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Prevalence of Malocclusion among School aged Children and Adolescents in Kabul, Afghanistan

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ABSTRACT

One of the major public health concerns is the prevalence of malocclusion among school-aged children. Malaligned teeth and incorrect jaw posture are referred to as malocclusion, and they can cause a number of functional and cosmetic problems. The aim of this study was to investigate the prevalence of malocclusion in school-aged children and adolescents in Kabul, Afghanistan. This descriptive cross-sectional study was conducted at the Faculty of Dentistry, Kabul University of Medical Sciences "Abu Ali Ibn Sina" (KUMS). The data were collected from High schools in Kabul, Afghanistan during 2019 and 2020. A sample of 479 children and adolescents, 236 females (49.3%) and 243 males (50.7%) 8-18 years old (mean age 14.16±2.8) were randomly selected from four high schools of different districts of Kabul city. We used the angle classification for sagittal plane malocclusion; open bite and deep bite for vertical plane malocclusions; cross bites for transverse plane malocclusion; midline diastema, spacing and crowding show the tooth material and arch length discrepancies. This study demonstrated that only 41 (8.6%) of subjects had normal occlusion while 92.4% of subjects had different types of malocclusions. Class I malocclusion was found in 275 subjects (%57.4), class II Division 1 in 63 subjects (13.1%), Class II Division 2 in 64 subjects (13.4%), Class III malocclusion in 36 subjects (7.5%), moreover, crowding in 183 (38.2%), spacing in 79 (16.5%), midline diastema in 54 (11.3%), crossbite in 77 subjects (16.1%), open bite in 23 subjects (4.8%) and deep overbite in 44 subjects (9.2%) were found. According to Angle's classification of malocclusion class I malocclusion was the most prevalent malocclusion and class III was the least prevalent malocclusion in school-aged children and adolescents in Kabul city.

Keywords: Angle's Classification, Bite Abnormalities, Crowding, Spacing, Malocclusion

INTRODUCTION

A systemic and well-organized dental care program for any target population in a community requires some basic information, such as the prevalence of the conditions to be assessed (Aldrees, 2012). Malocclusion is defined by the World Health Organization (WHO) as an occlusal anomaly that impairs function or results in disfigurement. If the disfigurement or functional defect is likely to pose a risk to the patient's physical or mental health, the condition must be treated (Hassan et al., 2014). A skeletal or dental disparity may be the cause of malocclusion and frequent dental anomaly.

Angle's classification of malocclusion in the 1890s was a significant step in the history of orthodontics since it provided the first precise and straightforward definition of normal occlusion in natural dentition in addition to subdividing the main types of malocclusions. The upper and lower molars should be related so that the upper molar's mesiobuccal cusp occludes in the lower molar's buccal groove, according to Angle, who thought that the upper first molars were essential for occlusion. In molar relationships, normal occlusion would arise if the teeth were positioned on a gently curving line of occlusion. This statement, which has been proven accurate by 100 years of experience, except in cases when there are abnormalities in tooth size, brilliantly summarized normal occlusion. Based on the occlusal relationships of the first molars, Angle then illustrated three classes of malocclusion:

Class I: The molar relationships are normal, however due to malpositioned teeth, rotations, or other factors the line of occlusion is incorrect.

Class II: There is no defined line of occlusion and the lower molar is positioned distally in relation to the upper molar.

Class III: There is no definite line of occlusion and the lower molar is positioned mesially in relation to the upper molar (Profit et al., 2019).

Occlusal malrelationship is a morphologic variation that frequently occurs without a pathogenic cause and is not a disease (Diagne et al., 1993). Malocclusion is a common term for such a manifestation. Besides periodontal diseases and tooth decay, dental malocclusion is the oral pathology with the third highest prevalence. They are considered to be the third-worst issues with dental health (WHO, 1962).

Among epidemiological investigations of malocclusion, scientists have discovered distinctive epidemiological figures of malocclusion in various nations. Several studies have reported the prevalence of malocclusion in various ethnic groups (Alqarni et al., 2014). The estimated prevalence of malocclusion in children and adolescents varies greatly, ranging from 39% to 93%. (Jacobson et al., 1996; Thilander et al., 2001).

