Prevalence of Malocclusion in University of Khartoum Students

Gamar A Suleiman, Amal H Abuaffan, Marwa M Hamid[*]

Department of Orthodontics, Pedodontic and Preventive Dentistry, University of Khartoum, Sudan

ABSTRACT

This study aimed to assess the prevalence of malocclusion in University of Khartoum students in sagittal, transverse, and vertical directions. In addition, providing information on the gender distribution of occlusal variation.

Methods: A descriptive cross-sectional study was conducted among 2550 University students (1305 females and 1245males), aged 18-22-year-old. The method for epidemiological registration devised by Björk et al (1964) was used. The prevalence of dental malocclusion and the interrelationship between some malocclusion traits were investigated.

Results: Angle's Class I normal occlusion was the most prevalent trait (58%) followed by Class I malocclusion (30.2%), Class II (7.5%), and Class III (4.3%). Approximately 89% of the subjects had grade 1 deep bite. 3.2% of the males and 3.6 of the females had grade 1 frontal open bite. Scissor bite was the commonest transverse malocclusion (0.7% and 0.3%) on the right and left side respectively compared to (0.2% and 0.1%) cross bite on the right and left side respectively. The majority of the sample showed no space problem in right and left sides in both upper and lower jaws, more spaces and crowding problems were recorded in the upper and the lower anterior segments. Anterior open bite seemed to have a positive correlation with Class II in this sample.

Conclusion: The most prevalent malocclusion among University of Khartoum students was class I malocclusion. The reported prevalence among Sudanese adults was much lower than that reported by a previous study in 12-year-old Sudanese children.

Keywords: Sudanese, Malocclusion, Classification

INTRODUCTION

Malocclusion is one of the most common oral disorders among children, and it affects not only oral masticatory function but also craniofacial development and facial appearance. Children with certain malocclusion traits appear to have more problems related to psychology and social interactions, and even their quality of life suffers when they reach adulthood.

Malocclusion, in its simplest definition, is an irregularity concerning teeth alignment and/or their relationship during dental occlusion beyond the range of what is accepted as normal [1].

Malocclusion can have a negative effect on the appearance, oral functions, and health as well as the psychological well-being of the human being. It can affect the swallowing pattern, mastication, and even speech. According to the world health organization, malocclusion ranks the third priority for oral health diseases [2]. Malocclusion was also found to be the leading cause of getting teased and bullied in school children (60.7%) [3].

The number of patients seeking orthodontic treatment in Khartoum, Sudan has increased markedly, from one year to another. Therefore, it is necessary to have a detailed epidemiological study on malocclusion in the adult population to evaluate the distribution and prevalence of malocclusion. This would largely help in developing strategies and plans to promote public oral health. The scarcity of such published data led to conducting this study [4].

METHOD

2550 University students (1305 females and 1245males), aged 18-22-year-old were examined. All subjects had to fulfill these criteria: Participants and their parents must be of Sudanese nationality, Aged 18-22 years, all

permanent teeth present. Students with one of the following criteria were excluded: History of trauma or surgery that affects occlusion, previous history of orthodontic treatment, subjects with prosthetic replacements.

The students were selected for examination during the period from August to November 2010. The occlusal status was recorded using the method for epidemiological registration devised [5]. The occlusion was classified in the sagittal plane using Angle classification (1899)

Class I: Normal relationship of the molars, but the line of occlusion incorrect because of malposed teeth, rotations, or other causes

Class II: Lower molar distally positioned relative to upper molar,

Line of Occlusion not specified

Class III: Lower molar medially positioned relative to upper molar,

Line of occlusion not specified [6].

The occlusal features were registered, according to the criteria defined below

An Occlusion
The sagittal occlusion was registered on the first permanent molars and permanent canines. Angle classification was registered on the right side (Rt) and the left side (Lt) at the molar (M) and canine (C) areas.

Not Registered
In case of missing teeth.

Maxillary over Jet
The horizontal distance from the most labial point of the incisor edge of the maxillary right central incisor to the labial surface of the antagonistic mandibular incisor parallel to the occlusal plane in the maximal intercuspal position:

Grade 1: 1 - 4.9 mm

Grade 2: 5 - 8.9 mm

Grade 3: 9 mm and more

Mandibular over jet
Lower incisors labial to the maxillary incisors, measured in the same way as maxillary overjet:

Grade 1: 0 - -1.9 mm.

