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PREVALENCE OF MALOCCLUSION IN AURANGABAD DISTRICT OF MAHARASHTRA: A CROSS-SECTIONAL STUDY

[1]Bharat B Chavan, [2]Seema S Salve, [3]N A Razvi, [4]Mohan K Doibale

[1]Associate Professor, Department of Community Medicine, Govt. Medical College, Aurangabad, Maharashtra, India
[2]Dental Surgeon, Rural Health Training Center, Paithan, Dist. Aurangabad, Maharashtra, India
[3]Biostatician, Department of Community Medicine, Govt. Medical College, Aurangabad, Maharashtra, India
[4]Professor & Head, Department of Community Medicine, Govt. Medical College, Aurangabad, Maharashtra, India
Corresponding Author: Dr. Bharat B Chavan (E-mail: bharatbchavan@gmail.com)

Abstract

Introduction: *A pleasant smile not only increases the face value but is also important for improving the quality of life of a person in a variety of spheres. Facial appearance has a long lasting implication on an individual. An unacceptable dental appearance has often been associated with a negative effect on self-image, career advancement and peer-group acceptance. The third most frequent oral disorders, alongside tooth decay and periodontal disease, are dental malocclusions. To confer a treatment plan and to work out on the treatment needs of a community group, it is obligatory to know the trends of occurrence of various malocclusions. With this background the study was planned to determine the prevalence and various preventive and treatment procedures of malocclusion in Aurangabad district of Maharashtra.*
Methods: *A community based cross-sectional study was conducted among 2151 subjects in Aurangabad district, being the capital of Marathwada region by Rural Health 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 3 months i.e. from June to August 2021. 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 using SPSS-17 version.*
Results: *In the present study, prevalence of malocclusion was found to be 28.4%. Epidemiological studies on malocclusion not only help in orthodontic treatment needs and evaluation of dental health services but also offer a valid research tool for assessing distinct environmental and genetic factors in the aetiology of malocclusion.*
Conclusion: *Drastic efforts are being taken by developing countries like India to eradicate many medical and dental diseases. Extensive multi centric studies are required to obtain a countrywide representative data.*

Keyword: *Malocclusion, prevalence, dental disease*

Introduction

"A Smile is a curve that sets everything straight"….Phyllis Diller. A pleasant smile not only increases face value but is also important for improving the quality of life of a person in a variety of spheres. Aesthetically appealing persons are found to be brimmed with confidence. Thus face can be described as the door of the mind and body [1]. It plays an important role in both communication and emotional display. Everybody aims to be adored, respected or accepted by the surrounding community. On this basis different behavioural patterns and personal interactions are observed by different people. Dentition of an individual has a direct impact on his/her physical appearance. Malocclusion has been described as an handicapping dentofacial anomaly which causes defacement or which hinders function and necessitating treatment "if the mutilation poses an obstacle to the patient's physical or emotional wellbeing" (WHO, 1987) [1, 2].

Although malocclusion is not a debilitating disease it can be considered as a public health concern attributed to its high prevalence, prevention and treatment possibilities. The third most frequent oral disorders, alongside tooth decay and periodontal disease, are dental malocclusions [2]. They are classified as the third major oral health problems according to WHO. Indeed malocclusion can impact stomatognathic system of an individual affecting several oral functions like chewing, swallowing and speaking skills. Moreover it can also strike dentofacial esthetics and self-esteem of the individual with a negative impact on everyday life. The prevalence of malocclusion in India varies from 20-43% [3].

There are ethnic, geographical, nutritional and environmental factors producing variations in the prevalence of mal-occlusion [4]. To confer a treatment plan and to work out on the treatment needs of a community group, it is obligatory to know the trends of occurrence of various malocclusions. There is a lack of statistical data on

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malocclusions in this particular geographical area. Though there is no single way to classify malocclusion, the simple way to assess in field area according to WHO oral health survey (3rd Edition) was used for categorization of individuals in three groups. The aims and objectives of the study were to determine the status of malocclusion in Aurangabad district and recommend various preventive and treatment procedures needed for the community.

Materials and Methods

Study design: It was a community based, cross-sectional study.
Study area: Field practice area of Rural Health Training Center, Paithan of Govt. Medical College, Aurangabad, Maharashtra, India.
Study period: June 2021 to August 2021.
Study population: Being a capital place of Marathwada region, Aurangabad District was chosen for the study. Pathfinder methodology was used for sample selection. For urban population, 4 sites from Aurangabad city, For Urban III/ Semi-urban population, 2 sites from Paithan and 2 sites from Kannad were selected whereas for rural population 4 villages from Aurangabad city i.e. Phulambri, Kachaner, 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. According to standards of pathfinder methodology the minimum number of subjects acceptable as one cluster is 20, but considering the errors from recorder, operator or examiner, a size of 25 per cluster is recommended. Male: Female ratio was tried to be kept as 1:1. Applying this sampling distribution to the entire population the total sample size of 2151 was selected.
Study tool: The standard proforma was designed for malocclusion according to WHO Oral Health Assessment Form (3rd Ed) and pretested on 25 subjects as a pilot trial and continued on entire subjects for data collection.

