

The Prevalence of Dentofacial Characteristics and oral habits among Adolescents of Eastern Uttar Pradesh, India:**A Survey and Review Report**

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Abstract

Introduction: The main objective of the present study is to determine the prevalence of various malocclusions, oral habits, facial profiles, and lip competence in the age group of 12 to 16 years school going adolescents of Eastern Uttar Pradesh (Eastern UP), India.

Methods: Total sample comprised of 1876 subjects (956 males and 920 females) from different regions of Eastern UP. None of the subject went through any kind of orthodontic care preventive, interceptive or corrective. Different variables were recorded using a combination of different qualitative methods. Comparisons between genders were performed for the prevalence of malocclusions, and other variables (chi-square tests).

Results: The prevalence of malocclusion was 49% of the total sample studied. Class I, class II and class III malocclusions were present in 34.2%, 11.6%, and 3.3% of

the sample respectively. Midline deviation, midline diastema, crowding, deepbite, and openbite were observed in 37.6%, 16.6%, 23.7%, 11.1%, and 1.5% cases respectively. Oral habits (3.4%) prevailed less than the other studies reported. Straight facial profile was present in 62.7 % of the total sample that is higher than convex and concave profile. Peg-laterals were present in 2.5% of the total sample that was almost similar to most of the other studies. No statistically significant differences between genders were found except edge to edge bite and mouth breathing habit.

Conclusions: This epidemiological study on malocclusion is useful in providing objective information about the malocclusion, important to develop various public health strategies to enable population to benefit from interceptive and corrective orthodontic care.

Keywords: prevalence, malocclusion, facial profiles, oral habits, lip competence.

Introduction

Prevalence is the total number of all individuals who have an attribute or disease at a particular time or period divided by the population at risk of having the attribute or disease.^[1] A malocclusion can be define as misalignment of teeth or incorrect relation between the teeth of the two dental arches when they approach each other as the jaws close.^[2] World Health Organization reports that malocclusion is the third most common oral condition only after caries and periodontal disease and it is included as dentofacial anomalies that may lead to affect quality of life of an individual, the same organization recommends that health authorities should conduct the epidemiological surveys of the major oral diseases at ages 5, 12 and 15 years and in age groups 35 to 44 and 65 to 74 years every five to ten years.^[3,4] One of the earlier studies in which 1000 school children were examined, it was observed that 69% had class I, 19% had class II, 3.4% had class III molar relationship.^[2] From then, there is a number of epidemiological studies reported worldwide regarding the prevalence of malocclusion, its variation with respect to age, gender, location and ethnicity, measurement of its severity and treatment need. Prevalence of malocclusion was reported as low as 12.5% in hilly regions of Himachal Pradesh (India) and as high as above 95% in different

regions of Iran, while in India, 90.4% is the highest prevalence, reported in Punjab state.^[5-7] A wide spectrum of the prevalence of malocclusion is due to variation in methods and criteria involved, variation in sample size, age group studied, ethnicity and racial variation. There can be a qualitative and quantitative evaluation of malocclusion, many researchers previously used different qualitative methods for the epidemiological survey and also a number of researchers modified the originally proposed method to obtain better results, Angle's method for the qualitative evaluation of malocclusion is still the most common method of recording and it is also the commonest method utilized in different modified forms [Table 1]. NHANES III survey (National Health and Nutrition Examination Survey) was done in the USA in which there was use of a combination of Angle's method, irregularity index and occlusal contact discrepancies.^[8] Most part of the world has been subjected to epidemiological studies regarding malocclusion yet some parts are still untouched. In India itself, number of states went through these studies but some of the states such as Uttar Pradesh are still uncovered. None of the studies reported till now in Eastern Uttar Pradesh. Aim of this study was to evaluate the prevalence of various malocclusions, oral habits, lip competence and facial profiles of the subject in the sample of 12 to 16 years school going adolescents of Eastern Uttar Pradesh, India.

Table 1: Different qualitative methods used in various epidemiological survey

<i>Qualitative methods</i>	<i>Utilized by researchers</i>
Angle's method (1890) and Angle's method modified ^[2,12-20,7,21-34]	Masseler and Frankel (1951), Altemus et al (1959), Wood (1971), Foster and day (1974), Johnson et al (1978), Garner & Butt (1985), Hensel et al (1991), Decosta et al (1999), Willems et al (2001), Sahil M (2007), Gul E Eram et al (2008), Borzabadi F et al (2009), Sharma et al (2010), K Sridharan et al (2011), Muppa R et al (2013), H Kaur et al (2013), Aniket H et al (2013), Tulika T et al (2014), Satinder PS et al (2015), Ruchi S et al (2015),

