Prevalence of Malocclusion and Orthodontic Treatment Needs Among 12 and 15 Years Old Rural School Children in Kancheepuram District, Tamilnadu

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ABSTRACT

Introduction: Oral health care in rural areas is limited due to shortage of dental manpower, financial constraints and the lack of perceived need for dental care among rural masses.

Aim and Objectives: To assess malocclusion and orthodontic treatment needs among 12 and 15 years old rural school children in Kancheepuram district.

Materials and Methods: Multistage random sampling methodology was employed for the selection of blocks, village panchayats, schools and school children. The final sample size of the study is 1000 which included 500 children from 12 years and 500 from 15 years. The malocclusion was recorded using Dental Aesthetic Index.

Results: The overall prevalence of malocclusion among both the age groups was 75%. The mean DAI score among the 12 years was 29.1 ± 6.02 and among the 15 years was 28.2 ± 5.45 respectively.

Conclusion: The results of this study indicate that there is high prevalence of malocclusion among the rural school children.

Keywords: Rural schoolchildren, Malocclusion, Dental aesthetic index, Orthodontic treatment needs

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INTRODUCTION

Oral health is an integral part of overall health. Oral cavity plays a vital role in the life of human beings through functions like mastication, aesthetics, phonetics, communication and emotional expressions etc. It is highly essential to safe guard oral health of all the children from childhood because healthy individuals are the most precious assets any country can have (1).Oral health care in rural areas is limited due to shortage of dental manpower, financial constraints and the lack of perceived need for dental care among rural masses (2).

There is no definite picture as yet regarding the prevalence of malocclusion in the rural areas of our country, where 72.2 % of the population live. It is important that steps had to be taken to curb this trend, because this may lead to crippling consequences on the functional component of the oral cavity.

The present study was conducted to provide additional information regarding the current needs in dental care among rural children. Till date no study has been done among school children in Kancheepuram district to assess their oral health status. 12 – 15 years is the time of adolescent growth

spurt and orthodontic problems are most amenable to correction in this age group. Schools are the best center for effectively implementing the comprehensive health care programme, as children are easily accessible at school (3).

The aim of this study is to assess the malocclusion and orthodontic treatment needs among 12 and 15 years old rural school children in Kancheepuram district, Tamil Nadu.

MATERIALS AND METHODS

An epidemiologic survey was conducted to assess the prevalence of malocclusion and orthodontic treatment needs among 12 and 15 years old rural school children in Kancheepuram district, Tamil Nadu. The sources of data in the present study were the various schools in Kancheepuram district.

According to the Directorate of Rural Development and Panchayat Raj Department Government of Tamil Nadu, Kancheepuram district comprises of 13 blocks and each block has many village panchayats.

All school children of 12 and 15 years old who were present on the day of examination were included in the study. The school children undergoing orthodontic treatment and who were not willing to participate and/or were absent on the successive days of examination were excluded from the study.

The ethical clearance was obtained from the Institutional Review Board of Meenakshi Academy of Higher Education and Research. The nature and purpose of the study was explained to the heads of the schools (Correspondent, Principal, Headmaster/ Headmistress, etc.) and prior permission was obtained to conduct the study in their schools.

Training exercises were first carried out in the Department of Public Health Dentistry, MeenakshiAmmal Dental College and Hospital on the out-patients under the guidance of an experienced teacher. A group

of 10 school children were examined on successive days to assess the consistency of intra-examiner reproducibility. The agreement for most assessments was found to be 85%.

For the pilot study, two blocks were randomly selected and from each block one village panchayat was randomly taken and one school from each village panchayat were selected randomly and examined according to the WHO Basic Oral Health Assessment (1997) modified. The total population examined was 200. All school children were examined by a single examiner, seated on a chair under natural light using standardized instruments. The sample size was calculated based on the prevalence rate obtained from the pilot study. It was decided to take 1000 (500 from 12 years and 500 from 15 years) children with power of the study set at 95%, as the maximum sample size required for the study.