The prevalence of malocclusion and the various types of malocclusions vary by racial group. The type of malocclusion is an essential factor that influences the patient's intention to seek treatment. Therefore, careful treatment planning is required when managing dentofacial deformities of patients during orthodontic treatment. As previous studies investigated the prevalence of malocclusion in different ethnic groups, therefore, this study aims to investigate the prevalence of different types of dental malocclusions among school children and adolescents of both genders in Kabul, Afghanistan.

MATERIALS AND METHODS

Study Design

The Faculty of Dentistry at Kabul University of Medical Sciences "Abu Ali Ibn Sina" (KUMS) carried out this descriptive cross-sectional study. Information was gathered from high schools in Kabul, Afghanistan during 2019 and 2020.

Data Collection and Analysis

A sample of 479 children and adolescents, 236 females (49.3%) and 243 males (50.7%) aged 8-18 years old were randomly selected in four high schools from different districts of Kabul city. A team of Department of Orthodontics members with the student’s consent performed all the clinical examinations on high school students in their classroom utilizing disposable mouth mirrors and dental probes with natural light. The participants were examined for the presence of dental malocclusions Angle’s class I, class II div 1 & div 2, class III, open bite, cross bite, midline diastema, deep bite, and crowding. The sagittal anteroposterior relationship between the upper and lower dental arches was evaluated using Angle's classification. Open bite and deep bite show the malrelation of vertical dimension. Cross-bite shows the malrelation of the transverse dimension. Dental crowding and midline diastema reveal the tooth size-arch length discrepancy.

Statistical Analysis

The data was entered into an Excel sheet table and then analyzed using IBM SPSS Statistics 27 (IBM Corp, Armonk, New York, NY, and United States).

RESULTS

Growth Parameters

The sample comprised 479 subjects with two age groups, children (8-12) and adolescents (13-18) were gathered for further study and analyses (Table 1).

Table 1. Demographic Characteristics of Participants		
Gender	Frequency (N)	**Percentage (%)**
Male	243	**%50.7**
Female	236	**%49.3**
Total	479	**%100**
Age range		
8-12	129	**%26.9**
13-18	350	**%73.1**
Total	479	**%100**

Among 479 participants, 41 individuals (8.6%) had normal occlusion, while 438 individuals (91.4%) had different types of malocclusions. Class I, Class II, Class III, and normal occlusion prevalence were 8.6%, 57.4%, 26.5%, and 7.5%, respectively. The Open bite, deep bite, crossbite, midline diastema, spacing, and crowding were shown in 23 (4.8%), 44 (9.2%), 77 (16.1%), 54 (11.3), 79 (16.5%), 183 (38.2%) of participants respectively (Table 2).

Table 2. Distribution of the different types of Malocclusions		
Types of malocclusions	Frequency	Percent
Normal occlusion	41	8.6%
Angle's Class I malocclusion	222	57.4%
Angle's Class II malocclusion		
Division 1	63	13.1%
Division 2	64	13.4%
Total	127	26.5%
Angle's Class III malocclusion	36	7.5%
Open bite		
Present	23	4.8%
Absent	456	95.2%
Deep bite		
Present	44	9.2%
Absent	435	90.8%
Anterior Crossbite		
Present	53	11%
Absent	426	89%
Posterior crossbite		
Present	24	5%
Absent	455	95%
Midline diastema		
Present	54	11.3%
Absent	425	88.7%
Spacing		
Present	79	16.5%
Absent	400	83.5%
Crowding		
Present	183	38.2%
Absent	296	61.8%

Table 3. Distribution of the Different types of Malocclusions Among the Research Participants According to age and Gender groups								
Types of Malocclusions	Male 243 subjects		Female 236 subjects		8-12 years 129 subjects		13-18 years 350 subjects	
	(N)	(%)	(N)	(%)	(N)	(%)	(N)	(%)
Normal occlusion	9	3.7%	32	13.6%	19	14.85%	22	6.33%
Angle's Class I Malocclusion	139	%57.2	136	57.6%	68	52.7%	207	59.1%
Angle's Class II Division 1	46	18.93%	17	7.2%	22	17%	41	11.7%
Angle's Class II Division 2	26	%10.7	38	16.1%	14	10.8%	50	14.3%