	Retna K N et al (2016), Zakirulla M et al (2016), S. Ojass K et al (2017), Selma MH (2018)
Bjork et al (1964) ^[9, 35-42]	Lavelle (1976), Helm (1970), Ingervall et al (1978) , Kerosuo et al (1988) , Otuyemi & Abidoye (1993), Thilander et al (2001), Bourzgui F et al (2012) Baeshen H et al (2017)
Ackerman and Proffit's classification (1973) ^[10,43-44]	Brunell et al (1996), Roopa S et al (2013)
WHO FDI (1979) ^[11,45-47]	Woon et al (1989), Tod & Taverne (1997), Shyama et al (2001)
NHANESS III (1988-1994) ^[8,47-49]	Ciuffolo et al (2005), Ferro R et al (2016), Alvarado K et al (2017)

Materials and Methods

Ethical approval

Name of the institution- Institute of Medical Sciences, Banaras Hindu University. *Date of issue of certificate-* 19-01-2017 *Reference number in the certificate-* ECR/526/Inst/UP/2014/Dt. 31.1.14 (No. Dean/2015-16/EC/582)

Study design and setting

Present study is basically a cross-sectional, qualitative type descriptive study was carried out in rural and urban areas of Eastern UP. This study was performed from February 2017 to March 2018. A total of 20 schools were selected using simple random sampling technique in which 14 schools from rural and 6 were from urban areas. 200 adolescents were examined from each school and those fulfilling inclusion criteria were included in the study.

Selected children underwent final examination. Finally, 1876 school going adolescents of age 12 to 16 years were enrolled for the study that consisted of 956 male and 920 female subjects. Informed consent was obtained along with one witness before the examination. The method employed in the present study is the combination of different qualitative methods (Table 2). The principal examiner was trained and calibrated by the well-experienced staff of the department. The examiner practiced recordings on thirty 12 to 16-year-old students presented in the OPD of Faculty of Dental Sciences IMS BHU and the recordings were calibrated by the examiner. The same examination was repeated a day after and the results of the two examinations were compared and checked for intra-examiner reliability (Kappa = 0.80).

Table 2: Methods employed in the present study

Methods	As employed in the present study
Basic oral health survey method 1997 ^[4]	Demographic information and standard codes guideline
Angle's method modified	Angle's classification of malocclusion and modification of class I and class III malocclusion by Dewey. ^[50]
Ackerman and Proffit's	a. <i>Alignment:</i> minimal or no crowding, crowding, spaced dentition (midline

method modified	<p>diastema, spacing other than diastema)</p> <p>b. <i>Facial profile</i>: straight, convex, and concave</p> <p>c. <i>Transverse plane</i>: posterior crossbite (anterior crossbite is also included in the same classification as a means of convenience), dental midline coinciding, dental midline deviated</p> <p>d. <i>Sagittal plane</i>: Angle's classification of molar relation, normal overjet, moderately increased overjet, severely increased overjet, reverse overjet</p> <p>e. <i>Vertical Plane</i>: normal overbite, increased overbite, deepbite, edge to edge bite, openbite.</p>
Other variables	<p><i>Lip competence</i> (competent, incompetent, potentially incompetent), <i>peg lateral</i> (unilateral or bilateral), <i>oral habits</i> (Thumb sucking, tongue thrusting, mouth breathing).</p>

Eligibility criteria

All children between 12-16 years of age and who were present on the day of examination formed the study population. Permanent dentition with the first molar must be present and teeth present in each arch and in a sufficient state of the eruption (the third molar excluded), no previous history of orthodontic treatment in either arch, no faulty restoration that might have altered occlusion, no retained deciduous teeth/mixed dentition were included in the survey. Multiple missing teeth, mutilated malocclusion, medically compromised and handicapped children, other craniofacial anomalies like cleft lip and palate and subjects without informed consent were excluded from the survey.

Clinical examination

Clinical Examination Data was collected by the principal examiner and one assistant. The examiner visited the schools on predetermined dates. Clinical examination of the study subjects was conducted using diagnostic gloves, millimeter ruler, calliper, CPI probes and plane mouth mirrors under the adequate natural light. All occlusal relationships were evaluated at Maximum

Intercuspatation. Evaluation of position of the tongue along with masseter muscle activity during swallow used to determine the tongue thrust habit. Subject was believed to be a tongue thruster if he/she was presented with thrusting of tongue against the upper central incisors or between the upper and lower central incisors during swallowing or with teeth apart swallow and/or Excessive lower lip activity during swallowing while mouth breathers was diagnosed via water holding test and using double ended mirrors.^[51] All the observations were recorded in the modified malocclusion recording form. Proper sterilization was maintained throughout the examination. After the oral examination, an oral health education program was conducted by the examiner for all the study subjects.

