

Pattern of Malocclusion and Assessment of Orthodontic Treatment Need for the Population of Mid-Western Nepal

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ABSTRACT

Introduction: Malocclusion is malalignment or abnormal relationship between maxillary and mandibular teeth. The prevalence of malocclusion varies due to genetic, racial, and environmental factors. Understanding the distribution of malocclusion in specific geographic areas can help orthodontists to address challenges by planning preventive, interceptive and corrective treatment approaches among targeted population. **Aims:** To assess the prevalence of various malocclusion traits and to evaluate the orthodontic treatment need based on the Dental Health Component of the Index of Orthodontic Treatment need. **Methods:** This was an observational and cross-sectional study. The study included patients of age (8-58 years) with intact permanent first molars. It was carried out among patients who visited the Outpatient Department of Dental College – Nepalgunj Medical College, and those attending dental camps, based on the inclusion criteria. Molar relationships were recorded based on Angle's classification of malocclusion and according to the criteria laid down by the Dental Health Component of the Index of Orthodontic Treatment. **Results:** A total of 500 patients were included in the study. Among them, 311 (62.2%) were males and 189 (37.8%) were females with male:female ratio 1.6:1. The mean age of patients was found to be 21.06 years. Angle's Class I (68.2%) was most prevalent malocclusion whereas Angle's Class III was observed in 9.6 % of total samples followed by Angle's Class II Div2 (9.4%). The Index of Orthodontic Treatment showed that 2.6% had an extreme treatment need, 4.2% had severe treatment need, 23.2% had moderate treatment need, 26.6% had mild treatment need, and 43.4% had no treatment need. **Conclusion:** The most prevalent malocclusion in our study is Angle's Class I in both male and female patients. Crowding was the most prevalent occlusal traits observed whereas hypodontia was the least.

Keywords: Angle's classification; Malocclusion; Midwestern; Orthodontic treatment needs

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INTRODUCTION

Malocclusion is malalignment or abnormal relationship between maxillary and mandibular teeth. It affects oral health, functional abilities, aesthetics, and the psychological well-being of individuals. The prevalence of malocclusion is highly variable. It is documented as the third most prevalent oral pathology, following dental caries and periodontal diseases. The World Health Organization (WHO) emphasizes conducting regular epidemiological surveys for common oral diseases with the aim of effective treatment planning and implementation of preventive, interceptive and corrective measures.¹⁻⁵ Malocclusions can occur in three different spatial planes: sagittal, transverse and vertical. It can be assessed through several methods. Angle's classification of malocclusion by Dr. Edward Angle is the most common classification method in orthodontics for a

century. Similarly, the Index of Orthodontic Treatment Need (IOTN), developed to categorize malocclusions based on the impact of specific occlusal traits on dental health and aesthetic concerns is another common index for quantitative measurement of malocclusion. This index includes a Dental Health Component (DHC), formulated based on the recommendations of the Swedish Medical Board, and an Aesthetic Component.^{1,5-10} The prevalence of malocclusion and the need for orthodontic treatment have been studied in the eastern, central, and western regions of Nepal. However, to date, no study has been conducted to assess malocclusion prevalence and orthodontic treatment needs in the population of Mid-Western Nepal.^{1-4,6-7,9,12-16} Therefore, the present study aims to evaluate the epidemiology of malocclusion and orthodontic treatment requirements in Mid-Western Nepal using the Angle's Classification of Malocclusion and IOTN index(DHC).

METHODS

An observational cross-sectional study was conducted in OPDs of the Dental College - NGMC and those who attended school oral health program and community dental camps held in different districts of Mid-Western Region like Banke, Bardiya districts from January 2025 – April 2025, after the ethical approval from Institutional Review Committee (Ref. 47/081-082), Nepalgunj Medical College Teaching Hospital (NGMCTH-IRC).

The data for sample size calculation was based on the study done by Baral (2015) with prevalence of 61.3%.

$N = (z^2 pq)/e^2 = 364.4$ where, N= minimum sample size, Z= 1.96 at 95 % confidence interval, p (prevalence) = 61.3% prevalence of crowding, q= 1-p and e= maximum tolerable error= 0.05

The sampling technique was random sampling technique. However, as there were large numbers of patients in the camp and OPDs, current study was conducted among 500 patients. Informed verbal consent was taken from all the participants before starting the examination. Patients agreeing to participate in study with all permanent first molar present were included in this study. Patients with missing teeth, patients having the history of tooth extraction and orthodontic treatment in the past, patients with grossly decayed first molars, patients with craniofacial anomalies were excluded from the study. The examination was done by a single examiner using mouth mirror, probe and metal scale. The subjects were assessed for malocclusion based on molar relationship, overjet, overbite, open bite, crowding, spacing, and crossbite and measurements were recorded in a proforma. Molar relationship was recorded based on Angle's system of classification, as Class I, Class II, and Class III and the criteria laid down by DHC of IOTN. Overjet between 1-2 millimeters (mm) was considered normal, more than 2 mm was considered as increased. Overbite between 1-3 mm was considered normal, more than 3mm was considered as increased, and less than 1 mm was considered as decreased.

Statistical Analysis

Data analysis was performed using Microsoft Excel sheet. The Statistical Package for Social Sciences (SPSS)-25 software was used for the analysis of data. Frequency and percentage were obtained for descriptive analysis.

RESULTS

A total of 500 patients were included in the study. Among them, 311 (62.2%) were males and 189 (37.8%) were females with male: female ratio 1.6:1 (Table I). The mean age of patients was 21.06 ± 11.05 years with the age range of 8-58 years. Of the total patients, Angle's Class I, Class II Div1, Class II Div2 and Class III occlusion were seen in 341 (68.2%), 64 (12.8%), 47(9.4%) and 48(9.6%) respectively. Table I shows the prevalence of Class I, Class II(Div1 and 2) and Class III malocclusion among male and female.