Table 3. Distribution of the Different types of Malocclusions Among the Research Participants According to age and Gender groups								
Types of Malocclusions	Male 243 subjects		Female 236 subjects		8-12 years 129 subjects		13-18 years 350 subjects	
	(N)	(%)	(N)	(%)	(N)	(%)	(N)	(%)
Total Angle's class II malocclusion	72	39.6%	55	23.3%	36	27.8%	91	26%
Angle's Class III malocclusion	23	9.47%	13	5.5%	6	4.65%	30	8.57%
Open bite	13	5.34%	10	4.23%	6	4.65%	17	4.8%
Deep bite	20	8.23%	24	10.1%	6	4.65%	38	10.8%
Anterior Crossbite	30	12.4%	24	10.1%	26	20.1%	28	8%
Posterior crossbite	12	4.9%	11	4.7%	4	3.1%	19	5.4%
Midline diastema	34	%14	20	%8.47	26	%20.1	28	%8
Spacing	50	%20.57	29	%12.28	33	%25.58	46	%13.14
Crowding	120	%49.38	63	%26.69	33	%25.58	150	%42.85

Based on Angle's classification, class I malocclusion was the most common among the subjects (57.4%) followed by class II division 1 with a prevalence of (13.1%), class II division 2 (13.4%), and class III (7.5%). In this study, 8.6% of the participants had normal occlusion. (Table 2).

In gender groups, normal occlusion was more common in females (13.6%) and lower in males (3.7%). Furthermore, the types of malocclusions that were more common among males were class II division 1 (18.9%) and class III (9.46%). While class I malocclusion (57.6%) and class II division 2 malocclusion (16.1%) were more common in females (Table 3).

In terms of the age range, class I (59.1%), class II division 2 (14.3%), and class III (8.57%) were more common in the 13-18 years, while class II division 1 (17%) was more common in 8-12 years old participants (Table 2).

The prevalence of dental crowding was 38.2%, interdental space was (16.5%), and midline diastema was 11.3% (Table 2). The prevalence of dental crowding was high in males (49.38%) and 26.69% of females subjects had dental crowding. While the prevalence of interdental space was found 20.57% in males and 12.28% in females and the prevalence of midline diastema was 14% in males and 8.47% in females (Table 3). The prevalence of dental crowding, interdental space, and Midline diastema of 8-12 years old age and 13-18 groups are shown in (Table 3).

Crossbite was reported to be prevalent in (16.1%) of subjects, in which the prevalence of anterior crossbite was higher (11.3%) than posterior crossbite (4.8%) (Table 3).

Considering the gender groups, the prevalence of crossbite was higher in males (17.3%), than in females (14.8%) (Table 3). Based on age groups, the prevalence of anterior crossbite was high in 8-12 years-old subjects, while posterior crossbite was found high in 13-18 years-old subjects (Table 3).

The anterior open bite was found (4.8%) (5.34% in males and 4.23% in females). Furthermore, the open bite was higher in the 13-18 years old age group (4.85%) (Table 2) and (Table 3). The deep overbite was found (9.2%) its prevalence was higher among females than males (Table 2) and (Table 3). Deep bite was more prevalent in the 13-18 years of age group (Table 2) and (Table 3).

DISCUSSION

One of the most prevalent dental issues that nowadays affects people is malocclusion. In addition, malocclusion of teeth can result in a variety of psychological issues, including diminished dentofacial aesthetically pleasing, speech difficulties, swallowing, and mastication, as well as increased vulnerability to periodontal diseases and trauma. (Narayanan et al., 2016).

The prevalence of malocclusion in various populations has been published in several research studies. The results have revealed significant variations. The most significant factors underlying these discrepancies are likely differences in the age distributions of the populations, the number of subjects evaluated, and the method used (Narayanan et al., 2016). Furthermore, recently, several research studies have been conducted regarding the prevalence of malocclusion in Afghanistan, but none of these studies have been conducted on school students considering the age range in Afghanistan while this research study was conducted on 479 school students in Kabul who were between 8 and 18 years old.