Orthodontic variables

Assessment form was modified that includes a combination of different methods as given in the Table 2. Findings were classified into following categories-

1. Normal occlusion as described by Angle, Houston, and Andrew.^[52]
2. Class I molar relation as described by Angle.

3. Class I malocclusion and its Dewey's modification -
Class I type 1, Class I type 2, Class I type 3, Class I type 4, Class I type 5
4. Class II malocclusion- class II division 1, Class II division 2, Class II subdivision
5. Class III malocclusion and its Dewey's modification-
Class III type 1, Class III type 2, Class III type 3
6. Dental Midline- Coinciding or shifted less than $1/3^{\text{rd}}$ of the width of lower incisor, deviated $1/3^{\text{rd}}$ or more than $1/3^{\text{rd}}$ of the width of lower incisor
7. Spacing- Midline diastema, Spacing other than midline diastema.
8. Crowding- Anterior crowding, Posterior crowding
9. Crossbite- Anterior crossbite, Posterior crossbite
10. Overjet- Normal overjet (1-3mm), Moderate overjet(>3-5mm), Increased overjet(>5mm), Reverse overjet
11. Overbite- Overbite $1/3^{\text{rd}}$ of lower incisors, Overbite $2/3^{\text{rd}}$ of lower incisors, $2/3^{\text{rd}}$ to 100% overbite (deepbite), Edge to edge bite, Open bite(>1mm)
12. Facial Profile- Straight, Convex, Concave
13. Lip competence- Competent lips, Incompetent lips, Potentially incompetent lips
14. Peg lateral- unilateral/bilateral presence or absence

Table 3: Sample distribution according to gender

Gender	Frequency	Percent
Male	956	51%
Female	920	49%
Total	1876	100%

Figure 1 (pie chart) Sample distribution according to gender

Statistical Analysis

The data was entered into the MS Excel (2013) and was subjected to statistical analysis using the Statistical Package for the Social Sciences version 17.0. Descriptive statistics were calculated for every measured variable as

frequency and percentage distribution. The descriptive statistics of the key variables were calculated using the chi-square test of Pearson to determine differences in prevalence rates between genders. P value for statistical significance was set at 0.05.

Results

Out of the 1876 subjects, total prevalence of malocclusion was 49% in which the most prevalent Angle's class was class I malocclusion (34.2%). Distribution of different malocclusion variables are shown in Tables 5-13 and figures 3-5b.

Table 4: Distribution of occlusion

Variables	Male (956)	Female (920)	Total (1876)
Normal occlusion	498 (52.1%)	458 (49.8%)	956 (51%)
Malocclusion	458 (48%)	462 (50.2)	920 (49%)

Table 5: Distribution of Angle's class of malocclusion and its Dewey's modification

Variables	Male (956)	Female (920)	Total (1876)
Class I malocclusion	319 (33.4)	322 (35%)	641 (34.2%)
Class I type 1	160 (16.7%)	171 (18.6%)	331 (17.6%)
Class I type 2	129 (13.5%)	124 (13.5%)	253 (13.5%)
Class I type 3	17 (1.8%)	15 (1.6%)	32 (1.7%)
Class I type 4	8 (0.8%)	8 (0.9%)	16 (0.85%)
Class I type 5	5 (0.5%)	4 (0.4%)	9 (0.45%)
Pearson Chi-Square	1.242		

P value	.941		
Class II malocclusion	106 (11.1%)	112 (12.2%)	218 (11.6%)
Class II division 1	70 (7.3%)	79 (8.6%)	149 (7.9%)
Class II division 2	29 (3%)	23 (2.5%)	52 (2.8%)
Class II subdivision	7 (0.7%)	10 (1.1%)	17 (0.9%)
Pearson Chi-Square	2.139		
P value	.544		
Class III malocclusion	33 (3.5%)	28 (3%)	61 (3.3%)
Class III type 1	12 (1.3%)	9 (1%)	21 (1.1%)
Class III type 2	8 (0.8%)	9 (1%)	17 (0.9%)
Class III type 3	13 (1.4%)	10 (1.1%)	23 (1.25%)
Pearson Chi-Square	.718		
P value	.869		

Table 6: Distribution of transverse plane variables

Variables	Male (956)	Female (920)	Total (1876)
Midline coinciding	606 (63.4%)	565 (61.4%)	1171 (62.4%)
Midline deviation	350 (36.6%)	355 (38.6%)	705 (37.6%)
Pearson Chi-Square	.780		
P value	.377		
No crossbite	929 (97.2%)	888 (96.5%)	1817 (96.7%)
Anterior crossbite*	17 (1.8%)	21 (2.3%)	38 (2.2%)
Posterior crossbite	10 (1%)	11 (1.2%)	21 (1.1%)

Pearson Chi-Square	3.124
P value	.373

* Anterior crossbite is included in the same classification as a matter of convenience.

