Prevalence of malocclusion and orthodontic treatment need in a sample of 12-15-year-old kurdish schoolchildren in Ranyia district

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Background and objectives: In recent years, much attention has been focused on measuring the severity and prevalence of malocclusion and orthodontic treatment need worldwide,in particular, the aetiological importance of genetic factors has been reduced, considering that many malocclusions recognize a post-natal origin related to habits at early stages of life and trauma.This study aimed to determine the prevalence of malocclusion and to evaluate the need for orthodontic treatment in school going children in Ranyia district in Kurdistan region of Iraq.

Methods: A sample of 518 students aged 12-15 years old consisting of (261boys and 257 girls) who had not undergone orthodontic treatment were selected from different parts of the city. The Dental Health Component (DHC) and the Aesthetic Component (AC) of the Index of Orthodontic Treatment Need (IOTN) were used to analyse the relationship of malocclusion with gender and age.The data were recorded in questionnaires.

Results: Statistical analysis revealed that 47.1 % of children do not need orthodontic treatment while 52.7% of them have malocclusion with varying treatment needs. The results for DHC of IOTN were: 30.4% of children showed severe and very severe need for treatment, 8.8% were in borderline, 13.5% had a mild need and 47.1% did not need treatment. There was a significant correlation between DHC and gender (P=0.003) according to DHC, boys need more orthodontic treatment than girls. In evaluating AC, 77.2% needed little or no orthodontic treatment, 12.9% needed moderate treatment while 9.8% were in great need for treatment. There was a significant correlation between DHC and ACE (P=0.000). The most prevalent features of malocclusion for the group of the need for orthodontic treatment were the following: Impeded eruption teeth14.3%, partially erupted and tipped or impacted teeth 14%,increased overjet 12.4%,crossbites 7.5%, increased overbites 6.6%, contact point displacement (crowding) 5.6%, openbites 4.1% and reversed overjets 0.8%.

Conclusion: The prevalence of malocclusion in Ranyia district population is comparative to other studies. To conclude, boys need more orthodontic treatment than girls. The demand for aesthetics decides the amount of orthodontic treatment that a patient must have.

Keywords: Prevalence of malocclusion, Index of Orthodontic treatment need, IOTN.

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Introduction

An increase in orthodontic treatment demand has been observed in the last three decades. This is due to the high perception rate of malocclusion and greater attention to aesthetics. The resources for publicly funded dental care are not enough to accommodate orthodontic services and training programs for specialist.[1] Malocclusions sequence lead to other dental problems such as caries, traumatized teeth and lower self-esteem,[2] therefore, the selection of the patient has been necessary to ensure that treatment is provided to subjects with the greatest need, those likely to derive themost benefit from the treatment.

Occlusal indices were used to define orthodontic treatment need according to the severity of need from a dental professional's viewpoint.[1,2]The demand for orthodontic treatment is increasing in most countries and deviation from what is considered the ideal occlusion are common, approximately 75% of the population has some type of malocclusion, but not all of them require treatment. Measuring the prevalence of malocclusion and treatment need in a population is helpful for the planning of orthodontic services.[3] New indices for the assessment of malocclusion and determination of orthodontic treatment need have been developed, including the dental aesthetic index (DAI),[4] and index of orthodontic treatment need (IOTN) which includes an Aesthetic Component (AC) with 10 severity levels and a Dental Health Component (DHC) with five severity levels. These indices are simple, repeatable, and reliable.[5]

This study is an effort to find out the prevalence of malocclusion and orthodontic treatment needs using the index of orthodontic treatment need (IOTN).