The prevalence of malocclusion in this study was 91.4%, which is approximately the same as Jordon 92%, Anatolia 89.9%, Tanzania 97.6%, and Turkey 96.5% (Abu Alhaija et al., 2005; Gelgor et al., 2007; Rwakatema et al., 2006; Celikoglu et al., 2010). The result of this study has shown more differences with studies done in India, Bangalore 71%, Brazil 20% and Bangladesh 24.7% (Das et al., 2008; Teixeira et al., 2016; Sultana & Hossain, 2019). In this study, there were fewer differences in the prevalence of malocclusion between gender groups (91% in males and 92.1% in females). In this study, the prevalence of class I malocclusion was (57.4%) which was similar to studies in Iran 55.1% and Jordon 55.3% (Ramazanzadeh et al., 1996; Abu Alhaija et al., 2005). Furthermore, the studies in Brazil 76.6%, Kerala India 69.8% and Nigeria 80.7% reported the highest prevalence of class I malocclusion (Tak et al., 2013; Narayanan et al., 2016; Brito et al., 2009) while studies in Turkey 41.5% and Isfahan Iran 41.8% shows the lowest prevalence of malocclusion (Celikoglu et al., 2010; Borzabadi-farahani & Eslamipour, 2009). This study showed no significant difference in gender distribution in class I malocclusion male (57.2%) and female subjects (57.6%) which is almost the same in studies in Turkey and Nigeria and the worldwide prevalence of malocclusion (Celikoglu et al., 2010; Brito et al., 2009; Lombardo et al., 2020). The differences between this study and their studies might be due to different ethnicities, the number of sample sizes, and different variable criteria for the classification of malocclusion.

Class II malocclusion affected 26.5% of participants in this study (class II div 1 in 13.1% and class II div 2 in 13.4%). The prevalence of class II malocclusion in this study was comparable to studies conducted in Saudi Arabia (28.4%) and Iran (23.2%); however, the class II division 1 and division 2 malocclusion prevalence in this study was not comparable, possibly as a result of ethnic differences. (Ramazanzadeh et al., 1996; Meer et al., 2016). Furthermore, research in Nigeria (6.3%) and Jordan (17.5%) revealed the lowest frequency of class II malocclusion, while studies in Shiraz (32.6%) and Turkey (44.7%) found the highest prevalence. Differences in age groups, ethnicities, and races could be the cause. (Oshagh et al., 2010; gelgor et al., 2007; Aikins & Onyeaso , 2014; Abu Alhaija et al., 2005).

In this study, the distribution of class II malocclusion in males and females was 29.6% and 23.3% respectively. The prevalence of class II division 1 was higher in males 18.9% than females 7.2% while the prevalence of class II division 2 was higher in females 16.1% than males 10.7%. There is no reason for the difference between the distribution of malocclusion in male and female subjects despite differences in assessment methods, geographic region, and ethnicity.

According to this study, 7.5% of school-aged children and adolescents in Kabul had class III malocclusion, which is in agreement with studies done in Iran 7.3% and Saudi Arabia 9.3% (Ramazanzadeh et al., 1996; Meer et al., 2016). While class III malocclusion was more prevalent in Turkey 16.7% and Iran Tabriz 17% and less prevalent in Bangalore 0.6% and Nigeria 1.6% (Celikoglu et al., 2010; Ahangar Atashi, 2007; Das et al., 2008; Aikins & Onyeaso, 2014). The difference between the prevalence of class III malocclusion in this study and other studies might be due to racial and ethnicity differences, differences in age groups, differences in assessment methods, and inclusion and exclusion criteria. The prevalence of class III malocclusion in male and female participants was 9.46% and 5.5% respectively compared to studies in Turkey, Nigeria and Anatolia which the prevalence of class III malocclusion was higher in females than males (Celikoglu et al., 2010; Meer et al., 2016; gelgor et al., 2007). The difference might be due to in number of male and female participants in research studies.

In this study, the prevalence of crowding, spacing, and midline diastema respectively was 38.2%, 16.5%, and 11.3%. The prevalence of crowding in this study has a similarity with studies done in Anatolia 38.2% and India 38.8%, in contrast to studies done in Brazil 45.5%, Saudi Arabia 47.2%, Tabriz 77.4%, Jordon 50.4%, Nigeria 14.4% which reported a different prevalence of crowding in their studies (gelgor et al., 2007; Ahmmed et al., 2013; Tak et al., 2013; Gudipaneni et al., 2018; Ahangar Atashi, 2007; Abu Alhaija et al., 2005; Aikins & Onyeaso, 2014).

