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# Prevalence of malocclusion and orthodontic treatment need in adolescent population of Tripura (North East India): A cross-sectional study

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## ABSTRACT

**Introduction**: In everyday clinical practice, most treatment decisions are based on orthodontic treatment need indices. Several indices have been developed to assess orthodontic treatment need in particular populations or communities. One of the most widely applied indices for assessment orthodontic treatment need is the Index of Orthodontic Treatment Need (IOTN).

Demand for orthodontic therapy may be influenced by the patient's perceived need for treatment and the anticipated improvement in self-image. Lew has stated that the practitioners should focus their attention beyond orthodontic mechanotherapy to the most subjective aspects of patient's discomfort and attitude toward treatment.

**Aim**: The aim of present study is to determine the prevalence of malocclusion and the need for orthodontic treatment in adolescent school children of Tripura.

**Methodology**: The study was conducted from june 2017 to august 2018. Five schools were randomly selected in the state Tripura (North East) and a random sample of 1500 children aged 12 to 18 years old were screened. School authorities and parents of sampled children was notified about purpose of the study conducted.

**Result:** The preventive & interceptive strategies and early orthodontic treatment as adopted in other countries, could be successfully integrated in the development of an effective national programe in Tripura aimed at increasing the level of oral health and reducing malocclusion risk factors.

**Conclusion**: The findings could be explained considering the very hard social and economic conditions in which these populations live. On the other hand, the lower prevalence rate for definite orthodontic need reported in the mentioned epidemiological European surveys on adolescents could be caused by appropriate preventive measures or interceptive orthodontic treatment performed at an early age.

## INTRODUCTION

The objective assessment of malocclusion is important in documenting prevalence and severity of malocclusion in populations group. Many methods are developed for assessing the

malocclusion.[1] Occlusal Index based on Angle classification is the diagnostic index. Usually, it is used in evaluating the incidence of malocclusion in a particular population. [2]

However in everyday clinical practice, most treatment decisions are based on orthodontic treatment need indices. One of the most widely applied indices for assessment orthodontic treatment need is the Index of Orthodontic Treatment Need (IOTN). [3]

The benefits of orthodontic treatment are hard to justify if treatment is based on improvement in oral or dental health for the majority of orthodontic patients. [4] Previously published study indicates an encouraging awareness of the psychosocial benefits of orthodontic treatment. [5]

Personal perception of the need for orthodontic treatment may be influenced by variety of social, economic and cultural factors.[2] Consequently an increase in the demand for health services including oral health became evident.[3] As growing public interest in oral health increased the demand for orthodontic treatment also became more noticeable in dental practices.[4]

Demand for orthodontic therapy may be influenced by the patient's perceived need for treatment and the anticipated improvement in self-image.[5,6] Lew has stated that the practitioners should focus their attention beyond orthodontic mechanotherapy to the most subjective aspects of patient's discomfort and attitude toward treatment.[7]

Several studies have concentrated on clarifying the role of malocclusion on an individual's perception and satisfaction with dental or facial appearance.[8] Enhancing appearance and improving psychological status have been identified as an important motivating factors behind the decision to initiate orthodontic treatment.[5]

Traditional methods of estimating orthodontic treatment need are mainly based on normative need assessed by professionals using occlusal or cephalometric measurements. This shortcoming is serious because there are considerable difference between professional and patient's perceptions of dental appearance and need for the treatment. While the orthodontist prioritizes the function and occlusion in consultation, the patient might perceive other factors to be equally important to initiate the treatment. As the ultimate goal of a health service is to meet the public needs, professional measurements can be supplemented and related to individual's self-perception of occlusion and need for treatment.[5]

In the last few years, orthodontic treatment demand increased in most countries. Epidemiological studies are essential in order to achieve extensive data on the prevalence of malocclusions and of the social need for orthodontic therapy. This information can be used in every country to create public health plans for orthodontic prevention and screening and to organize the resources in this area.[6,7]

There are no records of the earlier reports related to the prevalence of malocclusion and orthodontic treatment needs in children aged 12 and 18 years in Tripura. Hence, the present study is undertaken to assess the prevalence of malocclusion and need for orthodontic treatment in school children aged 12 and 18 years in Tripura, Northeast India.

## METHODOLOGY

The study was conducted from june 2017 to august 2018. Five schools were randomly selected in the state Tripura (North East) and a random sample of 1500 children aged 12 to 18 years old were screened. School authorities and parents of sampled children was notified about purpose of the study conducted.