Grade 2: -2 mm and more.

Angle Cl. I
Full Cl. I relationship between the upper and lower dentition (registered on molars and canines bilaterally).

Angle Cl. II
Occlusion distal to Cl. I relationship

Angle Cl. III

Occlusion mesial to Cl. I relationship

Deep Bite
Grade 1: 0 - 2.9 mm vertical overlapping of the upper to lower right incisors

Grade 2: 3 - 4.9 mm of overlap.

Grade 3: 5 mm or more overlapping.

Open Bite
Lateral open bite

Lack of contact between one or more teeth in one or both lateral segments.

Frontal open bite measured at the central incisors

Grade 1: 0 - 1.9 mm

Grade 2: 2 mm and more

Cross Bite
The buccal cusp of the upper tooth occluded lingual to the buccal cusp of the corresponding lower tooth. Registered on permanent teeth including one or more teeth distal to the canine, bilateral registration.

Scissors Bite
The lingual cusp of the upper tooth occluded buccal to the buccal cusp of the corresponding lower tooth. Registered on the permanent teeth including one or more teeth distal to the canine. Registration is made bilaterally.

Space Condition
For each jaw, it was registered for the incisor segment, comprising all the incisors, and for the lateral segments comprising the canine and premolars on each side.

Not registered: Not possible to register.

Lack of space: Lack of space exceeding 2 mm in each segment

Excess of space: Excess of space exceeding 2 mm in each segment

Ethical approval was obtained from the Faculty Research Committee. A letter of consent was obtained from all participants after explaining the nature and purpose of the research. Data were collected, cleaned, and analyzed using the Statistical Package for Social Science (SPSS) software version 15 (IBM, Armonk, NY, USA).

RESULTS

Out of the 2550 Sudanese adult university students, 1245 were females (48.8%) and 1305 were males (51.2%). The Mean age was 19.11 years (range 18-22years).

Occlusion
261 subjects had missing lower permanent first molar therefore they were excluded. In addition, 28 (1.2%) subjects had different right and left molar classifications and were also excluded from the sagittal molar occlusion

analysis.

Table 1 depicts the sagittal occlusal anomalies. Angle's Class I normal occlusion was the most prevalent trait (58%), followed by Class I malocclusion (30.2%), Class II malocclusion (7.5%), and lastly, Class III malocclusion (4.3%).

Table 2 shows that (87.1%) of the females and (85.4%) of the males exhibited a normal maxillary overjet (grade1). On the other hand, (8.4%) of the females and (8.6% of) the males had increased maxillary overjet (grade2). Extreme maxillary overjet (grade3), was found in only (0.5 %) of the females and (0.2%) of the males.

Regarding mandibular overjet, grade 1 was found in (5.3%) and (4.2%) of males and females respectively, while only (0.2%) of both genders displayed grade 2 mandibular overjet. The normal deep bite was almost equally observed in both sexes (89.1%) males, and (89.3%) females. Grade 2 was found in (4.4%) of the total sample, with a slight male predilection. (1.1%) of the total sample (both males and females) had Grade3.

Frontal open bite showed to be of low frequency (5.2%). No significant difference was found between females and males. Grade1frontal open bite was the most dominant type.

The genders-related differences in the frequency of the overjet and vertical malocclusion were not statistically significant. The frequency distribution of Molar relationship R and L sides for both sexes according to Angle's classification as well as canine classification are shown in tables 3 and 4 respectively. None of the subjects had a Bilateral open bite, while Scissors bite was observed in (0.7 %) and (0.3%) in the right and left sides respectively.

Lateral cross bite and scissor bite were extremely rare in this sample. The frequency and gender distribution of lateral open bite, cross bite, and scissor bite are shown in table 5.

Below table 6 shows the relationship between Angle Cl. I molars and sagittal and vertical jaw relation in males and females.

Space Condition

The majority of the sample shows no space problem in

Table 1: Distribution of the students according to Angle classification.

	Frequency	Percent
Class I Normal	1311	58%
Class I malocclusion	684	30.20%
Class II	169	7.50%
Class III	97	4.30%
Total	2261	100%

Table 2: Sagittal an vertical jaw relationship.

