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## Pattern of malocclusion in orthodontic patients at a tertiary care centre

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### Abstract

**Introduction:** Malocclusion is the most common dentofacial abnormality in human population, which can cause dental caries, periodontal disease and aesthetic problems. It is closely related to psychosocial wellbeing. The prevalence of malocclusion varies among different age and ethnic groups. The aim of this study was to assess the pattern of malocclusion occurring in orthodontic patients.

**Method:** A 4-year data from 14 Apr 2018 to 13 Apr 2022 were collected retrospectively by the principal investigator (PI) from the pre-treatment record and an acceptable study cast from the Dental Department at Patan Hospital, Patan Academy of Health Sciences. Angle's classification of malocclusion was used to classify malocclusion. The collected data were entered, and statistical analysis was carried out by using SPSS version 25. Chi-square test was applied to test the significant differences. The comparison was made between male and female and age group 6-12 years and 13 years and above for the Angle's classification.

**Result:** A total of 384 patients included in the study, female patients were 263(68.5%). Prevalence for malocclusion was 267(69.5%) of Angle's class I, while Class II and Class III were 111(28.9%) and 6(1.6%) respectively. The study revealed not statistically significant. Majority 372(96.9%) belong to 13 y and above age group while only 12(3.1%) belong to 6-12 y age group.

**Conclusion:** Angle's Class I malocclusion was most prevalent with the least common being Angle's Class III malocclusion. No statistically significant relationship was found. Almost all subjects were 13 years and above age group.

**Keywords:** Angle's classification, orthodontic patient, pattern of malocclusion

## Introduction

Malocclusion is abnormal contact between the maxillary and mandibular teeth. It is caused by a mismatch in size between jaw and teeth, certain oral habits, missing teeth, and certain congenital defects.<sup>1</sup> It can cause an increased prevalence of dental caries, and disorders of temporo-mandibular joint.<sup>2</sup> The person may refrain from social contact, feel shame, and lose career opportunities.<sup>3</sup>

Malocclusion is highly prevalent in children and adolescents worldwide, affecting one out of two individuals.<sup>4</sup> Early attention to the development of dentition and occlusion, during childhood is important to reduce its prevalence.<sup>5</sup> A study in India showed that class I malocclusion was most prevalent followed by II and III.<sup>6</sup> However, the incidence of class III was higher and class II had the lowest incidence in Malay adults.<sup>7</sup> A study in Biratnagar, Nepal showed female (70%) patients had more malocclusion compared to males.<sup>8</sup>

The prevalence of malocclusion varies among different populations of the world. Many etiological factors for malocclusion have been proposed, among which genetic, racial, and environmental aspects are the major contributors.<sup>9</sup> Nepal is a country with a diverse ethnic population, culture, climate, and environment. The distribution of malocclusions might vary in different regions of Nepal. Hence, the objective of the study is to assess the malocclusion of patients, which has been recorded at the dental department of Patan Hospital, Patan Academy of Health Sciences (PAHS), and to find out the association between malocclusion and age and gender. The study will be valuable for identifying key areas of malocclusion incidence for review that reflect evidence-based guidelines for orthodontic treatment among the population.

## Method

A 4 year data (14 Apr 2018 to 13 Apr 2022) were collected retrospectively by the principal

investigator (PI) from the pre-treatment record from the Dental Department at Patan Hospital, PAHS. An acceptable study cast (dental stone models that have complete replication of teeth and surrounding tissue) of 384 orthodontic patients, who visited the dental department of Patan Hospital, PAHS for orthodontic treatment, was selected. Those patients with fully erupted intact first permanent molar, no history of previous orthodontic treatment, no history of jaw trauma, no craniofacial anomalies, complete pre-treatment records, and those undergoing orthodontic treatment were included in the study. Those patients who came to the dental outpatient department just for consultation, data that were not completely recorded, with the presence of masticatory disharmony or temporomandibular joint disorder, were excluded from the study. Ethical approval was obtained from the Institutional Review Committee (IRC) of the Patan Academy of Health Sciences prior to the commencement of the study. No direct contact with patients was required for the study and all patient identifiers were removed from the raw data.

