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Epidemiology of Dental Caries in Aurangabad District: A Cross Sectional Study

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Abstract

Introduction: *Dental caries is the most common chronic contagious disease widely prevalent globally but the distribution and severity of dental caries varies across countries and regions. Dental caries is the most prevalent of oral diseases. It has a very high morbidity potential that brought this disease into the main focus of the oral health profession. It affects both the sexes, various races, all socioeconomic status and multiple age groups. It not only causes pain and discomfort, but also in addition, will cause economic expenditure to the person. The prevention of dental caries has long been considered as an important task for the dental health profession. To have a look on the same problem in Marathwada region of Maharashtra, a cross sectional study was carried out to see the prevalence of dental caries in Aurangabad district of Maharashtra.*

Materials and Methods: *A community based cross-sectional study was conducted among 2400 subjects in Aurangabad district, being the capital of Marathwada region by Rural Health And Training Center, Paithan under Govt Medical College, Aurangabad. The standard pro-forma was designed and house to house survey was conducted over a period of June 1993 to March 1994. Mouth mirrors, caries explorers and periodontal probes were used for oral examination with proper aseptic precautions. All the findings were recorded in the data sheet after thorough examination. Descriptive statistics and chi-square test were applied.*

Results: *The prevalence of Dental Caries in Aurangabad district was found to be 63.5%.*

Conclusion: *Dental caries, though preventable, is the most prevalent oral condition which can detrimentally affect different demographic groups. More campaigns and programs need to be done in order to raise awareness regarding the oral hygiene and to decrease the prevalence of dental caries in community.*

Key Words*: Dental Caries, Oral Health*

Introduction

A healthy mouth is not only important in the nutrition of the physical body, but also enhances social interaction and promotes self-esteem and feelings of well-being. Oral health is a vital part of general wellbeing. Despite huge efforts to increase awareness of oral health worldwide, dental caries and periodontal disease continue to plague many populations around the world.

Dental caries is the most common chronic disease affecting most of the population all over the world, with a higher incidence in developing countries.[1] It is characterised by the dissolution of the dental enamel and dentine and in its later stage infection of the pulp. This eventually destroys the affected tooth surface or the tooth itself. Dental caries is a multifactorial disease. The pathogenesis is complex involving many contributing elements. Apart from diet, oral flora, and morphology of the tooth, an array of risk factors which are both local and general—have been implicated.[2] The consequences of dental caries include loss of teeth, difficulty in eating and speaking, malnutrition, lack of self-esteem and bacteremia. Thus the negative impact of poor oral health on the quality of life is an important public health problem.

According to the World health organization (WHO), dental caries (tooth decay) is defined as the destruction of the enamel layer of the tooth by acids produced by the action of bacteria on sugar.[2] Approximately 2.4 billion or 36% of the world population have dental caries in their permanent teeth. More than 530 million of children lose their primary teeth due to dental caries.

Dental caries results from a complex interaction of factors like host susceptibility, bacteria, diet, and time (duration). The bacteria and sugary food act together to form acid productions that result in the formation of teeth cavitation. Consequently, the acid destroys the enamel surface; if the process is not seen, it will result in progressive destruction of the tooth.[3] Dental caries is highly increasing among children due to the excessive consumption of sugary substances, poor oral hygiene, lack of fluoride exposure, and inadequate health service utilization. Dental caries has many complications like toothache, pulpitis, tooth loss, dental discoloration, and Ludwig angina.

Inspite of such a devastating nature, much attention is not being given for its prevention. To know the disease burdon in the region of Marathwada, a study was designed to assess the prevalence of dental caries in Aurangabad district of Maharashtra.

Materials and Methods:

Study design: It was a community based, prevalence study.

Study area: Field practice area of Rural Health And Training Center, Paithan of Govt. Medical College, Aurangabad, Maharashtra, India.

Study period: 1st June 1993 to 31st March 1994.

Study population: Aurangabad District was chosen for the study because it is a capital place of Marathwada region. Sample selection was done using Pathfinder methodology. For urban population, 4 sites from Aurangabad city; for Urban III/Semi-urban population, 2 sites from Paithan and 2 sites from Kannad and for rural population 4 villages from Aurangabad city i.e. Phulambri, Kachner, Adul and Hathnoor were selected.

Five index age groups were included: 5-6 yrs, 12 yrs, 15-18 yrs, 35-44 yrs and above 65yrs. As per the standards of pathfinder methodology, there should be the minimum 20 subjects in each cluster. Male: Female ratio was tried to be kept as 1:1. Applying this sampling distribution to the entire population the total sample size of 2400 was selected.