The sampling was done usingMultistage randomsampling methodology. The first stage included the selection of blocks in

Kancheepuramdistrict, out of thirteen blocks ten blocks were randomly selected. The second stage included the random selection of one village panchayat from each selected block. The final stage included the selection of one school from the existing selected panchayats and from this selected school 100 school children were taken which included fifty from 12 years and fifty from 15 years. Thus the desired sample size of 1000 was taken from ten blocks which comprised of 100 children from each block.
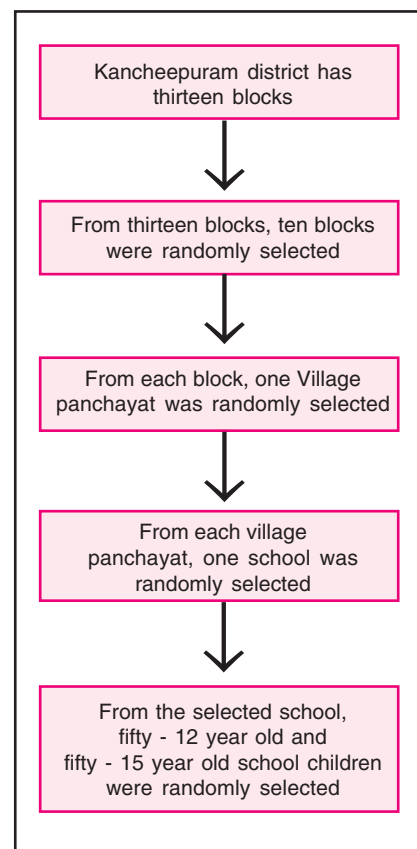
The planned distribution of selection of blocks, village panchayats, schools and school children is given below:
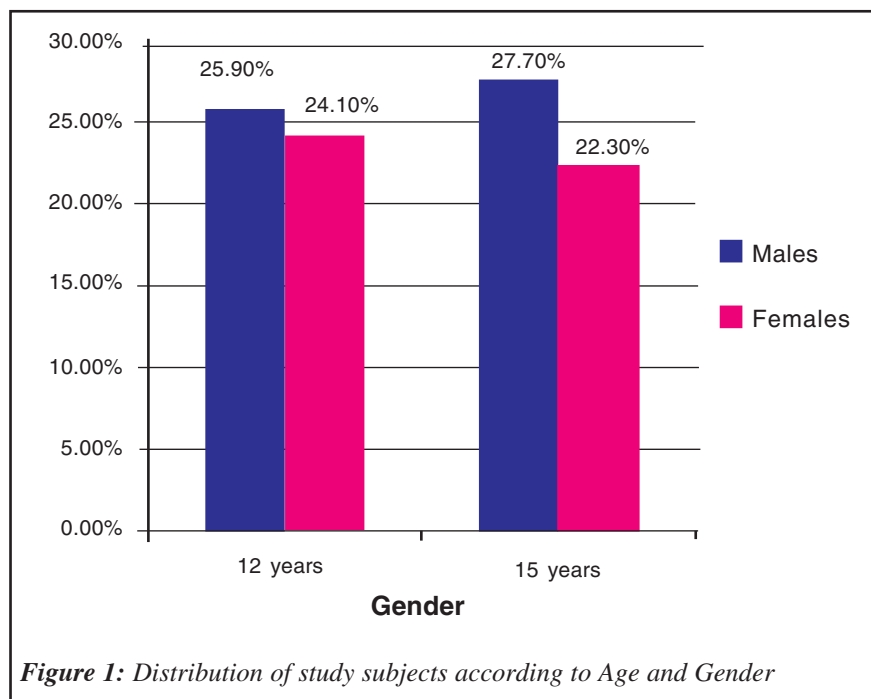
The data was collected using WHO Oral Health Assessment Form (1997) Modified. The criteria and recording instructions used for survey form followed those stated in Manual "Oral Health Surveys – Basic Methods", 4th edition, WHO 1997 (4). Type III Clinical examination as recommended by ADA was followed (Inspection using mouth mirror, explorer and adequate illumination).

The malocclusion was recorded according to the components of Dental Aesthetic Index (DAI) as described by WHO, Oral Health Survey, Basic Methods – 4th edition, 1997, by using CPI probe and plane mouth mirror. The collection of data according to Dental Aesthetic Index (DAI) criteria permits analysis to be made of each of the separate components of the index or grouped under anomalies of dentition, space and occlusion. It is also possible to calculate standard DAI scores using the DAI regression equation whereby the measured components of the DAI are multiplied by their regression coefficients, theproducts then being added to the regression equation constant. The resultant sum is the DAI score (4).