Any child not fulfilling the stated criteria was excluded from our study. The sampling frame comprised of approximate 1500 schoolchildren fulfilling the above criteria. The sample size was 300approx in each school. Thus 300 children from each school were selected for the study giving a total sample size of 1500. The examinations was carried out at school with the subject seated on a chair with adequate natural light. A total number of 20 to 25 children were

examined per day. No radiographs were taken. Basic infection control procedures for hand hygiene were adopted.The instruments used were Mouth mirror, Cheek retractors, Kidney trays, Disposable mouth masks, Disposable gloves and Towels. Mouth mirror, Cheek retractor set were used once and then discarded. Alcohol based antiseptic solution (Savlon) was used for hand hygiene after washing with soap and water. At the end of the day all the reused instruments were autoclaved. All survey forms were filled up after the examination of children and need for orthodontic treatment was assessed using IOTN and other details like Angle's Classification was examined.

To assess the attitude towards orthodontic treatment, demand of patients was recorded by asking questions like,Are you satisfied with the arrangement of your teeth? Do you want to get your teeth straightened?Do you consider well aligned teeth important for an overall facial appearance? Photographs were taken after applying cheek retractor with high-resolution digital camera.Immediately after the survey, health talk was given in Bengali/Hindi/English. The DHC of the IOTN was graded in five categories for each patient.

A master file was created for the purpose of data analysis. The data was then transferred from pre-coded survey performa to master file.

## CLINICAL EXAMINATION

Under the daylight conditions by using mouth mirror and millimeter ruler, clinical examination was done in a school classroom. In this study, the examination was carried out by utilization of the IOTN and Occlusal Index (molar and canine relationships according to Angle classification; overjet, overbite, tooth rotation and crowding in the arch).

For each subject, a registration chart was designed. It was comprise an anamnestic questionnaire and clinical examination measurements without radiograms.

## ORTHODONTIC VARIABLES

**The following parameters were evaluated during the examination:**

Occlusal relationships, canine and molar sagittal relationships (according to Angle's classification) and coincidence of incisor midlines.Findings was classified in the following categories: class I, class II divisions 1 and 2 and class III malocclusion.

Occlusal patterns of patients that deviated from theclass I relationship (including crowding, spacing and rotations) was categorised as class I malocclusion. In the group class I malocclusion, subjects presenting with bilateral class I canine andmolar relationship (permanent dentition).

The group class II malocclusion consisted of subjects presenting with bilateralclass II canine and class II molar relationship (divisions 1 and 2).

The group 'class III malocclusion' consisted of subjects presenting with bilateralclass III canine and class III molar relationship.

The need for orthodontic treatment was assessed for each subject by means of the dental health component (DHC) of the IOTN. This index presents five grades of different need of treatment: grades 5 and 4 represent high priority of treatment, grade 3 represents borderline treatment and grades 2 and 1 represent little or no need for treatment.

**Grades of the dental health component of the index of orthodontic treatment need Grade Description**

**Grade 5 - Very great:** Defects of cleft lip and/or palate; increased overjet greater than 9 mm; reverse overjet greater than 3.5 mm with reported masticatory or speech difficulties; impeded eruption of teeth (with the exception of third molars) due to crowding, displacement, the presence of supernumerary teeth, retained primary teeth and any other pathological cause;

extensive hypodontia with restorative implication (more than one tooth missing in any quadrant) requiring pre-restorative orthodontics.

**Grade 4 – Great:** Increased overjet greater than 6 mm but less than or equal to 9 mm; reverse overjet greater than 3.5 mm with no reported masticatory or speech difficulties; reverse overjet greater than 1 mm but less than or equal to 3.5 mm with reported masticatory or speech difficulties; anterior or posterior crossbites with greater than 2 mm displacement between retruded contact position and intercuspal position; posterior lingual crossbites with no occlusal contact in one or both buccal segments; severe displacement or teeth greater than 4 mm; extreme lateral or anterior open bite greater than 4 mm; increased and complete overbite causing notable indentation on the palate or labial gingiva, patient referred by colleague for collaborative care, e.g. periodontal, restorative or TMJ considerations; less extensive hypodontia requiring pre-restorative orthodontics or orthodontic space closure to obviate the need for a prosthesis (not more than one tooth missing in any quadrant)

**Grade 3–Moderate:** Increased overjet greater than 3.5 mm but less than or equal to 6 mm with incompetent lips at rest; reverse overjet greater than 1 mm but less than or equal to 3.5 mm; increased and complete overbite with gingival contact but without indentations or signs of trauma; anterior or posterior crossbites with less than or equal to 2 mm but greater than 1 mm displacement between retruded contact position and intercuspal position; moderate lateral or anterior open bite greater than 2 mm but less than or equal to 4 mm; moderate displacement of teeth greater than 2 mm but less than or equal to 4 mm.