Study tool: The standard pro-forma was designed for assessment of dentition staus according to WHO Oral Health Assessment Form (3rd Ed) and pretested on 40 subjects as a pilot trial and continued on entire subjects for data collection.

Criteria for recording dentition status: primary teeth were noted with alphabetical and permanent teeth with numericals. Codes used for the dentition status were as follows:

0- Sound Tooth

1- Decayed Tooth

All subjects were examined under proper illumination, on simple bed, table or chair. Following instruments were used for the examination:

1. Mouth Mirror
2. Caries Explorers
3. Periodontal Probe
4. Concentrated sterilized solution.

All the findings were recorded in the datasheet after thorough examination.

Statistical analysis: The data of respondents was collected and compiled. Prevalences were calculated. The proportions were compared using Chi–square test with and without Yate's correction and the level of significance was set at $P<0.05$.

Results:

Table no. 1

Table 1: Socio-demographic profile of study population

Sr. No.	Socio-demographic profile	Urban	Urban III	Rural	Total
1	**Sex**				
	Male	400(33.33)	400(33.33)	400(33.33)	1200(100)
	Female	400(33.33)	400(33.33)	400(33.33)	1200(100)
	Total	800(33.33)	800(33.33)	800(33.33)	2400(100)
2	**Age**				
	5-6	160(33.33)	160(33.33)	160(33.33)	480(100)
	12	160(33.33)	160(33.33)	160(33.33)	480(100)
	15-18	160(33.33)	160(33.33)	160(33.33)	480(100)
	35-44	160(33.33)	160(33.33)	160(33.33)	480(100)
	65+	160(33.33)	160(33.33)	160(33.33)	480(100)
	Total	800(33.33)	800(33.33)	800(33.33)	2400(100)
3	**Religion**				
	Hindu	564(30.90)	598(32.767)	663(36.328)	1825(100)

	Muslim	130(34.574)	131(34.840)	115(30.585)	376(100)
	Buddhist	106(53.266)	71(35.678)	22(11.055)	199(100)
	Total	800 (33.33)	800(33.33)	800(33.33)	2400(100)
4	**literacy status**				
	Illiterate	91(27.002)	106(31.454)	140(41.543)	337(100)
	literate	118(57.560)	57(27.804**)**	30(14.634)	205(100)
	primary school	261(39.545)	19(33.181)	180(27.272)	660(100)
	middle school	142(22.756)	207(33.173)	275(44.070)	624(100)
	high school	63(31.188)	56(27.722)	83(41.089)	202(100)
	intermediate or post high school certificate	82(29.602)	122(44.043)	73(26.353)	277(100)
	Graduate and Above	43(45.263)	33(34.737)	19(20)	95(100)
	Total	800(33.33)	800(33.33)	800(33.33)	2400(100)
5	**Occupation**				
	student	472(40.55)	366(31.443)	326(28.007)	1164(100)
	dependent	66(21.927)	128(42.525)	107(35.548)	301(100)
	Housewife	53(15.186)	137(39.255)	159(45.559)	349(100)
	agricultural labour	90(50)	51(28.333)	39(21.667)	180(100)
	own business	74(37.186)	65(32.663)	60(30.151)	199(100)
	others	23(40.351)	10(17.544)	24(42.105)	57(100)
	employed	22(14.667)	43(28.667)	85(56.667)	150(100)
	Total	800(33.33)	800(33.33)	800(33.33)	2400(100)
5	**Socio-economic status**				
	Class I	303(42.083)	378(52.5)	39(5.417)	720(100)
	Class II	358(35.516)	308(30.556)	342(33.929)	1008(100)
	Class III	139(20.685)	114(16.964)	419(62.351)	672(100)
	Total	800(33.33)	800(33.33)	800(33.33)	2400(100)

From the above **Table 1**, it is clear that equal no. of subjects were taken from each study area i.e. 800 (33.333%). Of the total 2400 subjects, 20% were examined from each index age group with equal proportion of male and female i.e. 50% each. Maximum No. of subjects were from Hindu (76.04%), Muslim (15.66%) and Budhist (8.2%). Cosidering the literacy status, lowest percentage of professionals (0.29%) and higher percentage of population of primary school (27.5%) followed by middle school (26%) were found. Occupationwise, out of the total 2400 subjects maximum were students (48.58%), housewife (29.08%) and dependent (12.54%). Socioeconomic status revealed maximum no.of subjects were from class I and II (72%) followed by class III (27.9%).