STATISTICAL ANALYSIS

The data collected was analyzed and tested for significance using statistical software packages, SPSS (Statistical Package for Social Sciences) version 17.0 software. For continuous variables, the descriptive statistics such as mean and standard deviation were

Kancheepuram district has thirteen blocks

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From thirteen blocks, ten blocks were randomly selected

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From each block, one Village panchayat was randomly selected

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From each village panchayat, one school was randomly selected

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From the selected school, fifty - 12 year old and fifty - 15 year old school children were randomly selected

Figure 1: *Distribution of study subjects according to Age and Gender*

estimated. For comparing percentages, Pearson's chi square test was used. For comparison of two groups, Student's "t" test was used.

RESULTS

Distribution of study subjects according to Age and Gender:

Among the 1000 study subjects, 500 (50%) children were of the age group 12 years which consisted of 259 (25.9%) males and 241 (24.1%) females and 500 (50%) children were of 15 years which consisted of 277 (27.7%) males and 223 (22.3%) females. (Figure 1)

Distribution of Dental Aesthetic Index components among the 12 years according to Gender:

Among the 12 year old study subjects, 495 (99%) had no missing teeth among which 255 (98.5%) were males and 240 (99.6%) were females and about 5 (1%) children reported to have missing teeth of which 4 (1.5%) were males and 1 (0.4%) were females. For incisal segment crowding a total of 105 (21%) children had no segment crowding out of which 68 (26.3%) were males and 37 (15.4%) were females, and 395 (79%) had 1or 2 segment crowding among which 191 (73.7%) were males and

204 (84.6%) were females. For incisal segment spacing a total of 273 (54.6%) children had nosegment spacing which included 150 (57.9%) males and 123 (51%) females; and 227 (45.4%) children had 1 or 2 segment spacing out of which 109 (42.1%) were males and 118 (49%) were females (Table 1).

Among the 500 school children of 12 years old examined, 347 (69.4%) had no midline diastema which consisted of 213 (82.2%) males and 134 (55.6%) females and 153 (30.6%) had >1 mm diastema in which 46 (17.8%) were males and 107 (44.4%) were females; 145 (29%) children had no maxillary anterior irregularity of which 93 (35.9%) were males and 52 (21.6%) were females and 355 (71%) children had >1 mm of maxillary anterior irregularity consisting of 166 (64.1%) males and 189 (78.4%) females. Among the study subjects, 282 (56.4%) children had no mandibular anterior irregularity of which 145 (56%) were males and 137 (56.8%) were females and 218 (43.6%) children had >1 mm of mandibular anterior irregularity out of which 114 (44%) were males and 104 (43.2%) were females.

For maxillary overjet a total of 193 (38.6%)

children had maxillary overjet of 0–2 mm which consisted of91 (35.2%) males and 102 (42.3%) females; 307 (61.4%) children had maxillary overjet>2 mm of which 168 (64.8%) were males and 139 (57.7%) were females. A total of 459 (91.8%) children had no mandibular overjet consisting of 242 (93.4%) males and 217 (90%) females and 41 (8.2%) children hadoverjet>1 mm of which 17 (6.6%) were males and 24 (10%) were females. 420 (84%) children had no anterior openbite out of which 210 (81.1%) were males and 210 (87.1%) were females and 80 (16%) children had >1 mm of anterior openbite of which 49 (18.9%) were males and 31 (12.9%) were females.

Regarding molar relationship, 254 (50.8%) children had normal molar relation of which 159 (61.4%) were males and 95 (39.4%) were females; 174 (34.8%) subjects had half cusp deviation including 74 (28.6%) males and 100 (41.5%) females; and 72 (14.4%) had full cusp deviation out of which 26 (10%) were males and 46 (19.1%) were females.

When the dental aesthetic index components among the 12 years were compared between the males and females, the differences were found to be statistically very highly significant, p<0.001 for components like diastema, maxillary anterior irregularity, maxillary overjet and molar relation and the difference was statistically significant, p<0.05 for crowding.