HOB – VOB	Males n=1305	Females n=1245	Total n=2550
MAX. Overjet			
Grade 1 (1-4.9mm)	1115 (85.4%)	1085 (87.1%)	2200 (86.3%)
Grade 2 (5-8.9mm)	112 (8.6%)	104 (8.4%)	216 (8.5%)
Grade 3 (≥9mm)	7 (0.5%)	2 (0.2%)	9 (0.4%)
MAND. Overjet			
Grade 1 (0 - -1.9mm)	69 (5.3%)	52 (4.2%)	121 (4.7%)
Grade 2 (≥-2mm)	2 (0.2%)	2 (0.2%)	4 (0.2%)
Frontal Deep Bite			
Grade 1 (0 - 2.9mm)	1163 (89.1)	1112 (89.3)	2275 (89.2%)
Grade 2 (3 -4.9mm)	62 (4.8%)	51 (4.1%)	113 (4.4%)
Grade 3 (≥5mm)	12 (0.9%)	16 (1.3%)	28 (1.1%)
Frontal Open Bite			
Grade 1 (0 -1.9mm)	42 (3.2%)	45 (3.6%)	87 (3.4%)
Grade 2 (≥2mm)	26 (2%)	21 (1.7%)	47 (1.8%)
Over jet Chi squire test performed, P value=.347, P Value is not significant			
Vertical Chi squire test performed, P value=.734, P Value is not significant			

Table 3: The frequency distribution of Molar relationship R and L sides for both sexes according to Angle's classification.

Molar Relationship Right Side	Males	Females	Total
Not registered	69 (5.3%)	110 (8.8%)	179 (7%)
Class I	1074 (82.3%)	996 (80%)	2070 (81.2%)
Class II	99 (7.6%)	97 (7.8%)	196 (7.7%)
Class III	63 (4.8%)	42 (3.4%)	105 (4.1%)
Total	1305 (100%)	1245 (100%)	2550 (100%)
Left Side			
Not registered	66 (5.1%)	99 (8%)	165 (6.5%)
Class I	1084 (83.1%)	1008 (81%)	2092 (82%)
Class II	96 (7.4%)	94 (7.6%)	190 (7.5%)
Class III	59 (4.5%)	44 (3.5%)	103 (4%)
Total	1305 (100%)	1245 (100%)	2550 (100%)

Table 4: The frequency distribution of Canine relationship.

Canine relationship Right Side	Males	Females	Total
Not registered	20 (1.5%)	16 (1.3%)	36 (1.4%)
Class I	1094 (83.8%)	1055 (84.7%)	2149 (84.3%)
Class II	135 (10.3%)	132 (10.6%)	267 (10.5%)
Class III	56 (4.3%)	42 (3.4%)	98 (3.8%)
Total	1305 (100%)	1245 (100%)	2550 (100%)
Left Side			
Not registered	19 (1.5%)	18 (1.4%)	37 (1.5%)
Class I	1110 (85.1%)	1063 (85.4%)	2173 (85.2%)
Class II	122 (9.3%)	124 (10%)	246 (9.6%)
Class III	54 (4.1%)	40 (3.2%)	94 (3.7%)
Total	1305 (100%)	1245 (100%)	2550 (100%)

Table 5: The frequency distribution of lateral open bite, cross bite and scissors bite.

Gender Right Side	Open bite	Cross bite	Scissors bite
Males	0 (0.0%)	2 (0.2%)	11 (0.8%)
Females	0 (0.0%)	2 (0.2%)	7 (0.6%)
Total	0 (0.0%)	4 (0.2%)	18 (0.7%)
Left Side			
Males	0 (0.0%)	1 (0.1%)	5 (0.4%)
Females	0 (0.0%)	2 (0.2%)	2 (0.2%)
Total	0 (0.0%)	3 (0.1%)	7 (0.3%)

Table 6: Relationship between Angle Cl. I and sagittal and vertical jaw relation.