Angle's classification<sup>10</sup> of malocclusion was used to classify the dental malocclusion and casts were measured to record the data. Class I malocclusion was characterized as the mesio-buccal cusp of the maxillary first permanent molar occluding in the anterior buccal groove of the mandibular first permanent molar and crowding, misalignment of the teeth, cross bites, etc. Class II malocclusion was characterized as disto-buccal cusp of the maxillary first permanent molar occluding in the buccal groove of the mandibular first permanent molar. Class II division 1 (Class II d1) malocclusion was characterized by proclined upper incisors with increased overjet and deep overbite. Class II division 2 (Class II d2) malocclusion was characterized by retroclined maxillary central incisors and proclined maxillary lateral incisors or retroclined maxillary central and lateral incisors and proclined maxillary canines with increased overbite and decreased overjet. Class III malocclusion was characterized as mesio-buccal cusp of

maxillary first permanent molar occluding in the interdental space between mandibular first and second molars.

The collected data were entered and statistical analysis was carried out by using SPSS (Statistical Package for the Social Sciences) version 25. The chi-square test was applied to test the significant differences. The comparison was made between males and females, and age group 6-12 years (mixed dentition) and 13 years and above (permanent dentition) for Angle's classification.

**Result**

A total of 384 patients with malocclusion meeting the inclusion criteria were included in the study. According to sex distribution, 263(68.5%) were female, which was more compared to male 121(31.5%), Table 1. The total distribution of malocclusion according to Angle's classification showed that Angle's Class I was 267(69.5%), while Angle's Class II and Angle's Class III were 111(28.9%) and 6(1.6%) respectively. In the male Angle's Class I malocclusion constituted 88(22.9%) and

Angle's Class III malocclusion 3(0.78%), whereas in female Angle's Class II d1 malocclusion and Angle's Class II d2 malocclusion were 54(14.06%) and 27(7.03%) respectively. The study did not reveal a statistically significant association between Angle's classifications of malocclusion with gender, Table 2. The majority of malocclusion, 372(96.9%), belonged to the 13 y and above age group permanent dentition to seek orthodontic treatment, while only 12(3.1%) belonged to the 6-12 y age mixed dentition. Among 372(96.9%) patients in 13 y and above age group, 258(67.18%) belonged to Angle's Class I malocclusion, whereas 108(28.12%) patients showed Angle's Class II malocclusion. Among Angle's Class II malocclusion, Class II d1 was 69(17.96%) and Class II d2 was 39(10.16%). The prevalence of Angle's Class III malocclusion was in only 6(1.56%). Among 12(3.1%) patients in the 6-12 y age group 9(2.34%) patients belonged to Angle's Class I malocclusion, whereas 3(0.78%) patients showed Angle's Class II d1 malocclusion. Angle's Class II d2 malocclusion and Angle's Class III malocclusion showed none of them. The association between Angle's malocclusion and age group was not statistically significant, Table 3.

**Table 1. Gender distribution of orthodontic patients with malocclusion**

Gender	Frequency(N)	Percentage (%)
Male	121	31.5%
Female	263	68.5%
<b>Total</b>	<b>384</b>	<b>100%</b>

**Table 2. Association of malocclusion with gender**

Angle's Classification	Male N (%)	Female N (%)	Total (%)	Chi Square	P- value
Class I	88(22.9%)	179(46.6%)	267(69.5%)	2.634 <sup>a</sup>	0.452
Class IId1	18(4.68%)	54(14.06%)	72(18.8%)		
Class IId2	12(3.1%)	27(7.03%)	39(10.1%)		
Class III	3(0.78%)	3(0.78%)	6(1.6%)		
<b>Total</b>	<b>121(31.5%)</b>	<b>263(68.5%)</b>	<b>384(100%)</b>		