Distribution of Dental Aesthetic Index components among the 15 years according to Gender:

Among the 15 year old study subjects, 470 (94%) had no missing teeth among which 260 (93.9%) were males and 210 (94.2%) were females, 30 (6%) children reported to have missing teeth of which 17 (6.1%) were males and 13 (5.8%) were females. For incisal segment crowding a total of 42 (8.4%) children had no segment crowding out of which 22 (7.9%) were males and 20 (9%) were females, and 455 (91.6%) had 1or 2 segment crowding among which 252 (92.1%) were males and 203 (91%) were females. For incisal segment spacing a total of 260 (52%) children had no segment

Table 1: Distribution of Dental Aesthetic Index components among the 12 years according to Gender

DAI Component		Males (n = 259)		Females (n = 241)		Total (n = 500)		p value
		n	%	n	%	n	%	
Missing teeth	0	255	98.5%	240	99.6%	495	99%	0.205
	≥ 1	4	1.5%	1	0.4%	5	1%	
Crowding (segment)	0	68	26.3%	37	15.4%	105	21%	<0.05*
	1,2	191	73.7%	204	84.6%	395	79%	
Spacing (segment)	0	150	57.9%	123	51%	273	54.6%	0.108
	1,2	109	42.1%	118	49%	227	45.4%	
Diastema (mm)	0	213	82.2%	134	55.6%	347	69.4%	<0.001**
	≥1	46	17.8%	107	44.4%	153	30.6%	
Maxillary anterior irregularity (mm)	0	93	35.9%	52	21.6%	145	29%	<0.001**
	≥1	166	64.1%	189	78.4%	355	71%	
Mandibular anterior irregularity (mm)	0	145	56%	137	56.8%	282	56.4%	0.342
	≥1	114	44%	104	43.2%	218	43.6%	
MaxillaryOverjet (mm)	0,2	91	35.2%	102	42.3%	193	38.6%	<0.001**
	>2	168	64.8%	139	57.7%	307	61.4%	
MandibularOverjet (mm)	0	242	93.4%	217	90%	459	91.8%	0.086
	≥1	17	6.6%	24	10%	41	8.2%	
Openbite (mm)	0	210	81.1%	210	87.1%	420	84%	0.098
	≥1	49	18.9%	31	12.9%	80	16%	
Molar relation	Normal	159	61.4%	95	39.4%	254	50.8%	<0.001**
	Half cusp deviation	74	28.6%	100	41.5%	174	34.8%	
	Full cusp deviation	26	10%	46	19.1%	72	14.4%	

p* value <0.05 is significant
p** value <0.001 is Very highly significant

spacing which included 136 (49.1%) males and 124 (55.6%) females; and 240 (48%) children had 1 or 2 segment spacing out of which 141 (50.9%) were males and 99 (44.4%) were females (Table 2).

Among the 500 school children of 15 years old examined, 324 (64.8%) had no midline diastema which consisted of 172 (62.1%) males and 152 (68.2%) females and 176 (35.2%) had >1mm diastema of which 105 (37.9%) were males and 71 (31.8%) were females; 42 (8.4%) children had no maxillary anterior irregularity of which 22 (7.9%) were males and 20 (9%) were females and 458 (91.6%) children had >1mm of maxillary anterior irregularity consisting of 255 (94.1%) males and 203

(91%) females. Among the study subjects, 316 (63.2%) children had no mandibular anterior irregularity of which 156 (56.3%) were males and 160 (71.7%) were females and 184 (36.8%) children had >1mm of mandibular anterior irregularity out of which 121 (43.7%) were males and 63 (28.3%) were females.

For maxillary overjet a total of 200 (40%) children had maxillary overjet of 0–2 mm which consisted of 97 (35%) males and 103 (46.2%) females; 300 (60%)children had maxillary overjet>2mm of which 180 (75%) were males and 120 (53.8%) were females. A total of 426 (85.2%) children had no mandibular overjet consisting of 253 (91.3%) males and 173 (77.6%) females

and 74 (14.8%) children had overjet>1mm of which 24 (8.7%) were males and 50 (22.4%) were females. 483 (96.6%) children had no anterior openbite out of which 263 (94.9%) were males and 220 (98.7%) were females and 17 (3.4%) children had >1 mm of anterior openbite out of which 14 (5.1%) were males and 3 (1.3%) were females.

