need for RPD/Implants was high (14.4% ($n = 49$)) and majority Crowns were needed in the 65-74 yrs old age group ($n = 40$).

Regarding the prosthetic status, 14% ($n = 49$) subjects required some form of prosthetic treatment in the upper arch as compared to a 17.94% ($n = 61$) need in the lower arch. A one unit prosthesis was required by 4.70% ($n = 16$) and 5.90% ($n = 20$) subjects in the upper and lower arches respectively. There was also a need for multi unit prostheses by 4.10% ($n = 14$) and 6.8% ($n = 23$) subjects in the upper and lower arches respectively and 5.29% ($n = 18$) of the subjects needed complete dentures.

One-surface filling was needed by 61.5% ($n = 128$) females as compared to only 38.5% ($n = 80$) males and this difference was significant ($c^2 = 6.95$, $P < 0.006$). All those subjects requiring

any other treatment such as: full mouth rehabilitation; extraction of retained primary teeth; treatment of dental anomalies; bleaching; and pit and fissure sealants, were recorded as those needing other care. There was also a significant difference found by gender in subjects needing other care ($\chi^2=3.94$, $P<0.03$) (Table VI).

Discussion

Various studies conducted in India illustrate that decayed teeth account for the highest percentage of DMFT as was observed in our study sample.^{[10],[14],[15],[16]}

The overall dental caries prevalence of 67.94% and mean DMFT of 5.8 ± 7.80 in our sample shows that dental decay is still among the major dental problems affecting the rural population of Punjab. Our results were comparable to those reported by studies conducted in other areas of North India. Kaur R.^[11], reported similar caries prevalence of 63.20% on a study among 16 to 21 years olds in Punjab. Analogous results were also reported in a study in Rajasthan among 15 to 54 year olds whereby the mean DMFT was observed to be 5.34.^[17] Maru AM.^[7], in a study on rural population of Gujarat between the age group of 20 to 60 years observed the caries prevalence to be 80% and a mean DMFT of 5.1.

However, higher caries prevalence as compared to our study (67.94%) has also been reported in a recent study among 12 and 15 year old school children residing in Ludhiana (Punjab) whereby the caries prevalence was observed to be 81.36% and 86.16% respectively.^[10] Kalra S.^[18] also observed a higher caries prevalence of 83% among 12 to 13 year old school children in Haryana. The authors attributed high caries prevalence to poor oral hygiene and overall negligence of oral health. On the other hand, studies conducted in Faridkot District of Punjab have reported a lower caries experience, analogous to our study, than that observed by other studies in Punjab.^{[19],[20]}

One of the reasons for this variation could be due to both Faridkot and Ferozpur being situated in the high fluoride belt region of Punjab. Additionally, caries rate in our study showed an increase with age and research shows that caries rates in the permanent dentition are expected to increase with age probably due to prolonged exposure of teeth to caries associated risk factors.^{[5],[8]}

A review of gender variation in dental decay illustrated that females showed

higher caries prevalence than males in the present study, similar to that observed by other authors in India.^{[8],[21]} Khan AA.^[22] in a study conducted in Gwalior on 11 to 80 year olds also observed that females had a higher caries prevalence rate (51.41%) than males (49.51%). It is postulated that the observed variation in caries prevalence rates in the documented data could have been due to differences in: oral hygiene practices, accessibility to dental health care facilities, diet or a variation in research methodology.

Another noteworthy trend was the presence of higher decay among the first and second molars and higher prevalence of decay in the mandibular arch. Chawla HS.^[23], Saravanan S.^[24] and Udoye C.^[25] also observed similar trends. Furthermore, the overall high treatment need and lack of restorations, suggests that there is a high prevalence of dental caries and lack of dental care in the rural areas and this is in accordance with similar studies conducted elsewhere. In our study, need for one surface filling (61.20%) was the maximum in all groups, followed by the need for a crown (19.70%) and two surface fillings (16.70%). Maru AM.^[7] reported comparable results in a rural population of 20 to 60 year olds in Gujarat whereby he observed that the need for one surface filling, two surface filling, crown and extraction was 60.80%, 16.90%, 23.80% and 37.60% respectively. Mandal KP.^[6], in a study conducted in East India, found that in the age group of 5 to 35 years, the need for single surface restorations was maximum; indicating lack of restorative treatment, preventive oral care facility, and awareness among population.

The need for tooth extraction in our study was 12.3% and showed an increase with age. Our results were comparable to those reported by Saravanan S.^[5] in a study conducted on school children in Tamil Nadu wherein almost 3% to 15% of the children in his study needed extraction. The need for extraction in our sample was lower than that observed by Munjal V.^[10], which was 15.41% in 12 year olds, and this again could be due to lower caries experience found in our study due to Ferozpur being in the high Fluoride belt region of Punjab.

Conclusion

Our study provides a comprehensive review of oral health status and existing treatment needs among the rural population of Punjab. Clearly, it can be

established that this community has experienced a low utilization of oral health services mainly due to the lack of dental facilities in rural areas of Punjab owing to the disproportionate distribution of dental professionals in urban and rural India. The need for dental health education including proper instruction of oral hygiene practices and school based preventive programs is vital as they would be beneficial for a lifetime. Lastly, there is a need to integrate the existing oral health care infrastructure with the rural community health centres to ensure that oral health problems identified through dental surveys are treated in a timely manner.

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