**Table 3. Association of malocclusion with age group**

Age group (Year)	Angle's Classification				Chi Square	P-value
	Class I (%)	Class II (d1+d2) (%)	Class III (%)	Total (%)		
6-12	9(2.34%)	3 (3+0) (0.78%)	0(0%)	12(3.1%)	1.763 <sup>a</sup>	0.623
13-above	258(67.18%)	108(69+39) (28.12%)	6(1.56%)	372(96.9%)		
<b>Total</b>	<b>267(69.54%)</b>	<b>111(72+39) (28.9%)</b>	<b>6(1.56%)</b>	<b>384(100%)</b>		

## Discussion

The present study showed that the most frequent malocclusion was Angle's class I, constituting 69.5% of the cases followed by Angle's class II (28.9%) and Angle's class III (1.6%). This report is comparable to the previous study done in western Nepal which showed Angle's Class I in 71.5%, Class II in 24.6%, and Class III in 4.1% cases of malocclusion.<sup>11</sup> Similarly, a study done among the eastern population of Nepal also showed the prevalence of Angles Class I, Angles Class II, and Angles Class III malocclusion to be 67.5%, 28.8%, and 3.7% respectively.<sup>12</sup> Another study done in Pokhara, Nepal also showed that Angles Class I, Angles Class II, and Angles Class III malocclusion were 67.9%, 19.5%, and 6.8% respectively. A study done in Biratnagar, Nepal found Angles Class I 63.33%, Angles Class II 35.99%, and Angles Class III malocclusion were 0.66%.<sup>16</sup> Where a study done in Dharan, Nepal reported the prevalence of Angles Class I, Angles Class II and Angles Class III malocclusions were 62.28%, 29.4%, and 8.2% respectively.<sup>17</sup> Study done in Chitwan, Nepal shows the prevalence of malocclusion was 61.92% for Angles class I, 33.47%, and 4.60% for Angles class II and Angles class III respectively.<sup>18</sup> Another study in Biratnagar, Nepal showed 59.65% Angles Class I, 35.71% Angles Class II, and 4.64% Angles Class III malocclusion.<sup>8</sup> Study done in Kathmandu shows 59.5% Angles Class I, 26.7% Angles Class II, and 13.7% Angles Class III malocclusion.<sup>19</sup> Another study done in Bangladesh found that Angles Class I 64.2%, Angles Class II 25.3%, and Angles Class III malocclusion were 10.5%.<sup>14</sup> Study done in Turkish population, which found 64% Angles Class I, 24% Angles Class II, and 12% Angles Class III malocclusion.<sup>15</sup> In all these studies Class I malocclusion was seen to be the most prevalent followed by Class II and Class III malocclusion which is in accordance with the present study.

The study done (Literature search was performed through the PubMed, Medline, Scopus, Web of Science, LILACS, Open Grey, and Cochrane Library databases for this

review. A total of 1765 articles on the topic were identified within the PubMed database and 1329 within the other search databases) on the prevalence of Dental Malocclusions in Different Geographical Areas; Scoping Review showed: among the three classes of Angles malocclusion, Class I was found most frequently, in a range between 34.9% and 93.6% whereas the average prevalence of Class II was 19.56% in a range varying from 4.4% to 44.7% and class III in a range between 1.4% to 19.4%.<sup>20</sup> These studies also support our study where angle Class I malocclusion (69.5%) and angle Class II malocclusion (28.9%) were within the range. A study done in Italian school children showed the prevalence of Angles Class III malocclusion was 1.6%<sup>21</sup> and another study done in the Nigerian population also showed a 1.6% prevalence of Angles Class III malocclusion,<sup>22</sup> which was exactly in accordance with our study where angle Class III malocclusion was 1.6%.