Table 7: Distribution of alignment variables

Variables	Male (956)	Female (920)	Total (1876)
No spacing	729 (76.3%)	724 (78.7%)	1453 (77.5%)
Midline diastema	173 (18.1%)	138 (15%)	311 (16.6%)
Spacing other than diastema	54 (5.6%)	58 (6.3%)	112 (6%)
Pearson Chi-Square	3.409 ^a		
P value	.182		
No Crowding	731 (76.5%)	701 (76.2%)	1432 (76.3%)
Anterior Crowding	196 (20.5%)	196 (21.3%)	392 (23.7%)
Posterior Crowding	29 (3%)	23 (2.5%)	52 (2.75%)
Pearson Chi-Square	.630		
P value	.730		

Table 8: Distribution of sagittal plane variables

Variables	Male (956)	Female (920)	Total (1876)
Class I molar relation	817 (85.5%)	780 (84.8%)	1597 (85.2%)
Class II molar relation	106 (11.1%)	112 (12.2%)	218 (11.6%)
Class III molar relation	33 (3.5%)	28 (3%)	61 (3.3%)
Pearson Chi-Square	1.572		
P value	.666		

Normal overjet	568 (59.4%)	572 (62.2%)	1140 (60.7%)
Moderate overjet	224 (23.4%)	197 (21.4%)	421 (22.4%)
Increased overjet	151 (15.8%)	137 (14.9%)	288 (15.4%)
Reverse overjet	13 (1.4%)	14 (1.5%)	27 (1.4%)
Pearson Chi-Square	1.773		
P value	.621		

Table 9: Distribution of vertical plane variables

Variables	Male (956)	Female (920)	Total (1876)
Normal overbite	402 (42.1%)	376 (40.9%)	778 (41.5%)
Increased overbite	390 (40.8%)	394 (42.8%)	784 (41.8%)
Deep bite	99 (10.4%)	110 (12%)	209 (11.1%)
Edge to edge bite	52 (5.4%)	25 (2.7%)	77 (4.1%)
Open bite	13 (1.4)	15 (1.6%)	28 (1.5%)
Pearson Chi-Square	10.392		
P value	.034		

Table 10: Distribution of facial profile

Variables	Male (956)	Female (920)	Total (1876)
Straight profile	599 (62.7%)	549 (59.7%)	1148 (61.2%)
Convex profile	328 (34.3%)	338 (36.7%)	666 (35.5%)
Concave profile	29 (3%)	33 (3.6%)	62 (3.3%)
Pearson Chi-Square	1.896		

P value	.388
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Table 11: Distribution of Oral habits

Variables	Male (956)	Female (920)	Total (1876)
No habits	933 (97.6%)	880 (95.7%)	1813 (96.6%)
Thumb sucking habit	7 (0.7%)	8 (.9%)	15 (0.8%)
Tongue thrusting	14 (1.5%)	21 (2.3%)	35 (1.9%)
Mouth breathing	2 (0.2%)	11 (1.2%)	13 (0.7%)
Pearson Chi-Square	8.559		
P value	.036		

Table 12: Distribution of lip competence

Variables	Male (956)	Female (920)	Total (1876)
Competent lips	756 (79.1)	711 (77.3%)	1467 (78.2%)
Lips incompetent	151 (15.8%)	152 (16.5%)	303 (16.2%)
Potentially incompetent	49 (5.1%)	57 (6.2%)	106 (5.7%)
Pearson Chi-Square	1.297		
P value	.523		

Table 13: Distribution of peg lateral

Variables	Male (956)	Female (920)	Total (1876)
Peg lateral absent	934 (97.7%)	895 (97.3%)	1829 (97.5%)
Unilateral Peg lateral	12 (1.3%)	13 (1.4%)	25 (1.3%)
Bilateral Peg lateral	10 (1%)	12 (1.3%)	22 (1.2%)
Pearson Chi-Square	.363		

P value	.834
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Figure 2 (pie chart) Distribution of occlusion

Figure 3 (pie chart) Distribution of molar relations

Figure 4 (bar diagram) Distribution of Angle's class of malocclusion and its Dewey's modification

Figure 5a and 5b(bar diagram) Distribution of different variables.

Discussion

The presented study is one of the first study reported in referred population with the purpose to carry out orthodontic focus in community health service. Specific criteria for random selection of sample was followed and the sample selected was large enough to cover the population in which prevalence has to be determined. Although less prevalent than caries and periodontal disease, malocclusion has been studied in large extent in different countries due to its high prevalence in different populations. Functional and psychosocial effect area prime concern due to the presence of malocclusion; hence knowledge of an individual's perception and reaction to malocclusion in a population are necessary for effective orthodontic intervention. In this modern era, there is a number of methods to prevent or intercept developing malocclusion or even to correct it to a large extent that can improve the quality of life of the subject. Epidemiological studies are very helpful in remote areas where the residents are even unknown about the condition and possibilities of its correction, so motivation and awareness are the two key factors associated as advantages. In many

countries, epidemiological studies on malocclusion have been included in national health survey to provide orthodontic treatment according to need. Alteration in occlusion comes in different form and severity that leads to the development of diverse methods of measuring malocclusions so it is difficult to compare the results of other epidemiological studies. Although many studies have been reported on the prevalence of malocclusion in different populations, the review of the literature showed that none of the studies performed in referred population so as to plan and develop the treatment facilities based upon the frequencies and distribution of malocclusion pattern. A modified malocclusion form was established via a combination of different qualitative methods of recording. Diagnosis of different variables was made according to the classification described earlier. None of the skeletal variables were studied as it was difficult to discriminate between dental and skeletal component. All the three planes of space such as anteroposterior, transverse and vertical component of malocclusion have been studied. Oral habits, facial profiles and lip competence were also included in the survey. The presented study demonstrates that there is prevalence of 49% of malocclusion which means 49% of population between 12 to 16 year age group has some type of alteration with its occlusion. Some of the previous studies shows the prevalence of malocclusion closer to the result of the present study (Table 14).