**Grade 2 – Little:** Increased overjet greater than 3.5 mm but less than or equal to 6 mm with competent lips at rest; reverse overjet greater than 0 mm but less than or equal to 1 mm; increased overbite greater than 3.5 mm with no gingival contact; anterior or posterior crossbites with less than or equal to 1 mm displacement between retruded contact position and intercuspalposition; small lateral or anterior open bites greater than 1 mm but less than or equal to 2 mm; pre-normal or post-normal occlusions with no other anomalies; mild displacement of teeth greater than 1 mm but less than or equal to 2 mm

**Grade 1- None:** other variation in occlusion including displacement less than or equal to 1 mm.

**Questionnaire format to analyze the Demand to orthodontic treatment:**

1. Are you satisfied with the arrangement of your teeth?
2. Do you want to get your teeth straightened?
3. Do you consider well aligned teeth important for an overall facial appearance?

## SAMPLE SIZE

The sample size consist of 1500 school children. (750 males and 750 females)**,** Age between 12 to18 years.

Patient included were withPresence of full complement of teeth except 3$^{rd}$molar.

Patient excluded were with no history of previous orthodontic treatment.

## RESULTS

Table 1 shows the prevalence rates of Malocclusion**,** Out of 1500 students participation voluntarily, 750 were male and 750 were female of 12 to 18 years old. Among total participation ; normal occlusion was found in 7.53% (girls 5.07% & boys 10.00% ), whereas angles class I malocclusion was found 46.27% (girls 47.73% & boys 44.80% ),, class II malocclusion was 28.80% and class III malocclusion was 17.40% (girls 22.13% & boys 12.67% ).

**Table: 1 The distribution of malocclusion was compared between males and females.**

| Malocclusion | Gender | | Total |
|---|---|---|---|
| | Girl | Boy | |
| Normal | 38 | 75 | 113 |
| | 5.07% | 10.00% | 7.53% |
| Class I | 358 | 336 | 694 |
| | 47.73% | 44.80% | 46.27% |
| Class II | 188 | 244 | 432 |
| | 25.07% | 32.53% | 28.80% |
| Class III | 166 | 95 | 261 |
| | 22.13% | 12.67% | 17.40% |
| Total | 750 | 750 | 1,500 |
| | 100.00% | 100.00% | 100.00% |
| **Chi-square value = 38.949, p-value < 0.001*** | | | |

**Chi-square test** *** Significant difference**

The distribution of Malocclusion was compared between males and females using the **Chi-square test**. Class III malocclusion was significantly more among girls. Normal pattern was significantly more among boys.

As shown in Table 2, 25.33% of males and 44% of females expressed the satisfaction with the arrangement of their teeth meanwhile 60% of males and 52% of females expressed dissatisfaction. 9.33% of males and none of the females expressed that they are not sure regarding the arrangement of their teeth.

**Table: 2 The distribution of are you satisfied with the arrangement of your teeth was compared between males and females.**

| Are you satisfied with the arrangement of your teeth? | Gender | | Total |
|---|---|---|---|
| | Girl | Boy | |
| Yes | 330 | 190 | 520 |
| | 44.00% | 25.33% | 34.67% |
| No | 390 | 450 | 840 |
| | 52.00% | 60.00% | 56.00% |
| Don't know | 30 | 110 | 140 |
| | 4.00% | 14.67% | 9.33% |
| Total | 750 | 750 | 1,500 |
| | 100.0% | 100.0% | 100.00% |
| **Chi-square value = 166.667, p-value < 0.001*** | | | |

**Chi-square test** *** Significant difference**

The distribution of are you satisfied with the arrangement of your teeth was compared between males and females using the **Chi-square test**. A significantly more number of girls were satisfied with the arrangement of their teeth compared to boys.

As shown in Table 3, 71.47% of males and 86.00% of females expressed that their teeth needed to be straightened while 10.46% of males and females expressed that their teeth needed not be straightened, and 13.47% of males and 8.53% of females expressed that they are not sure whether to straighten their teeth.

**Table: 3 The distribution of desire to get your teeth straightened was compared between males and females.**

| Do you want to get your teeth straightened? | Gender | | Total |
|---|---|---|---|
| | Girl | Boy | |
| Yes | 645 | 536 | 1,181 |
| | 86.00% | 71.47% | 78.73% |
| No | 43 | 113 | 156 |
| | 5.73% | 15.07% | 10.40% |
| Don't know | 64 | 101 | 165 |
| | 8.53% | 13.47% | 11.00% |
| Total | 750 | 750 | 1,500 |
| | 100.0% | 100.0% | 100.00% |
| **Chi-square value = 166.667, p-value < 0.001*** | | | |

**Chi-square test** *** Significant difference**

The distribution of desire to get your teeth straightened was compared between males and females using the **Chi-square test**. A significantly more number of girls wanted desire to get their teeth straightened compared to boys.

There were 87.07% of males and 94.93% of females expressed that well aligned teeth are important for overall facial appearance while 3.47% of males and 4.00% females expressed that well aligned teeth are not important for overall facial appearance, while 9.47% of males and 1.07% of females expressed that they have no opinion regarding this matter.