Table 2 : Association between Geographic Location and Dental Caries in study population

Sr .no	**Geographic Location**	**DENTITION STATUS**			
		0	**1**	**Total**	P value
1	Urban I	275(34.38)	525(65.62)	800(100)	X 2 = 7.7545 $p < 0.05$
2	Urban III	325(40.63)	475(59.38)	800(100)	

3	Rural	283(35.38)	517(64.62)	800(100)	
4	Total	883(36.79)	1517(63.5)	2400(100)	

Percentage of caries was maximum in urban I (65.62%) followed by rural (64.62%). Lower percentage was found in urban III population (59.37%).

Table 3: Association between socio-demographic profile and dental caries of study population

Sr. no.	Socio-demographic profile	DENTITION STATUS		Total	P value
		0	1		
1	**Sex**				
	Male	438 (36.5)	762 (63.5)	1200(100)	X2 = 0.0878 $p > .05$
	Female	445 (37.08)	755 (62.92)	1200(100)	
	Total	883 (36.79)	1517 (63.21)	2400(100)	
2	Age				
	5-6	203 (42.29)	277 (57.71)	480(100)	X2 = 195.9867 $p < 0.01$
	12	230 (47.92)	250 (52.08)	480(100)	
	15-18	239 (49.79)	241(50.21)	480(100)	
	35-44	152 (31.67)	328 (68.33)	480(100)	
	65+	59 (12.29)	421(87.71)	480(100)	
	Total	883 (36.79)	1517 (63.21)	2400(100)	
3	Religion				
	Hindu	684 (37.48)	1141 (62.52)	1825(100)	X2 = 8.8575 $p < .05$
	Muslim	145 (38.56)	231 (61.44)	376(100)	
	Buddhist	54 (27.14)	145 (72.86)	199(100)	
	Total	883 (36.79)	1517 (63.21)	2400(100)	
4	**Literacy status**				
	Illiterate	73(21.66)	264(78.34)	337(100)	X2= 100.278 P < 0.01
	literate	50(24.39)	155(75.61)	205(100)	
	primary school	250 (37.88)	410 (62.12)	660(100)	

	middle school	283 (45.35)	341 (54.65)	624(100)	
	high school	50 (24.75)	152 (75.25)	202(100)	
	intermediate or post high school certificate	138 (49.82)	139 (50.18)	277(100)	
	Graduate and above	39 (41.05)	56 (58.95)	95(100)	
	Total	883 (36.79)	1517 (63.21)	2400(100)	
5	**Occupation**				
	student	547 (46.99)	617 (53.01)	1164(100)	X2= 163.279 P < 0.01
	Dependent	33 (10.96)	268 (89.04)	301(100)	
	Housewife	111 (31.81)	238 (68.19)	349(100)	
	agricultural labour	67 (37.22)	113 (62.78)	180(100)	
	own business	60 (30.15)	139 (69.85)	199(100)	
	Others	6 (10.53)	51 (89.47)	57(100)	
	employed	59 (39.33)	91 (60.67)	150(100)	
	Total	883 (36.79)	1517 (63.21)	2400(100)	
6	**Socio-economic status**				
	Class I	287 (39.86)	433 (60.14)	720(100)	X2= 6.6963 P < 0.05
	Class II	373 (37)	635 (63)	1008(100)	
	Class III	223 (33.18)	449 (66.82)	672(100)	
	Total	883 (36.79)	1517 (63.21)	2400(100)	
7	**Habit**				
	finger Cleaning	499 (37.49)	832 (62.51)	1331(100)	X2= 32.667 P < 0.01
	Brush Cleaning	295 (41.61)	414 (58.39)	709(100)	
	FTb*	58 (22.14)	204 (77.86)	262(100)	
	BTb**	31 (31.63)	67 (68.37)	98(100)	
	Total	883 (36.79)	1517 (63.21)	2400(100)	

From Table 3 it is seen that dental caries was slightly more common in males (63.5%) than in females (62.92%). Among different age groups, dental caries was found to be highest in age group of above 65 (87.71%) whereas it was hound to be lowest in 15-18 yrs age group (50.21%). Religionwise dental caries was found to be highest in Buddhists (72.86%) and lowest in Muslims (61.44%). Considering the literacy status dental caries was seen

maximum in illiterates (78.34%) and minimum in intermediate or post high school certificate (50.18%). Occupationwise prevalence of dental caries was seen to be maximum in others (89.47%) and dependents (89.04%) and minimum in students (53.01%). Considering the socioeconomic status the prevalence was maximum in Class III (66.82%) and minimum in Class I (60.14%). In view of teeth cleansing habit and habit of tobacco and betel nut chewing, dental caries was found maximum in individuals using fingers for teeth cleansing and having tobacco chewing habit also (77.86%) and minimum in individuals using toothbrush for teeth cleansing (58.39%).