Table 14 Review of literature on prevalence of malocclusion in different regions

Prevalence of malocclusion less than 30% (low prevalence) ^[5-6,53-60]	Prevalence of malocclusion 30-60% (moderate prevalence) ^[6,38,39,47,61-75]	Prevalence of malocclusion 60-90% (high prevalence) ^[3,6,13,17-19,26,30,32-33,36,40,76-89]	Prevalence of malocclusion more than 90% (very high prevalence) ^[6-7,47,78,90]
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<ul style="list-style-type: none"> • Himachal Pradesh (12.5%) • Iran (23.69%) • Nalgonda(17.2%) • Davangiri (19.9%) • Haryana (23.6%) • Madras(19.6%) • Udupi (28.8%) • Mandu (14.4%) • Chennai (26.2%) • France (21.3%) 	<ul style="list-style-type: none"> • Iran (41.5%) • Tanzania (45%) • Nigeria (32.6%) • Italy (32.2%) • Bangluru North (32.5%) • Chennai (42.9%) • South Canara (47%) • Mysuru (58.2%) • Apache Indian (48%) • Udaipur district (38.9%) • Tanzania(51%) • Finnish (38.9%) • Delhi (45.7%) • Himachal Pradesh (53%) • Thiruvananthapuram (49.2%) • Rural Haryana (55.3%) • Mumbai (46.8%) • Bagalkot (34.9%) • Nagpur(34.19%) 	<ul style="list-style-type: none"> • Rio de Janeiro(80.84%) • Iran pooled (87%) • American Negros (83.5%) • Germany (76.7%) • Kenya (83.2%) • Nigeria (87.8%) • Karnataka (87.79%) • Kozikode (83.3%) • Jaipur (74.57%) • Hyderabad (83.3%) • Denmark (78.5%) • Bogota (88%) • Kancheepuram (75%) • Gaale, Srilanka (69.5%) • Brazil (85.17%) • Hungary (70.4%) • Kenya (87.5%) • Nepal (85.58%) • Tanzania (63.8%) • Bangluru (71%) • Bosnia (83%) • Central Antolia (89.9%) • Kuwait (86%) • American Caucasians and Indian (82.5% and 65.4%) • Benin city, Nigeria (84.1%) 	<ul style="list-style-type: none"> • Punjab (90.3%) • Iran(99.7, 95.3 and 97.18%) • Italy (93%) • Brazil (91.3%) • China (92.9%)
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After dividing in different categories according to occurrence rate of malocclusion in different regions (Table 14), it is clear that most part of the world shows the prevalence that is higher than 30% in which more than 60% comprise the highest numbers. In the present study with the 49% of prevalence of malocclusion, the most prevalent Angle's class was class I (34.2%) in which type 1 (17.6%) and type 2 (13.5%) accounts higher rate. Total Angle's class I molar relation was 85.4%. Class II division

1 (7.9%) was more distributed than class II division 2 and subdivision while among class III types, type 1 and type 3 (1.1 and 1.2%) were almost equally distributed. Class II division 1 was less distributed than the other studies reported.^[17,20] In comparison to other variables, midline deviation (37.6%) and crowding (23.7%) were having the highest prevalence rate. Openbite (1.5%) was less distributed than deepbite (11.1%). Prevalence of midline diastema was 16.6% while spacing other than midline

diastema was present only in 6% of the sample studied. Lip incompetence and potential incompetence were present in 16.2% and 5.7% respectively. Straight profile accounted higher prevalence than convex and concave profile that is consistent with the result of other studies.^[91,92,93] In contrary to present study convex profile is also reported higher than straight profile.^[21,44,94] Tongue thrusting (1.9%) accounted higher rate while thumb sucking (0.8%) and mouth breathing (0.7%) accounted almost equal percentage. Prevalence of different habits in the present survey was less than the other studies reported.^[44,51,95-97] In comparison with the previous findings (2 to 5%) occurrence of peg lateral in present survey was

2.5%.^[98-103] Different racial groups having different prevalence rate of peg lateral in which the occurrence rates were higher in Mongoloid (3.1%) than in black and white subjects while the female subjects shows prevalence rate slightly more than the male subjects which is consistent with the present study.^[104] Sample size according to gender was almost equal for both male and female and the distribution of different variables (except edge to edge bite and mouth breathing habit) posed no significant difference between genders. There are a number of survey shows prevalence trend of different variables closer to the current study (Table 15).