The following codes were used for recording malocclusion -

0- No anomaly or malocclusion.
1- Slight anomalies, such as one or more rotated or tilted teeth or slight crowding or spacing, which disturb the regular alignment of the teeth.
2- More serious anomalies, specifically the presence of one or more of the following conditions of the four anterior incisors:

- Maxillary overjet estimated to be 9 mm or more.
- Mandibular overjet, anterior cross bite equal to or greater than a full tooth depth.
- Open bite.
- Midline shift estimated to be more than 4 mm.
- Crowding or spacing estimated to be more than 4 mm.

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, compiled and entered in MS Excel 2007 worksheet. It was analyzed using open Epi version 3.01. Percentages were calculated and graphical presentation was used wherever necessary by using Microsoft Office Excel 2007 software. 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 1: Socio-demographic profile of study population

Sr. No.	Socio-demographic profile	Urban	Urban III	Rural	Total
1	**Sex**				
	Male	380 (32.20)	386 (32.71)	414 (35.08)	1180(100)
	Female	316 (32.54)	300 (30.9)	355 (36.56)	971 (100)
	Total	696 (32.36)	686 (31.89)	769 (35.75)	2151 (100)
2	**Age (in years)**				
	5-6 yrs	114 (27.74)	154 (37.47)	143 (34.79)	411(100)
	12 yrs	91 (24.33)	118 (31.55)	165 (44.12)	374 (100)
	15-18 yrs	165 (37.84)	125 (28.67)	146 (33.49)	436 (100)
	35-44 yrs	222 (39.86)	171 (30.7)	164 (29.44)	557 (100)
	65 + yrs	104 (27.88)	118 (31.64)	151 (40.48)	373 (100)
	Total	696 (32.36)	686 (31.89)	769 (35.75)	2151(100)

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3	**Religion**				
	Hindu	588 (30.85)	624 (32.74)	694 (36.41)	1906 (100)
	Muslim	56 (34.57)	56 (34.57)	50 (30.86)	162 (100)
	Buddhist	52 (62.65)	6 (7.23)	25 (30.12)	83 (100)
	Total	696 (32.36)	686 (31.89)	769 (35.75)	2151 (100)
4	**literacy status**				
	Middle_school	102(22.82)	149(33.33)	196(43.85)	447(100)
	High school	93(30.9)	83(27.57)	125(41.53)	301(100)
	Illiterate	160(41.67)	103(26.82)	121(31.51)	384(100)
	Primary school	204(30.72)	210(31.63)	250(37.65)	664(100)
	Graduate	36(40.45)	34(38.2)	19(21.35)	89(100)
	Intermediate or post high school certificate	48(29.45)	72(44.17)	43(26.38)	163(100)
	Literate	43(57.33)	21(28)	11(14.67)	75(100)
	Post graduate	8(33.33)	13(54.17)	3(12.5)	24(100)
	Professionals	2(50)	1(25)	1(25)	4(100)
	Total	696 (32.36)	686 (31.89)	769 (35.75)	2151(100)
5	**Occupation**				
	Student	297(28.02)	333(31.42)	430(40.57)	1060(100)
	Dependent	61(35.67)	73(42.69)	37(21.64)	171(100)
	Housewife	144(44.58)	118(36.53)	61(18.89)	323(100)
	Agricultural labour	81(21.89)	103(27.84)	186(50.27)	370(100)
	Own business	41(43.62)	25(26.6)	28(29.79)	94(100)
	Others	5(41.67)	2(16.67)	5(41.67)	12(100)
	Unemployed	12(75)	2(12.5)	2(12.5)	16(100)
	Employed	54(56.84)	27(28.42)	14(14.74)	95(100)
	Not applicable	01(10)	03(30)	06(60)	10(100)
	Total	696 (32.36)	686 (31.89)	769 (35.75)	2151(100)
6	**Socio-economic status**				
	Class I and II (Upper and Upper Middle class)	272 (42.11)	339 (52.48)	35(5.42)	646 (100)
	Class III (Middle class)	381 (35.51)	328 (30.57)	364(33.92)	1073 (100)
	Class IV and V (Lower middle and Lower class)	43 (5.85)	19 (2.59)	370(50.34)	735 (100)
	Total	696 (32.36)	686 (31.89)	769 (35.75)	2151(100)