Methods

This cross-sectional study was carried out in Ranyia district, located in Sulaymaniyah governorate in Kurdistan region of Iraq. This study involved 518 (261 girls and 257 boys) schoolchildren aged between 12-15 years selected randomly from 16 public schools. Subjects who were undergoing or had previously received orthodontic treatment were not included in this study. Permission to undertake the survey was obtained from the Department of Health and Education. The selected schools were contacted and an appointment was made with the principal in order to obtain permission to implement the study. All of the schools (16) contacted, and the directorate was interested and did not refuse to arrange an appointment. In order to obtain reliable data, the sample was chosen through stratified random sampling from 16 schools, which were categorized according to the geographical location. Lists of all the schoolchildren from the selected schools with the information of the age and gender were collected, and a detailed explanation of the study was outlined at the initial appointment.

A pilot study was undertaken in order to establish the feasibility of this study and identify any potential problems. Clinical examination of students was performed in the school classroom, with natural daylight as a source of illumination and with an assistant recording the observations. The assessment of dental occlusion was carried out using latex gloves, dental mouth mirrors, lip retractors, face mirror, face mask, and disposable IOTN ruler. No radiograph or study cast were used.

The IOTN was calculated from direct examination. In order to make the assessment more reliable, a lip retractor and a mirror were utilized, and then the examiner evaluated the intra-oral frontal view of the student and scores them for different levels of attractiveness according to the scale of 10 color photographs of AC of IOTN attractiveness (Figure 1).[5] Then the student was asked to evaluate which photograph on this aesthetic scale most closely resembled their own dentition. The students were then

examined to determine their IOTN (DHC) with the help of a mirror and disposable IOTN ruler (Table 1), then the findings were recorded in the questionnaires and each patient was graded according to the severity of the occlusal traits.

The statistical package SPSS program was used for descriptive and inferential data analyses, which included the frequency, percentage, mean and standard deviation, and Chi-square test. A *P*-value of ≤ 0.05 was considered as statistically significant.
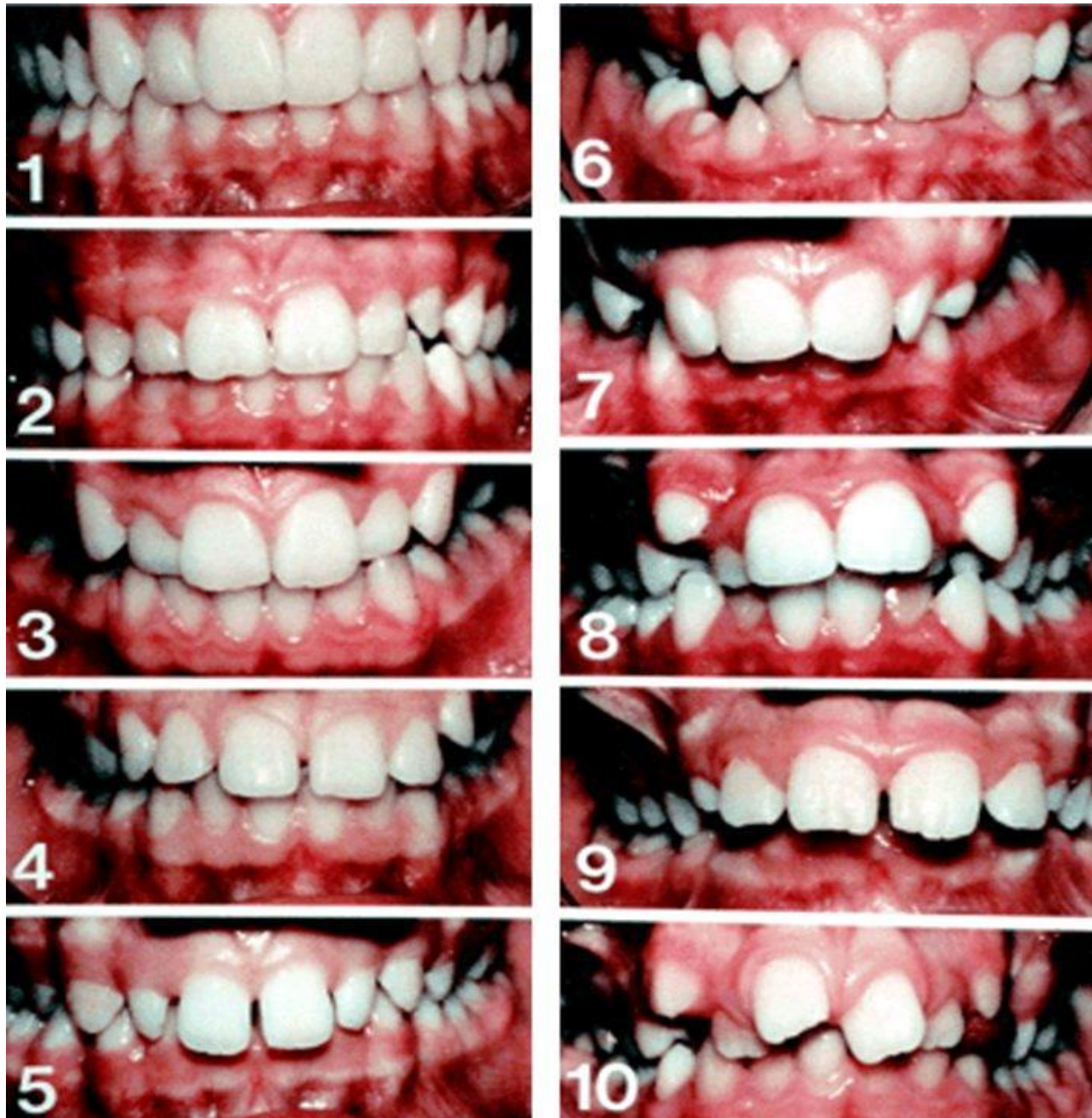