Maxillary overjet	Males	Females	Total	Males	Females	Total
Grade 1 (1-4.9mm)	1011 (94.1%)	958 (96.2%)	1969 (95.1%)	1020 (94.1%)	966 (95.8%)	1986 (94.9%)
Grade 2 (5-8.9mm)	38(3.5)	22 (2.2)	60(2.9)	38 (3.5)	22 (2.2%)	60 (2.9%)
Grade 3 (≥9mm)	1 (0.1%)	0(0%)	1(0.05%)	1(0.1%)	0(0%)	1 (0.05%)
Mandibular Overjet						
Grade 1 (0 -1.9mm)	24 (2.2%)	16(1.6%)	40(1.9%)	25(2.3%)	20 (2%)	45(2.2%)
Grade 2 (≥-2mm)	0%	0%	0%	0%	0%	0%
Deep Bite						
Grade 1 (0 -2.9mm)	997(92.8%)	928(93.2%)	1925(93%)	1006 (92.8%)	937(93%)	1943 (92.9%)
Grade 2 (3 -4.9mm)	26(2.4%)	24(2.4%)	50(2.4%)	27(2.5%)	24(2.4%)	51(2.4%)
Grade 3 (≥5mm)	8(0.75)	8(0.8%)	16(0.8%)	7(0.6%)	9(0.95%)	16(0.8%)
Open Bite						
Grade 1 (0 -1.9mm)	25(2.3%)	26(2.6%)	51(2.5%)	26(2.4%)	29(2.9%)	55(2.6%)
Grade 2 (≥2mm)	18(1.7%)	10 (1%)	28(1.4%)	18(1.7%)	9(0.9%)	27(1.3%)
Total	1074 (100%)	996 (100%)	2070 (100%)	1084 (100%)	1008 (100%)	2092 (100%)

Table 7: Space Condition.

	Right Side	Front	Left Side
males (n = 1305)			
Upper Jaw			
Not registered	0 (0.0%)	0 (0.0%)	0 (0.0%)
No space problem	1293 (99.1%)	1026 (78.6%)	1296 (99.3%)
Crowding	10 (0.8%)	72 (5.5%)	7 (0.5%)
Spacing	2 (0.2%)	207 (15.9%) *	2 (0.2%)
Total	1305 (100%)	1305 (100%)	1305 (100%)
Lower Jaw			
Not registered	0 (0.0%)	0 (0.0%)	0 (0.0%)
No space problem	1285 (98.5%)	1045 (80.1%)	1286 (98.5%)
Crowding	16 (1.2%)	173 (13.3%)	16 (1.2%)
Spacing	4 (0.3%)	87 (6.7%)	3 (0.2%)
Total	1305 (100%)	1305 (100%)	1305 (100%)
females (n = 1245)			
Upper Jaw			

Not registered	0 (0.0%)	0 (0.0%)	0 (0.0%)
No space problem	1230 (98.8%)	1046 (84%)	1237 (99.4%)
Crowding	10 (0.8%)	73 (5.9%)	6 (0.5%)
Spacing	5 (0.4%)	126 (10.1%)	2 (0.2%)
Total	1245 (100%)	1245 (100%)	1245 (100%)
Lower Jaw			
Not registered	0 (0.0%)	0 (0.0%)	0 (0.0%)
No space problem	1230 (98.8%)	1054 (84.7%)	1225 (98.4%)
Crowding	12 (1%)	133 (10.7%)	14 (1.1%)
Spacing	3 (0.2%)	58 (4.7%)	6 (0.5%)
Total	1245 (100%)	1245 (100%)	1245 (100%)

right and left side in both upper and lower jaws, more spaces and crowding problems were recorded in the upper and the lower anterior segment table 7.

DISCUSSION

The epidemiological picture of malocclusion varies from one geographical area to another and differs from one country to another. Different studies in several geographical locations yielded different prevalence rates of malocclusion [7-10]. This variation in reported numbers may largely be attributed to the discrepancies in the definitions of malocclusion as well as the methodologies applied. Malocclusions may decrease or increase with time. Nevertheless, it is possible to find different prevalence rates of malocclusion in different age groups in the same population. The age range for the current study was chosen for two main reasons: firstly, a reliable assessment of the occlusion must be made on the permanent dentition only as individual variation in dental patterns at the mixed dentition stage may modify the occlusion. Secondly: a reliable appraisal of the occlusal status must be made after total cessation of craniofacial growth and development [11]. The clinical data registration was based on the method proposed by Björk et al. (1964); this method had been used in numerous studies; it allows objective comparisons of the presence of malocclusion between different populations. The overall prevalence of malocclusion in the present study (42%) was found to be lower than the reported prevalence in a previous study in 12-year-old Sudanese children (91.7%). Moreover, the current sample displayed a much lower prevalence than other populations such as Egyptians, Chinese young adults, Singapore males, central Anatolians, Brazilians, and Nigerians (65.2%, 80%, 83% 89.9% 87.6%, and 76%) respectively [12-14].