Table 15 Prevalence in other regions closer to prevalence in Eastern UP

Malocclusion	Eastern UP prevalence	Prevalence closer to Eastern UP
Angle's class I molar relation	85.2%	American Negro children (66.4+16.5%), Leh region (87.4%), Kozikode (86.5%), Hyderabad (78.8%), Karnataka (85.4%). ^[13,29,30,33,44]
Class I malocclusion	34.2%	Delhi (27.7%), Thiruvananthapuram (45%), Haryana (43.6%). ^[69,71,72]
Class II malocclusion	11.6%	USA (15%), Tumkur (10%), Delhi (14.6%), Haryana (9.8%). ^[8,24,69,72]
Class II div 1	7.9%	Columbia (10.55%), Tumkur (8.8%), Leh (8.7%), Hyderabad (8.85%), Kenya (7.5%). ^[13,24,29,33,80]
Class II div 2	2.8%	Punjab (2.1%), Columbia (1.58%), Tumkur (1.2%), Leh (1.4%), Brazil (3.20%), Nepal (3.33%). ^[7,13,24,29,78,81]
Class III malocclusion	3.3%	Punjab (3%), Karnataka (2.14%), Leh (2.5%), Hyderabad (4.1%), Bogota (3.7%), Delhi (3.4%), Bagalkot (2.83%), Nepal (4.32%), Itlay (4.3%). ^[7,26,29,33,40,69,74,81,105]
Midline deviation	37.6%	Iran (23.7%), Karnataka (33.3%). ^[6,44]
Midline diastema	16.6%	Nepal (16%), Davangiri (18.3%), Chennai (17.8%), Bangluru (11.2%), Nagpur (8.28+4.38+2.47=17.13%), Benin City, Nigeria (19.5%). ^[23,54,59,61,75,89]
Crowding	23.7%	Himachal Pradesh (17.8%), Punjab (20%), Kenya (19%), Nepal (19.75%). ^[5,7,80,81]
Cross bite	4.8%	Punjab (4.4%), Nepal (4.57%). ^[7,81]
Deep bite	11.1%	Punjab (13.6%), USA (10%), Karnataka (15.4%), Nepal (13.23%). ^[7,8,44,81]

Open bite	1.5%	Himachal Pradesh (0.8%), Pakistan (2.6%), Iran (1.6%), Davangiri (2.1%), Chennai (2.3%), Bangluru (1.2%), Nepal(2.03%), Malesiya (2%) ^[5,21,22,54,59,61,81,106]
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Conclusion

1. Class I molar relation was present in 85.2% of the sample in which class I malocclusion was found 34.2% and normal class I occlusion was in 51% of the sample studied. Class II malocclusion was present in 11.6% while class III in 3.3% of the total sample.
2. Midline deviation ($1/3^{\text{rd}}$ or more than $1/3^{\text{rd}}$ of lower incisor width) prevailed in 37.6% while cross bite was in 4.8% of the sample. Midline diastema was present in 16.6% while crowding was present in 23.7% of the sample. Overjet more than 3mm was present in 37.8% while deepbiterefelected in 11.1% of the sample. Open bite was only in 1.5% of the total sample.
3. Straight profile was observed in 61.2%, convex in 35.5 % while concave was present only in 3.3% sample. Oral habits were observed in only 3.4% of the sample. The incompetent lips were present in 21.9%. Peg laterals were observed in 2.5% of the total sample.
4. Mouth breathing habit, was more prevalent in female than in male gender while edge to edge bite was observed more in male than in the female. Other variables of malocclusion showed no significant difference with respect to gender.
5. This epidemiological study on malocclusion is useful in providing objective information about the malocclusion, important factors in public health planning upon which various public health strategies could be formulated. A significant problem in epidemiological studies is the lack of uniformity in the measurement criteria between various studies since there is no universally accepted standardized method and it is quite possible that studies in future to be

executed in the same area may give different results if there would be use of other methods of measurements. Developed countries are full of basic information needed to improve dental health and orthodontic care but in developing countries like India, this information on the epidemiological status on the prevalence of orthodontic problems is usually lacking and in some remote areas people are totally unaware about the orthodontic condition. So, the presented study is the part of epidemiological survey performed in the Eastern UP population regarding different parameters such as distribution of malocclusion in deciduous, mixed and permanent dentition, orthodontic treatment need and studies to compare with hospital-based epidemiological status of malocclusion to calculate real need of orthodontic care and to enable population to benefit from preventive, interceptive and corrective orthodontic care.