Figure 1: The Aesthetic component of IOTN (Evan and Show, 1987).

Table 1:The Dental Health Component of IOTN.[5]

Grade 5 (Need treatment)

5•i Impeded eruption of teeth (except for third molars) due to crowding, displacement, the presence of supernumerary teeth, retained deciduous teeth and any pathological cause.

5•h Extensive hypodontia with restorative implications (more than 1 tooth missing in any quadrant) requiring pre-restorative orthodontics.

5•a Increased overjet greater than 9 mm.

5•m Reverse overjet greater than 3.5 mm with reported masticatory and speech difficulties.

5•p Defects of cleft lip and palate and other craniofacial anomalies.

5•s Submerged deciduous teeth.

Grade 4 (Need treatment)

4•h Less extensive hypodontia requiring pre-restorative orthodontics or orthodontic space closure to obviate the need for a prosthesis.

4•a Increased overjet greater than 6 mm, but less than or equal to 9 mm.

4•b Reverse overjet greater than 3.5 mm with no masticatory or speech difficulties.

4•m Reverse overjet greater than 1 mm but less than 3.5 mm with recorded masticatory and speech difficulties.

4•c Anterior or posterior crossbites with greater than 2 mm discrepancy between retruded contact position and intercuspal position.

4•l Posterior lingual crossbite with no functional occlusal contact in one or both buccal segments.

4•d Severe contact point displacements greater than 4 mm.

4•e Extreme lateral or anterior open bites greater than 4 mm.

4•f Increased and complete overbite with gingival or palatal trauma.

4•t Partially erupted teeth, tipped and impacted against adjacent teeth.

4•x The presence of supernumerary teeth.

Grade 3 (Borderline need)

3•a Increased overjet greater than 3.5 mm, but less than or equal to 6 mm with incompetent lips.

3•b Reverse overjet greater than 1 mm, but less than or equal to 3.5 mm.

3•c Anterior or posterior crossbites with greater than 1 mm, but less than or equal to 2 mm discrepancy between retruded contact position and intercuspal position.

3•d Contact point displacements greater than 2 mm, but less than or equal to 4 mm.

3•e Lateral or anterior open bite greater than 2 mm, but less than or equal to 4 mm.

3•f Deep overbite complete on gingival or palatal tissues, but no trauma.