On the contrary, a study done among the Tibetan ethnic group in Pokhara, Nepal showed that Angle's Class III malocclusion (9.40%) was more prevalent than Angles Class II (5.10%), the most prevalent malocclusion was Angles Class I (52.90%).<sup>23</sup> Similarly, an increased prevalence of Angles Class III malocclusion was also seen in the Saudi Arabian population (15.4%), however the most common prevalence of malocclusions was Angles Class I (52.8%) followed by Angles Class II (31.8%).<sup>24</sup> Another study done at Malay adults also showed Angles Class III malocclusion was most prevalent.<sup>7</sup> Study done in the Pakistani population, found the prevalence of Angle Class II malocclusion 70.5% were higher followed by Angles Class I and Angles Class III respectively.<sup>25</sup> All these studies were contrary to our study. This could be due to racial predisposition to certain malocclusions and socio-demographic variations.<sup>9</sup>

In the current study, a higher proportion of females (68.5%) received orthodontic treatment than males (31.5%). This study is in accordance with the two different studies

done in Biratnagar, Nepal which showed females (69.33%)<sup>16</sup> and (70%)<sup>8</sup> were more concerned about orthodontic treatment than males. Similarly, a study done at Dharan, Nepal also showed females (69.7%) were more concerned than males (30.3%).<sup>17</sup> Another study done in Chitwan, the central part of Nepal also supports our study where female patients were more concerned about orthodontic treatment with a 71.13% prevalence than males.<sup>18</sup> Another study in the eastern part of Nepal also showed the concern about orthodontic treatment, female patients to male ratio was 2:1,<sup>12</sup> whereas study done in western part of Nepal also showed the ratio between male to female was 0.58:1.<sup>26</sup> Some other studies also showed nearly similar to our study, these are study done at Dhaka dental college and hospital (64.5%),<sup>27</sup> study in Pakistani population (62.8%),<sup>25</sup> study done in Nepali population at Kathmandu (59.5%)<sup>19</sup> and study in Bangladeshi population (57.1%).<sup>14</sup> So, all these studies support our study which showed females were more interested in orthodontic treatment than males. The suggested causes would be females are more conscious of facial aesthetics or self-consciousness or parental concern for matrimonial reasons.<sup>27</sup> On the contrary, other studies showed that females were less interested than males; male to female ratio was 1.04:1 in a study done in Aryan and Mongoloid races of Nepal.<sup>11</sup> Study done in population of Pokhara, Nepal showed a prevalence of Angles Malocclusion were males (50.1%), and females (49.9%).<sup>13</sup> Another study in Saudi Arabia also showed males (55.4%) and females (44.6%)<sup>24</sup> with the prevalence of Angles malocclusion.

Among 384 patients, 372(96.9%) were 13 years and above age group. This could be due to the age when puberty starts or self-awareness, so patients become more aesthetically concerned about orthodontic treatment. Priority should be given to raising parent's awareness regarding the age factor in orthodontic treatment. Early assessment of patients for treatment of malocclusion would be helpful. This might be preventing complicated, long duration time of treatment

and more financial burden. Angles Class III malocclusion (male 3 and female 3, equal in number) was seen only in 13 years and above age group, which could be due to a higher number of patients in this study. Here, the association of Angles malocclusion with gender and age group was insignificant, which was similar to other studies<sup>12,13,18</sup> done before but contrary to study,<sup>8</sup> where the distribution of malocclusion and age was significant.

The present study comprises of few limitations, as it is a hospital-based study, so the results of this study do not represent the prevalence of malocclusion of the entire Nepalese population. It was conducted without ethnic specificity. Multi-centric studies with ethnic specificity could provide the national prevalence of malocclusion.

## Conclusion

Angle's Class I malocclusion was most prevalent with the least common being Angle's Class III malocclusion. The females were more concerned about orthodontic treatment than males. Malocclusion was not associated with gender or age. There is a late awareness for orthodontic treatment.

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## Conflict of Interest

None

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None

## Author Contribution

Concept, design, planning: BPS, BD; Literature review: BPS; Data collection: BPS; Data analysis: BPS, BD; Draft manuscript: BPS; Revision of draft: BPS, BD; Final manuscript: BPS, BD; Accountability of the work: BPS, BD.

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