Regarding molar relationship 348 (69.6%) children had normal molar relation of which 197 (71.7%) were males and 151 (67.7%) were females; 117 (23.4%) subjects had half cusp deviation including 58 (20.9%) males and 59 (26.5%) females; and 35 (7%) had full cusp deviation out of which 22 (7.9%) were males and 13 (5.8%) were females.

Table 2: Distribution of Dental Aesthetic Index components among the 15 years according to Gender

DAI Component		Males (n = 277)		Females (n = 223)		Total (n = 500)		p value
		n	%	n	%	n	%	
Missing teeth	0	260	93.9%	210	94.2%	470	94%	= 0.05
	≥ 1	17	6.1%	13	5.8%	30	6%	
Crowding (segment)	0	22	7.9%	20	9%	42	8.4%	<0.05*
	1,2	252	92.1%	203	91%	455	91.6%	
Spacing (segment)	0	136	49.1%	124	55.6%	260	52%	0.20
	1,2	141	50.9%	99	44.4%	240	48%	
Diastema (mm)	0	172	62.1%	152	68.2%	324	64.8%	0.12
	≥1	105	37.9%	71	31.8%	176	35.2%	
Maxillary anterior irregularity (mm)	0	22	7.9%	20	9%	42	8.4%	0.29
	≥1	255	94.1%	203	91%	458	91.6%	
Mandibular anterior irregularity (mm)	0	156	56.3%	160	71.7%	316	63.2%	<0.001**
	≥1	121	43.7%	63	28.3%	184	36.8%	
MaxillaryOverjet (mm)	0,2	97	35%	103	46.2%	200	40%	<0.05*
	>2	180	75%	120	53.8%	300	60%	
MandibularOverjet (mm)	0	253	91.3%	173	77.6%	426	85.2%	<0.001**
	≥1	24	8.7%	50	22.4%	74	14.8%	
Openbite (mm)	0	263	94.9%	220	98.7%	483	96.6%	<0.05*
	≥1	14	5.1%	3	1.3%	17	3.4%	
Molar relation	Normal	197	71.1%	151	67.7%	348	69.6%	0.27
	Half cusp deviation	58	20.9%	59	26.5%	117	23.4%	
	Full cusp deviation	22	7.9%	13	5.8%	35	7%	

p* value <0.05 is significant
p** value <0.001 is Very highly significant

When the dental aesthetic index components among the 15 years were compared between the males and females, the differences were found to be statistically very highly significant, p<0.001 for components like mandibular anterior irregularity and mandibular overjet and statistical significance, p<0.05 was noted for components like crowding, maxillary overjet and openbite.

Prevalence of Malocclusion and Orthodontic treatment needs among the 12 years:

The overall prevalence of malocclusion among the 12 year old children was 75% out of which 125 (25%) had no abnormality or minor malocclusion requiring no treatment or slight need, 190 (38%) had definite malocclusion requiring elective treatment, 106 (21.2%) had severe malocclusion requiring highly desirable treatment and 79 (15.8%) had very severe or handicapping malocclusion requiring mandatory treatment. The mean DAI score was 29.1 ± 6.02 respectively (Figure 2).

Prevalence of Malocclusion and Orthodontic treatment needs among the 15 years:

The overall prevalence of malocclusion among the 15 year old children was 75.4% out of which 123 (24.6%) had no abnormality or minor malocclusion requiring no treatment or slight need, 248 (49.6%) had definite malocclusion requiring elective

treatment, 93 (18.6%) had severe malocclusion requiring highly desirable treatment and 36 (7.2%) had very severe or handicapping malocclusion requiring mandatory treatment. The mean DAI score was 28.2 ± 5.45 respectively (Figure 3).

DISCUSSION

Oral health is fundamental to general health and well - being of an individual, significantly impacting on quality of life. Today millions of children are needlessly afflicted with dental disease because they cannot obtain timely preventive, educational or treatment services (5).