Out of 1500, 750 (50.00%) were males and 750 (50.00%) were females, On analyzing DHC component of IOTN, 20.00% were Grade 1, 29.00% were Grade 2, 25.00 % were Grade 3, 17.00% were Grade 4 and 09.00% were Grade 5.

the prevalence rates of the IOTN grades in the whole sample. An objective treatment need (grade5 and grade 4) was recorded in 390 subjects: grade 5 was registered in 135 subjects (09.00% of the schoolchildren), and grade 4 was registered in 255 subjects (17.00%). Borderline need, grade 3, was observed in 375 subjects (25.00%). Little need for orthodontic treatment (grade 2) was reported for 435 subjects, which is 29.00% of the schoolchildren. Only 300 subjects, 20.00% of the studied population, presented no need for orthodontic treatment (grade 1). IOTN Grade 1 and 4 was found significantly more among boys. Whereas IOTN grade 3 and 5 was found significantly more among girls of DHC of the IOTN.

## DISCUSSION

The prevalence of malocclusion has been found to vary with different population, race and origin. The result of our study showed that 12.53 % had normal occlusion and 87.4 % had malocclusion. The prevalence of malocclusion in our study was higher than compared to the study is done by Usha Mohan Das et al [9] in school children of Bangalore, India (71%), FarajBehbehani et a1[10] in adolescent Kuwaitis (86.3%), Emmanuel 0. Ajayi[11]in school children of Nigeria (84.1%) and NagarajaRao[12] in school children of Udipi, Karnataka, India (28.8%).

Occlusal indices were useful for research, audit, practice management and quality assurance in orthodontics.[13]Over the years different occlusal indices have been employed to assess different facets of orthodontic service. However, not many of these indices have enjoyed international acceptance. In our study assessment of prevalence of malocclusion and orthodontic treatment need using IOTN, in schoolchildren of Tripura was carried out. For any

health setup which provides orthodontic care to dependents, data regarding the prevalence of malocclusion and need for orthodontic treatment was required.

As the general awareness about esthetics was on high, demand for orthodontic treatment was on rise among the children of Tripura. This study showed high demand of orthodontic treatment need in the schoolchildren of Tripura within the age group of 12 to 18 years of age.

IOTN developed by Brook & Shaw was widely used internationally as a method of objectively measuring the prevalence of malocclusion and treatment need in public dental health setup.[14,15]

Malocclusion had a negative impact on the oral health related quality of life of adolescents. Children aged between 12 and 18 years old with malocclusion demonstrated. significantly more "impacts" i.e. worse quality of life, compared with a minimal malocclusion group based on the IOTN.[16] Several studies have been published to describe the prevalence and types of malocclusions in different populations.

The DHC of the IOTN, which was considered an objective and synthetic method was used to assess the need for orthodontic treatment. According to the index, 25.00% (09.00% + 17.00%) of the total sample needed an orthodontic treatment for very severe malocclusions (grade 5 & 4). In a British sample of 12 to 15-year-old subjects, 21% to 35% was judged to have a definite orthodontic treatment need.[17]Souames M et al. in 2006 [18] found that for the French population an objective need for orthodontic treatment was 21% of the sample (grades 4 and 5). Two southern European samples of schoolchildren (a Spanish sample and an Italian sample) [19]showed similar percentages of subjects assigned to grade 4 or 5 of the DHC (21.8% to 17.1% and 27.3%, respectively) when compared with the Tripua sample.

As for the outcomes of the our study, the data refered to a very large sample of subjects between 12 and 18 years of age, which represent a very heterogeneous sample; this sample included subjects at various stages of growth while as compared to other European countries, probably would undergo an interceptive orthodontic treatment.[20]

## CONCLUSION

**The following conclusions were drawn from this study:**

1. The prevalence of normal occlusion was 7.53% and malocclusion is 92.47% in school children of Tripura.

Class I malocclusion was observed in 46.27% of the total sample, class II was observed in 28.80%, class III was observed in 17.40%. Class I malocclusion is most prevalent followed by class II malocclusion and class III malocclusion showed the least prevalence.

2. The prevalence rates for grade 5 and grade 4 of the DHC of the IOTN in the total sample were 9.00% and 17.00%, respectively. The findings of our study indicated the real need to improve and integrate preventive strategies in a state programme in Tripura (NORTH EAST INDIA) in order to reduce malocclusion risk factors.
3. Patients with higher orthodontic demand required high treatment needs and vice versa.
4. Class III malocclusion was significantly more among girls. Normal pattern was significantly more among boys.

The demand of orthodontic treatment was more significant in girls compared to boys.

IOTN Grade 1 and 4 was found significantly more among boys. Whereas IOTN grade 3 and 5 was found significantly more among girls.

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