Angle's Malocclusion	Male 311(62.2%)	Female 189(37.8%)
Class I	220 (70.73)	121 (64.02)
Class II division 1	39 (12.54)	25 (13.22)
Class II division 2	26 (8.3)	21 (11.11)
Class III	26 (8.3)	22 (11.64)

Table I: Frequency distribution based on gender and pattern of malocclusion

Crowding was the most common type of malocclusion presented by the study group (46.4%). Features like open bite (5%), scissor bite (3%) and hypodontia (1%) were least noticed in the study group. (Table II)

Malocclusion	Prevalence %
Crowding	232 (46.4)
Protrusion	107 (21.6)
Spacing	84 (16.8)
Deep bite	93 (18.6)
Increased Overjet	56 (11.2)
Crossbite	48 (9.6)
Increased Overbite	36 (7.2)
Openbite	25 (5)
Scissorbite	15 (3)
Supernumerary teeth	14 (2.8)
Submerged deciduous teeth	9 (1.8)
Hypodontia	5 (1)

Table II: Frequency distribution based on occlusal traits

One of the common indigenous communities of midwestern Nepal is the Tharu community. In this study, individuals from the Tharu community comprised approximately 7.4% of the

sample population. Among them, the most frequently observed malocclusions were Class I malocclusion with proclination and crowding as presented in Table III and IV. A Class I bi-maxillary tendency was commonly observed within this group.

Malocclusion	Frequency %
Class I	23 (62.17)
Class II div1	2 (5.40)
Class II div2	2 (5.40)
Class III	10 (27.03)

Table III: Frequency distribution based on Angle's Malocclusion among Tharu community

Malocclusion	Frequency %
Protrusion	23 (62.16)
Crowding	23 (62.16)
Increased overjet	15 (40.54)
Increased overbite	5 (13.51)
Crossbite	3 (8.1)
Spacing	3 (8.1)
Open bite	3 (8.1)
Deep bite	2 (5.4)
Supernumerary teeth	1 (2.7)
Submerged deciduous teeth	1 (2.7)

Table IV: Frequency distribution based on various occlusal traits among Tharu community

DHC Grade	Need for Treatment	Total
Grade 1	No need of treatment	217 (43.4)
Grade 2	Little need of treatment	133 (26.6)
Grade 3	Borderline	116 (23.2)
Grade 4	Severe need of treatment	21 (4.2)
Grade 5	Extreme need of treatment	13 (2.6)

Table V: Dental Health Component (DHC) grades of Index of Orthodontic Treatment Need (IOTN)

Grades 1 and 2 were more commonly observed followed by Grades 3 and 4 respectively.

DISCUSSION

It is the first study of Mid-western region of Nepal to evaluate the prevalence of malocclusion and Orthodontic Treatment Need. The present study on malocclusion status and treatment needs is comparable to other studies carried out on the Nepalese population in different regions of Nepal. The present study was conducted among the individuals aged 8-58 years. This broad range was chosen as it represents both school children with developing malocclusion and nongrowing population which is considered more reliable for detection of malocclusion.

Class I malocclusion was the most common among the population both in male and female followed by Class II Div 1, Class III and Class II Div 2 malocclusion. Shrestha et al reported Class I malocclusion in 59%, Class II in 25% and Class III in 16% cases among students at high school in Kathmandu valley.¹² Similarly, Shrestha and Shrestha analyzed malocclusion and occlusal characteristics in orthodontic patients of Kathmandu valley and reported Class I malocclusion in 54.7%, Class II in 36.9% and Class III in 8.4%.¹³ Sharma found Class I, II and III malocclusions among 62.28 %, 29.4%.and 8.2% respectively among population of eastern Nepal⁶ which was consistent with the findings of our study.

According to the study by Sherchan (2020), among camp patients in two districts of Gandaki province, Class III was noted to be the second most common malocclusion. Similar result was found by Shrestha et al among the individuals of eastern Nepal, which contrasted with our study.^{14,4} Class II Div1 was second most common malocclusion followed by Class III malocclusion in our study, this difference could be due variation in geographical pattern, age and ethnic groups. Crowding was most common malocclusion in our study which was similar to studies by Shrestha et al⁴, Jha and Adhikari (2023).¹⁵ According to Proffit et al, a gradual reduction in jaw size, when not supplemented by a corresponding decrease in tooth size or number, can lead to dental crowding and malalignment. Additionally,

changes in lifestyles such as the shift from rural to urban living and shifts in dietary patterns have been suggested as contributing factors to reduced jaw development and crowding. The role of pressure from developing third molars in causing late mandibular crowding has also been proposed.⁵

The present study showed various degrees of orthodontic treatment needs, where most of patients fall in the grade 1 and 2 categories (no or little need for treatment), which is in accordance to Jha and Adhikari (2023) and in contrary to Shrestha et al and Singh and Sharma (2014) where more patients fall under Grade 4 and 5 (Definite need for treatment).^{1,7,16} Difference in findings could be due to selected age group of study population.

LIMITATIONS

The results could not be generalized as sample size was limited. Further studies with larger sample size involving generalized population are required to validate our findings.

CONCLUSION

The prevalence of malocclusion was reported to be Class I (68.2%), Class II Div1(12.8%), Class II Div2 (9.2%) and Class III (9.6%). Anterior crowding was observed to be more prevalent compared to spacing. Deep bite cases were more commonly observed than open bite cases. According to the Index of Orthodontic Treatment Need (DHC), most of the patients in this study were categorized into grades 1 and 2 followed by grades 3 and 4.

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