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Figure information

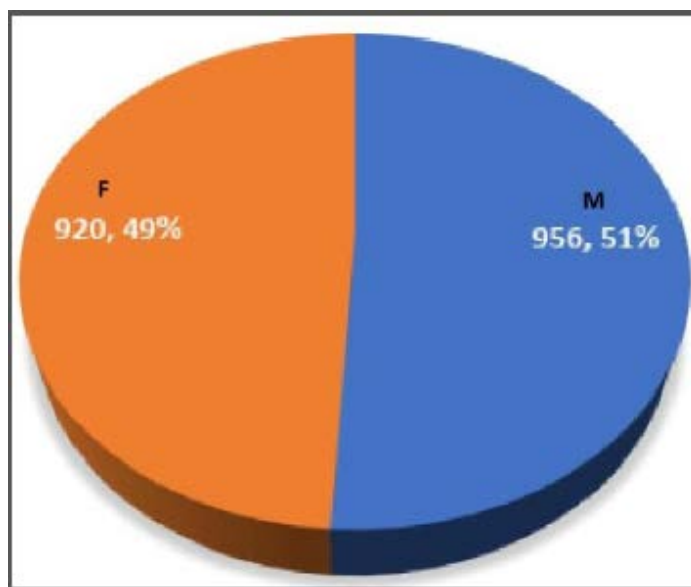


Figure 1 sample distribution according to gender

Figure 1 legends-M- male sample- 956 (51%), F- female sample- 920 (49%).

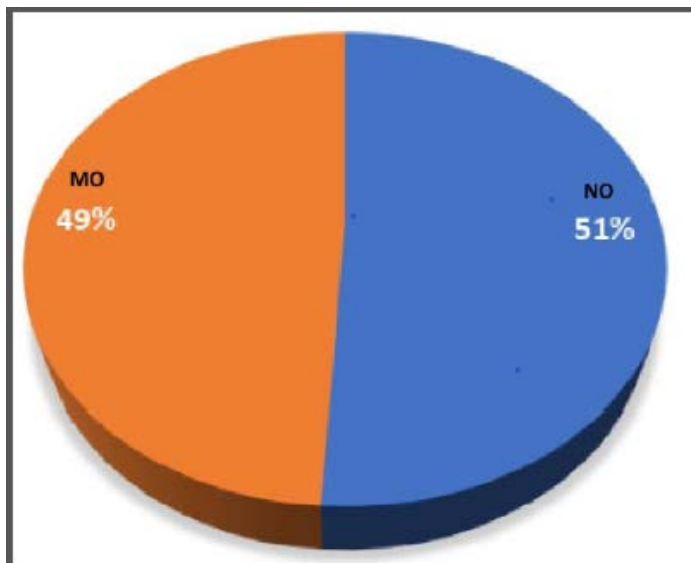


Figure 2 Distribution of occlusion

Figure 2 legends-NO- normal occlusion- 956 (51%), MO- malocclusion- 920 (49%).

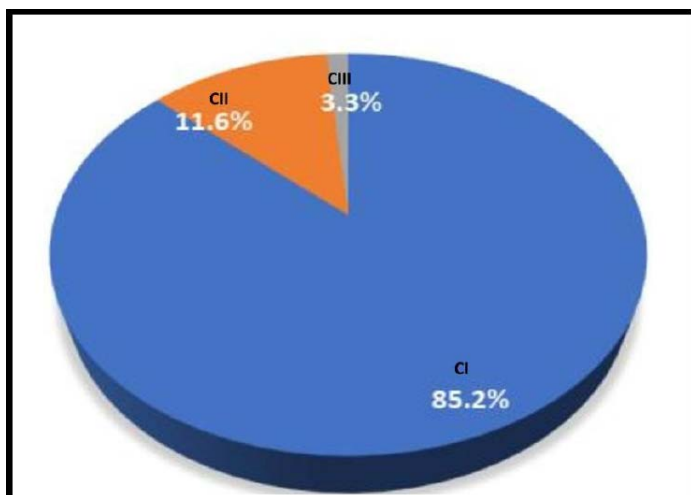


Figure 3 Distribution of molar relations

Figure 3 legends-CI- class I molar relation- 85.2%, CII- class II molar relation- 11.6%, CIII- class III molar relation- 3.3%.