Discussion

Dental caries is an infectious disease that can affect infants, children, adults and elderly. Caries can result in the inflammation of dental pulp and associated tissues which can ultimately lead to tooth loss, cellulitis and rarely to the brain abscess.[4]

In this current study, 2400 participants were assessed for dental caries which were divided equally into three regional subgroups i.e. Urban 1, Urban III and Rural areas.

Regional distribution revealed high percentage of caries free population in urban III area whereas Incidence of caries was found maximum in Urban I and Rural areas. Al Shammery AR and Wyne A et al in their studies revealed more caries prevalence in rural than in Urban individuals.[5,6]

Genderwise there was no significant difference in prevalence of dental caries in males (63.5%) and females (62.92%). Wyne A and Carino K also had similar findings in their studies.[7,8] Dominguez et al was found slightly higher caries prevalence in females (51%) than in males (49%).[9]

Agewise distribution of subjects with dentition status shows that higher percentage of caries free population was found in age group of 15-18 years (49.79%), whereas age group of 65+ exhibited highest caries prevalence (87.71%). Gaikwad and Indurkar found that percentage of caries at different age was as 5-6 years (47.8%), at 7-8 (57.7%), 9-10 59.3%; 11-12 (43.5%), 13-14 (53.9%) and the overall prevalence of caries was (51.12%).[10] Study of prevalence of dental caries in urban area of Nagpur showed that prevalence of dental caries was highest in age group of 12 years (83.33%) and at 18 years (79.29%).[11]

Considering the religion, percentage of caries free population was highest in Muslim (38.56%) and in Hindus (37.47%). Buddhists revealed highest caries incidence (72.86%). Readdy in his study in South Africa also showed significant racial deference in caries prevalence.[12] Newton J et al and Robinson P et al also stated the racial differences in different ethnic groups.[13,14]

Distribution of subject as per literacy status with dentition status showed that highest percentage of caries population was found in illiterates (78.34%). Amid et al found that, Mexican Americans with low educational status had significantly higher mean number of decayed teeth than those with high educational status.[15] Rajab L et al also revealed the impact of education on oral health and dental caries in Jordan.[16]

Distribution of subject as per occupation showed that, others and dependents revealed maximum prevalence of dental caries (89.47%, 89.04%) whereas students revealed least (53.01%). Considering the socioeconomic status, dentition status showed that – caries free population was seen more among class I and class II community whereas Class III group exhibited maximum caries prevalence (66.82%). Ibrahim et al found distribution of caries free individuals was as

44% for low, 42% for middle and 46% for high socio-economic group.[17] Dominguez et al have shown that- prevalence of caries in low socio-economic class was 52% and for middle socio-economic class it was 41%.[9] Gratix D and Kallestal C also revaled the association of lower socioeconomic status with higher dental caries.[18, 19]

Considering the relation of caries with habits of teeth cleansing and tobacco and betel nut chewing, prevalence of caries free subject with different habit was as follows – in finger users (37.49%), tooth brush users (41.60%), finger with tobacco and betal chewers (22.13%) and brush with tobacco and betal nut chewers (31.63%). Caries prevalence was maximum in individuals cleaning their teeth with fingers and having tobacco chewing habit too. Dominguez et al in their study found that, the prevalence of caries among brush users and those who did not brush was 47% and 78% respectively.[4] Jin B et al also revealed the role of oral hygiene practices in early childhood caries in Seoul, Korea.[20] Tomar S et al concluded in their studies that chewing tobacco may be a risk factor in the development of root surface caries which may be attributed to high sugar content, gingival recession and enhanced collagenase activity.[21]

Thus various factors affect the incidence and prevalence of dental caries. If measures are implemented at an early stage it would be beneficial to reduce the disease burdon.

Conclusion

Dental caries, though preventable, is the most prevalent oral condition which can detrimentally affect different demographic groups, and can have huge public health impact on the oral and systemic health, social well-being, income of individuals and health care systems.

More campaigns and programs need to be done in order to raise awareness regarding the oral hygiene and thus decrease the prevalence of dental caries in community. Health workers and dental profession have the most important role in community to change the quality of dental health. The current study was therefore designed to provide the baseline data regarding the prevalence and severity of dental caries in Aurangabad District. This can be beneficial for the implementation of future intervention programmes.

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