As Table 1 shows the socio-demographic profile of the study population. Out of 2151 participants, 696 were from urban area, 686 from Urban III and 769 were from rural area. Out of 696 from urban area, 380 (32.20) were male and 316 (32.54) were female. Similarly out of 686 from Urban III, 386 (32.71) male and 300 (30.9) were female and out of 769 from rural area, 414 (35.08) were male and 355 (36.56) were female. Considering the index age groups 411 were of 5-6 yrs, 374 were of 12 yrs, 436 were of 15-18 yrs, 557 of 35-44 yrs and 373 were of above 65 yrs. Maximum number of study subjects were of Hindu religion 1906, followed by Muslim 162, and 83 were Buddhist religion. In view of literacy status, maximum no. of population was seen to have education upto primary school 664 whereas only 24 were studied upto postgraduates and only 4 were among professionals. In study population maximum number of participants were seen in 3 groups ie, 1060 students, 370 agricultural labours and 323 were housewives. Distribution of socio-economic status shows in urban area maximum number of family belong to upper and upper middle class 42.11%, followed by middle class 35.51% and 5.85% lower middle and lower class. Similarly in Urban III area also maximum number of subjects were in upper and upper middle class 52.48%, Middle class 30.57% and only 2.59% were on lower and lower middle class. Whereas in Rural areas maximum study population was in lower and lower middle class 50.34%, middle class 33.92% and only 5.42% were in upper and upper middle class.

Table 2: Association between geographic location and malocclusion of study population

Sr. No.	**Geographic Location**	**Mal-occlusion Status**				**P-value**
		0	**1**	**2**	**Total**	
1	Urban I	521 (74.86)	141 (20.26)	34 (4.89)	696(100)	$\chi 2$ =33.602 p<0.001
2	Urban II	508 (74.05)	114 (16.61)	64 (9.33)	686 (100)	
3	Rural	511 (66.45)	159 (20.68)	99 (12.88)	769 (100)	
4	Total	1540 (71.60)	414 (19.25)	197 (9.16)	2151 (100)	

It was seen from Table 2 that the prevalence of malocclusion according to study area exhibited highest prevalence of malocclusion in rural area 33.56% (20.68% mild, 12.88% moderate to severe malocclusion); Urban III area revealed 25.94% (16.61% mild, 9.33% moderate to severe malocclusion) whereas Urban I area

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revealed 25.15% (20.26 % mild and 4.89% moderate) to severe malocclusion.

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

Sr. No.	Socio-demographic profile	Oral health status			Total	P-value
		0 (No Malocclusion)	1 (Slight Malocclusion)	2 (Moderate or Severe Malocclusion)		
1.	**Sex**					
	Male	859(72.80)	217(18.39)	104(8.81)	1180(100)	$\chi2$ =1.8647 p>0.05
	Female	681(70.13)	197(20.29)	93(9.58)	971(100)	
	Total	1540(71.60)	414(19.25)	197(9.16)	2151(100)	
2.	**Age (in years)**					
	5-6	398(96.84%)	12(2.92%)	1(0.24%)	411(100)	$\chi2$ =208.001 p<0.001
	12	279(74.6%)	72(19.25%)	23(6.15%)	374(100)	
	15-18	247(56.65%)	130(29.82%)	59(13.53%)	436(100)	
	35-44	353(63.38%)	139(24.96%)	65(11.67%)	557(100)	
	65+	263(70.51%)	61(16.35%)	49(13.14%)	373(100)	
	Total	1540(71.60)	414(19.25)	197(9.16)	2151(100)	
3.	**Religion**					
	Hindu	1352 (70.94)	376(19.73)	178(9.34)	1906(100)	$\chi2$ =5.7259 p>0.05
	Muslim	120 (74.07)	27(16.67)	15(9.26)	162(100)	
	Buddhist	68 (81.93)	11(13.25)	4(4.82)	83(100)	
	Total	1540 (71.60)	414(19.25)	197(9.16)	2151(100)	
4.	**Literacy status**					
	Illiterate	270(70.31)	66(17.18)	48(12.5)	384(100)	$\chi2$ =239.644 p<0.001
	literate	63(84)	11(14.67)	1(1.33)	75(100)	
	Primary school	581(87.50)	71(10.70)	12(1.81)	664(100)	
	Middle school	305(68.23)	101(22.60)	41(9.17)	447(100)	
	High school	157(52.16)	73(24.25)	71(23.69)	301(100)	
	Intermediate or post high school	88(53.99)	58(35.59)	17(10.43)	163(100)	
	Graduate	52(58.43)	31(34.83)	6(6.74)	89(100)	
	Post graduate	20(83.33)	3(12.50)	1(4.17)	24(100)	
	Professionals	4(100)	0	0	4(100)	
	Total	1540 (71.60)	414(19.25)	197 (9.16)	2151(100)	
5.	**Occupation**					
	Student	794(74.91)	188(17.74)	78(7.36)	1060(100)	$\chi2$ =54.7004 p<0.001
	Dependent	133(77.78)	16(10.52)	22(12.87)	171	
	Housewife	228(70.59)	67(20.74)	28(8.66)	323(100)	
	Agricultural labour	238(64.32)	82(22.16)	50(13.51)	370(100)	
	Own business	63(67.02)	24(25.5)	7(7.44)	94(100)	
	Others	10(83.33)	0	2(16.66)	12(100)	
	Unemployed	9(56.25)	6(37.50)	1(6.25)	16(100)	
	Employed	61(64.21)	25(26.31)	9(9.47)	95(100)	
	Not applicable	4(40)	6(60)	0	10(100)	
	Total	1540 (71.60)	414(19.25)	197 (9.16)	2151(100)	
6.	**Socio-economic status**					
	Class I and II	433 (67.04)	162(25.07)	51(7.89)	646 (100)	$\chi2$ =27.1236 p<0.001
	Class III	771 (71.86)	188(17.52)	114(10.62)	1073 (100)	
	Class IV and V	336 (77.8)	64(14.8)	32(7.4)	432(100)	
	Total	1540 (71.60)	414(19.25)	197(9.16)	2151 (100)	