During childhood and adolescence, oral health behaviours, as well as beliefs and
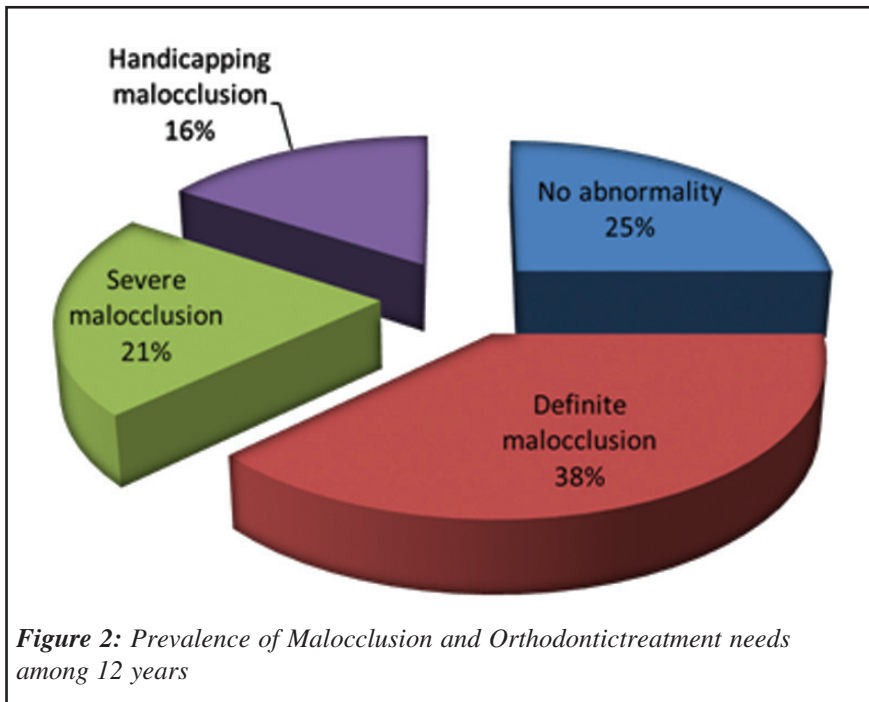
Figure 2: Prevalence of Malocclusion and Orthodontictreatment needs among 12 years

attitudes develop. Children and adolescents are receptive to new information, and the earlier that good oral habits are established the greater their impact. School is the ideal setting to reach these children and adolescents, and they provide a supportive environment for promoting oral health.

Only sporadic data are available on the oral health conditions in different states, particularly the rural areas of India. In the absence of baseline data, the exact magnitude of the oral health problems is seldom recognized in India; as a result oral health always remain a low priority area in the government programs.Therefore the present study was conducted to assess the malocclusion and orthodontic treatment needs among 12 and 15 years old rural school children in Kancheepuram district, TamilNadu to provide additional information on the current needs in dental care among rural children.

Demographic characteristics of the study population

The present study was conducted among 12 years and 15 years age group as both the age groups are the index age group of pathfinder survey as per WHO Basic Oral Health Survey method. The 12 years age group was selected because this age is considered as a global monitoring age for caries for international comparisons and monitoring of disease trends. The 15 years age group was selected because at this age, the permanent teeth have been exposed to the oral environment for 3-9 years. This age is also important for the assessment of periodontal disease indicators in adolescents (4).The study consisted of equal number of children (500) in both age groups.

Dental Aesthetic index components

Malocclusion is as an occlusion in which there is a malrelationship between the arches in any of the planes or in which there are anomalies in tooth position beyond the normal limits (6). In worldwide public health dental disease priorities, malocclusions feature the third highest prevalence(7).

In the current study, the overall prevalence of malocclusion among both the age groups was 75% which was higher when compared to the studies conducted by Dhar V *et al* in Uganda (8), Jose *et al* in Kerala (3) and Suma *et al*in Nalgonda (9). This may be attributed to variations in the indices used for assessing the severity of malocclusion.