On the other hand, it was much higher than what was reported in Black and white children in an urban population in the United States (30%, 37%) respectively [15].

Differences in the age groups selected for each study and the parameters used in assessing malocclusion may explain the variability of the findings.

Occlusion
In similarity to the findings of the previous study in 12-year-old Sudanese children, Angle Class I trait (normal and malocclusion) was reported as the predominant sagittal molar relationship (88.2%) compared to (85.8%) previously.

The prevalence of a Class I malocclusion (30.2%) and Class II molar relationship (7.5%) in the present study was lower than in the previous investigations (77.6%) and (11%) respectively in Sudan. On the contrary, the prevalence of a Class III molar relationship (4.3%) was higher when compared to the previous study (3.1%) reported. The prevalence of normal overjet in the present study (86.3%) was lower than that of Abu Affan et al study (90.0%) and higher than that observed among adolescents in Nigeria (66%) and Kuwait (53.2%). In the present study, an increased overjet (5 mm and more) was reported (8.9%), a higher percentage was demonstrated among Chinese adults (14.9 %), and Nigerian adolescents (16%), and a higher value was reported in Adolescent Kuwaitis (42.8%) [16].

The occurrence of a mandibular overjet (4.9%) in the present study was slightly higher than that reported in Adolescent Kuwaitis (4%) and lower than that (10.3) among adolescents in Nigeria.

Over Bite
The majority of the subjects in the present study sample had a normal overbite (89.2%), however (5.5%) had abnormal overbite, and severe deep bite that exceeded 5 mm was rare (1.1%). deep bite was higher (18.0%). The difference in the finding could be due to the full eruption of the premolars and second molars, in adults which might have stabilized their occlusion resulting in a decreased prevalence of a deep bite [17] Grade 2 deep bite (3-4.5 mm) was reported to be the most common vertical occlusal anomaly with more or less comparable values in males and females (4.8 and 4.1 mm) respectively. Much lower prevalence was recorded for grade 3 deep bites (0.9 %, 1.3%) for males and females respectively.

On the other hand, Frontal open bite showed lower frequency (3.4% for grade 1 open bite and 1.8% for the more severe grade 2 frontal open bite). These findings differ greatly from those of other populations: 32% of Egyptian males and 20% of females had anterior open bite moreover 12.2% of Saudis had reduced over bite. Nigerians' results were somehow comparable to the current results with 7.1 % of the sample having open bite. Regarding deep bite 23.4% deep bite of Saudis

demonstrated increased overbite and approximately 11 % of Egyptians had deep bite [18, 19].

In the present study, the prevalence of lateral cross bite was relatively lower than in other communities and existed twofold on the right side (0.2%) than on the left side (0.1%) and was lower than that reported in a previous finding among 12-year-old Sudanese children (1.9%), Scissors bite was (0.7%) in the right side which was higher than (0.3%) in the left side.

Space discrepancies

Spacing of 2 mm or more was significantly more prevalent in the anterior segment than in the posterior segment (15.9 % and 0.4%) respectively, this corresponds well with the fact that Sudanese people generally tend to have more flared anterior teeth [20]. Surprisingly Saudis had more spacing than Sudanese (27.2). Crowding in males was (5.5%) and (13.3%) in the upper and lower anterior segments respectively, and in females was (5.9%) and (10.7%) in the upper and lower anterior segments respectively. Spacing and crowding were found to be more common in the anterior segments than the posterior segments and were similar to previous findings.

CONCLUSION AND RECOMMENDATIONS

The findings of the present study were as follows

Angle's Class I malocclusion was the most prevalent trait in the investigated sample.

Spacing and Crowding were more common in Angle's Class I malocclusion.

Concerning gender, females had significantly more Angle's Class I normal occlusion than the males whereas males significantly had more Angle's Class I malocclusion than the females.

Further studies analyzing different age groups are recommended to study the relation between malocclusion and age groups and the need for Orthodontics treatment.

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