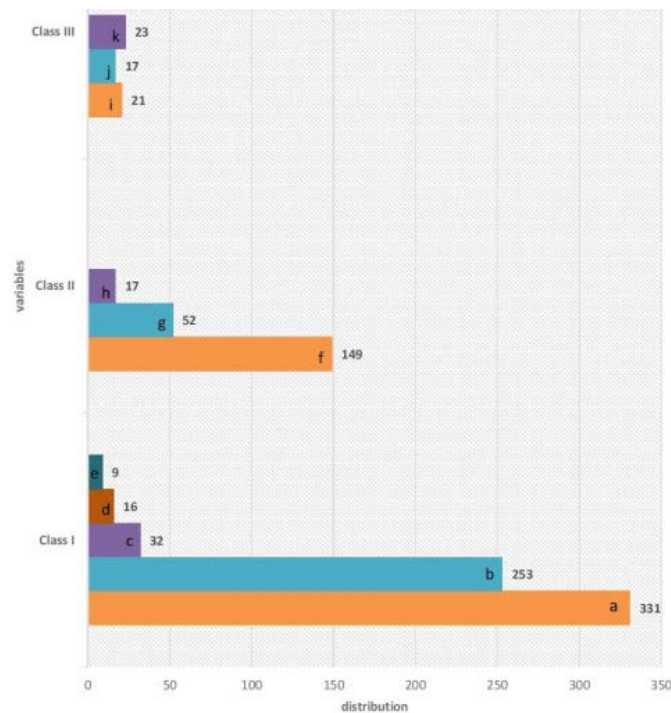
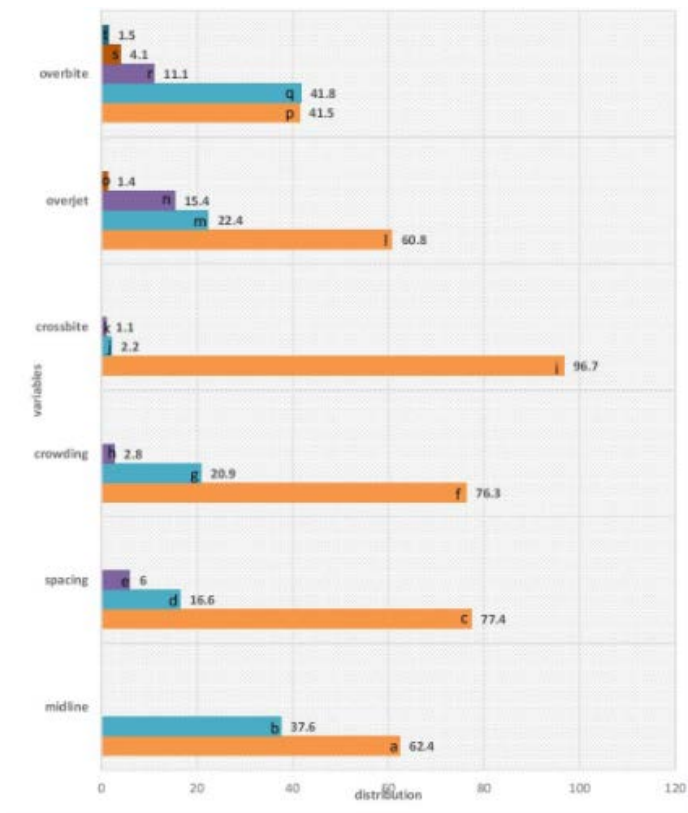


Figure 4 Distribution of Angle's class of malocclusion and its Dewey's modification

Figure 4 legends- a- class I type 1, b- class I type 2, c- class I type 3, d- class I type 4, e- class I type 5, f- class II division 1, g- class II division 2, h- class II subdivision, i- class III type 1, j- class III type 2, k- class III type 3.



h- posterior crowding, **i-** no crossbite, **j-** anterior crossbite, **k-** posterior crossbite, **l-** normal overjet, **m-** moderate overjet, **n-** increased overjet, **o-** reverse overjet, **p-** overbite 1/3rd of lower incisor, **q-** overbite upto 2/3rd of lower incisor, **r-** deep bite, **s-** edge to edge bite, **t-** open bite.

Figure 5b legends- **a-** straight facial profile, **b-** convex facial profile, **c-** concave facial profile, **d-** thumb sucking habit, **e-** tongue thrusting habit, **f-** mouth breathing habit, **h-** lips competent, **i-** incompetent lips, **j-** potentially incompetent lips, **k-** peg lateral absent, **l-** unilateral peg lateral, **m-** bilateral peglateral.

Figure 5a

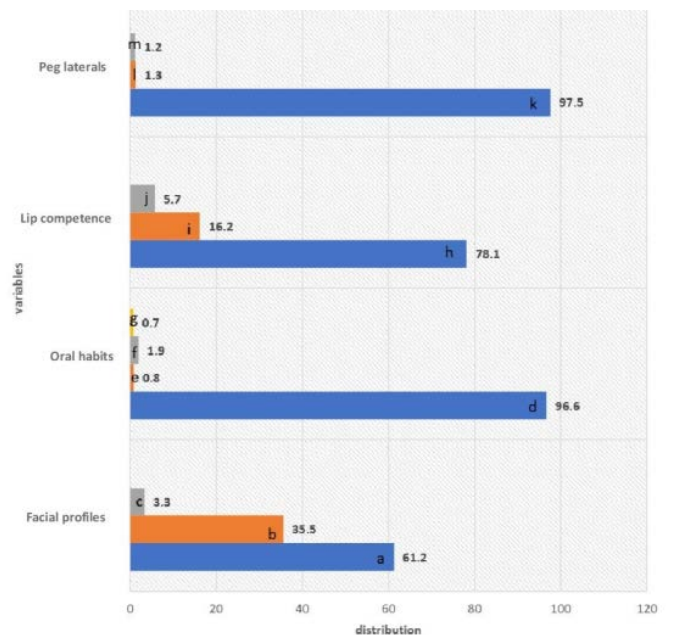


Figure 5b

Distribution of different variables

Figure 5a legends- **a-** midline coinciding, **b-** midline deviated, **c-** no spacing, **d-** midline diastema, **e-** spacing other than diastema, **f-** no crowding, **g-** anterior crowding,