In the both 12 and 15 year's age group, the most common malocclusion was crowding being 79% and 91.6%. Crowding normally occurs when there is disharmony in the tooth to jaw size relationship or when
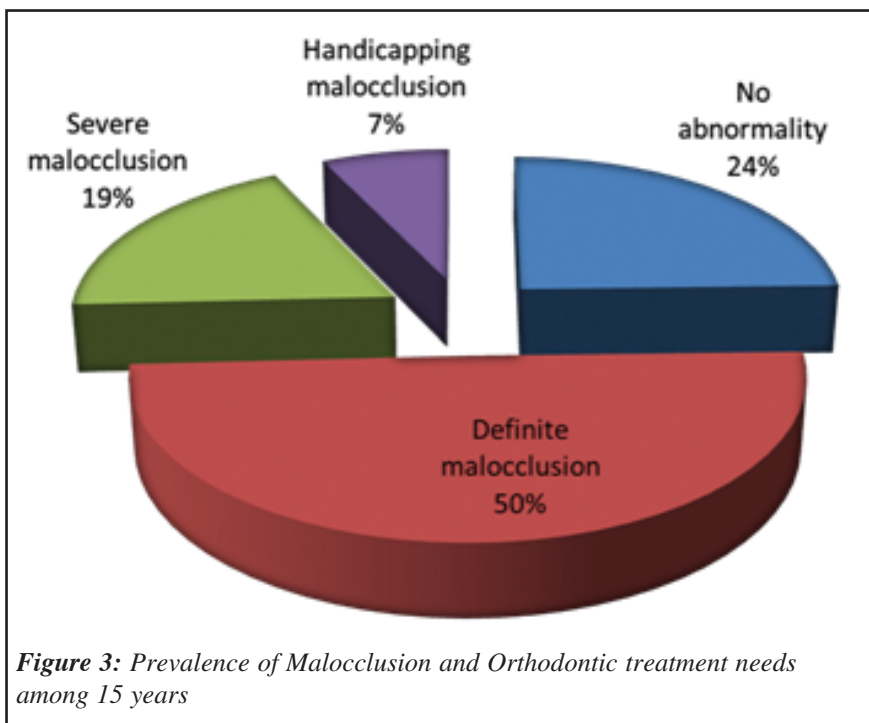

Figure 3: Prevalence of Malocclusion and Orthodontic treatment needs among 15 years

the teeth are larger than the available space. This was high when compared to a study conducted by Nainani *et al* (31.8%) in Maharashtra(10) and Daniel Ibrahim Brito *et al* (45.5%)in Brazil (7). The second common malocclusion among both the years in this study was maxillary anterior irregularity which is identified as the discrepancy between mesiodistal tooth width of four permanent incisors and available space in the alveolarprocess. The maxillary anterior irregularity was followed by maxillary overjet in both groups. The findings were very high when compared to a study done by Shivakumar *et al* in Karnataka (11). These differences in DAI components observed could be attributed to genetic predisposition, variation in growth, facial skeletal development and occlusion.

In the present study, the distribution of DAI scores and orthodontic needs among the 12 years showed that 25% had no abnormality or minor malocclusion which required no or slight need; 38% had definite malocclusion requiring elective treatment; 21.2% had severe malocclusion requiring highly desirable treatment and 15.8% had very severe malocclusion requiring mandatory treatment. This was in contrary to the findings of Poonacha *et al* in Gujarat (12).In the 15 years age group, 24.6% had no abnormality or minor malocclusion which required no or slight need; 49.6% had definite malocclusion requiring elective treatment; 18.6% had severe malocclusion requiring highly desirable treatment and 7.2% had very severe malocclusion requiring mandatory treatment. Contrast findings were observed in a study conducted by Shivakumar *et al* in Karnataka (11). In the current study the

mean DAI score among the 12 and 15 years was 29.1 ± 6.02 and 28.2 ± 5.45 respectively. This finding was high when compared to the studies conducted by Shivakumar *et al*(19.3 ± 4.8) in Karnataka(11)and Suma *et al*(21.3 ± 5.68) in Nalgonda (9). The possiblereason for these differences can be due to the variations in the sample size.

CONCLUSION

The results of this study indicates that there is high prevalence of dentofacial anomalies among the rural school children and it focuses the fact that there still exist a large segment of population who continue to remain ignorant about the detrimental effects of poor oral health and the multiple benefits enjoyed from good oral health. It is evident from the study that the existing oral health services are unable to cope with the need to oral care and efforts should also be taken for promotion of oral health care in these areas.

This study suggests that there is need for intensified oral health education in rural areas, targeted at both parents and school children to enable them benefit from interceptive orthodontic care which has numerous benefits.

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