Dental spacing in the present study was found in 79 participants (16.5%), the same in studies conducted in Brazil 16.2% and Saudi Arabia 17%, but different results were reported by studies in India 28.5%, the northern border of Saudi Arabia 27.2%, and Nigeria 59.5% (Tak et al., 2013; Al-Emran et al., 1990; Ahmmed et al., 2013; Gudipaneni et al., 2018; Aikins & Onyeaso, 2014).

In the present study, the prevalence of midline diastema was 11.3%, which is similar to studies in Brazil 16.2% and India 15.43% (Tak et al.,2013; Logewari et al.,2021). Furthermore, different studies in Kerala 3.25%, Anatolia 7%, and Turkey 4,5% reported less prevalence of midline diastema, but studies in India 22.4% and Nigeria 24% reported high prevalence of midline diastema (Narayanan et al., 2016; Gelgor et al., 2007;

Celikoglu et al., 2010; Ahmmed et al., 2013; Onyeaso, 2004). The difference between the results of the above-mentioned studies might be due to different age groups (9-11 the age ranged the ugly duckling stage) (Singh, 2015), the racial difference (the blacks are more than twice as likely to have midline diastema as the whites) (Profit et al., 2019).

Regarding the age groups in the present study, the prevalence of crowding (%49.38), spacing (%20.57), and midline diastema (%14) was higher in males than females which were (%26.69), (%12.28), and (%8.47) respectively. This study result is similar to previous studies conducted between gender groups in Jordon which also reported different prevalence of spacing between males 23.7% and females 28.6% and different prevalence of midline diastema in Brazil 5.6% in males and 10.6% in females (Abu Alhaija et al., 2005; Tak et al., 2013). Crowding showed similar results in previous studies.

This study showed that the prevalence of crossbite was 16.1% (Anterior crossbite 11.3% and Posterior crossbite 4.8%) which is the same as studies in India 18%[34] and Nigeria 17.1%[26], however these studies did not evaluate the crossbites as anterior and posterior crossbite separately (Siddegowda & Satish, 2014; Aikins & Onyeaso, 2014). Furthermore, studies in Kerala India 7.2%, Anatolia 9.7%, and Brazil 33.7% reported different prevalence of crossbite in their research studies (Narayanan et al., 2016; Geglor et al., 2007; Tak et al., 2013). However, there was not a significant difference in the prevalence of crossbite between males (17.3%) and females (14.8%) in this study.

In this study, the prevalence of open bite was found 4.8% with less difference between male 5.34% and female 4.23% subjects. This finding is similar to studies in Saudi Arabia 4.6% and Yemen 4.1% (Gudipaneni et al., 2018; Dear & Abbuaffan, 2015). While other studies reported a higher prevalence of open bite 8.5% in Sudan and (2.9%) in Iran[36] (Hassan & Abuaffan, 2016; Hosseini et al., 2014), the reason might be racial and ethnic differences (the open bite is more prevalent in blacks) (Proffit et al., 2019), and the difference between the number of sample sizes.

In the present study, 9.2% of school children and adolescents had a deep overbite, and less difference between gender distribution in the deep bite was found (male: 8.4%, female: 10.1%). Previous studies by Atashi reported a 3.3% prevalence of deep overbite in Iran and Gudipaneni et al reveal that the prevalence of deep bite among Saudi Arabian adolescents is 23.4% (Ahangar Atasi, 2007; Gudipaneni et al., 2018) The difference between results might be due to racial differences, ethnicity, sample size and method of assessment.

CONCLUSION

In Kabul's schools, malocclusion was found to be extremely common (91.4%) among children between the ages of 8 and 18 years old. Class I malocclusion was the most prevalent malocclusion according to Angle classification (57.4%), whilst the class III of malocclusion had the lowest prevalence. Another prevalent type of malocclusion among students aged 8 to 18 years old (38.2%) was crowding. Malocclusion was more common in men than women, with 96.3% of males and 86.4% of females suffering from it. In the 13–18 age years group, Class III Angle (8.57%) and deep bite (10.8%) were more prevalent, but anterior crossbite (20.1%), midline diastema (20.1%), interdental spacing (25.58%), and crowding (45.85%) were more common.

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