As Table 3 shows that sex wise prevalence of malocclusion was found to be 27.2% in male and 29.87 %in females. Age wise prevalence was found be highest in a 15-18 yrs age group i.e. 43.35% and lowest in 5 to 6 yrs age group i.e. 3.16%. In case of religion, Hindus exhibited highest prevalence of malocclusion i.e. 29.07% and Buddhist lowest prevalence i.e. 18.07%. Literacy status revealed maximum prevalence in intermediate or post high school certificate group 46.26%. Among different occupations, employed exhibited 35.78% prevalence, agricultural labours 35.67%, businessmen exhibited 32.94%, prevalence of malocclusion was

found to be highest in class I and II Socioeconomic status and lowest in class IV and class V. It was observed that statistically significant difference in prevalence was seen in study area or geographic location, different age groups, literacy status, occupation and socio-economic status whereas sex wise and religion wise prevalence of

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malocclusion was not found to be statistically significant.

Discussion

Physiognomy has a long lasting implication on an individual. An unacceptable dental appearance has often been associated with a negative effect on self-image, career advancement and peer-group acceptance. In order to prevent a wide-spread impact on their psychological development, children having very severe or handicapping malocclusion should be identified and corrective measures should be instituted at the earliest. With this background only the present study was executed.

The overall prevalence of malocclusion in Aurangabad district was found to be 28.4% amongst which 19.25% exhibited mild malocclusion, whereas 9.16% exhibited severe malocclusion. In the meta-analysis by Balachandran P *et al*. [5] revealed the overall pooled prevalence of malocclusion in 11 studies was found to be 26.69%. Another study by Senthilkumar J *et al*. [6] in 2018 found that the overall prevalence of malocclusion in their study was found to be 32%.

According to study areas, the percentage of malocclusion was found to be highest in rural areas compared to urban and peri-urban areas. Similar findings were seen in oral health survey done by Batra P *et al*. [7] in the period of 2001-2004. In this study, gender wise and religion wise distribution revealed no significant difference in prevalence of malocclusion amongst males and females. Meta-analysis done by Balachandran P *et al*. [5] also demonstrated no significant gender wise difference in prevalence of malocclusion.

Considering the age factor, highest prevalence (43.35%) was found in adolescents of which 29.82% exhibited mild changes, whereas 13.53% exhibited moderate to severe malocclusion. The findings were consistent with those of Kharbanda OP [8] where prevalence of malocclusion in adolescents was found to be 36.6%.

Considering the literacy status maximum prevalence was noted in intermediate or post high school certificate group 46.26%. Among different occupations highest prevalence was seen in employed persons. Socio-economic status revealed highest prevalence among Class I and II and lowest prevalence in Class IV and V. Literature does not reveal information regarding relation of these three parameters with malocclusion. But considering the logical correlation amongst these three parameters it could be correlated that psychosocial problems are more prevalent in highly educated and high income individuals rather than in lower socio-economic groups which could be a predisposing factor for development of different habits like thumb sucking, tongue thrusting, bruxism, etc which can produce malocclusion.

Conclusion

It was a short attempt to have a look on esthetics of Aurangabad district i.e. the status of occlusion and malocclusion of the community. Drastic efforts are being taken by developing countries like India to eradicate many medical and dental diseases. The main reason behind this struggle is inadequate implementation of preventive oral health care program which requires a sound base of epidemiological data. Epidemiological studies on malocclusion not only help in orthodontic treatment needs and evaluation of dental health services but also offer a valid research tool for ascertaining the operation of distinct environmental and genetic factors in the aetiology of malocclusion. Therefore, extensive multi centric studies are required to obtain a countrywide representative data

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