Grade 2 (Slight)

2•a Increased overjet greater than 3.5 mm, but less than or equal to 6 mm with competent lips.

2•b Reverse overjet greater than 0 mm but less than or equal to 1 mm.

2•c Anterior or posterior crossbite with less than or equal to 1 mm discrepancy between retruded contact position and intercuspal position.

2•d Contact point displacements greater than 1 mm but less than or equal to 2 mm.

2•e Anterior or posterior open bite greater than 1 mm but less than or equal to 2 mm.

2•f Increased overbite greater than or equal to 3•5 mm without gingival contact.

2•g Pre- or post-normal occlusions with no other anomalies (includes up to half a unit discrepancy).

Grade 1 (None)

1• Minor malocclusions including contact point displacements less than 1 mm.

Results

The sample includes 256 (49.4%) males and 262 (50.6%) females and their ages frequencies are shown in Table 2. The result with respect to Dental Health Component (DHC) of IOTN shows that: 244 (47.1%) students were in the category of no treatment need, 70(13.5%) were in slight treatment need, 46 (8.8%) were in borderline category, 81 (15.6%) were in the great treatment need and 77(14.8%) were in the category of very great treatment need. The orthodontic treatment was required by 30.4 % of the students (grades 4-5) (Table 3). There was a statistically significant difference in students' treatment need in DHC in relation to gender (Table 3, P=0.003), but there was no such significant difference in relation to age (Table 4,P=0.144).

Table 2: Distribution of sample by age.

Age	Frequency	%
12	97	18.7
13	132	25.5
14	159	30.7
15	130	25.1
Total	518	100

Table 3: Frequency and percentage distribution of the total students DHC treatment needs in relation to grades.

Grades	Total		95% CI		Male		Female		X² test
	No.	%	Lower	Upper	No.	%	No.	%	P value
1. No treatment need	244	47.1	42.9	51.5	101	41.3	143	58.6	
2. Slight need treatment	70	13.5	10.6	16.4	36	51.4	34	48.5	
3. Borderline need treatment	46	8.8	6.8	11.6	22	47.8	24	52.1	0.003
4. Great treatment need	81	15.6	12.7	18.9	52	64.1	29	35.8	
5. Very greater treatment need	77	14.8	11.8	17.8	45	58.4	32	41.5	
Total	518	100.0	100.0	100.0	256	49.4	262	50.5	

The result with respect to Aesthetic Component professional result (ACE) revealed different distribution 400 students (77.2%) little or no need, 67 students (12.9%) moderate need, and 51 students (9.8%) great need category (Table 5). There is no statistically significant gender or age differences in ACE (Table 5, P=0.065). There is a significant relationship between ACE and age (Table 6, P= 0.042). The differences in the IOTN scores regarding either dental health component (DHC) or the aesthetic component (AC) are statistically significant (Table 7).

Table 4: Age difference of DHC of IOTN.

DHC	Age								Total	X² test P value
	12 years		13 years		14 years		15 years			
	No.	%	No.	%	No.	%	No.	%		
No treatment needed	46	18.8	54	22.1	74	30.3	70	28.6	244	
Slight need	15	21.4	20	28.1	16	22.8	19	27.1	70	
Borderline need	9	19.5	11	23.9	14	30.4	12	26.1	46	0.144
great treatment need	14	17.2	18	22.2	35	43.2	14	17.2	81	
Greater treatment needed	13	16.8	29	37.6	20	25.9	15	19.4	77	
Total	**97**	**18.7**	**132**	**25.4**	**159**	**30.6**	**130**	**25.1**	**518**	

Table 5: Category of Aesthetic Component\Examiner (ACE).

Treatment require	Total		Male		Female		P
	No.	%	No.	%	No.	%	
Little or no	400	77.2	189	47.2	52.7	400	
Moderate	67	12.9	42	62.6	37.3	67	0.065
Great	51	9.8	25	49.01	50.9	51	
Total	**518**	**100.0**	**256**	**49.4**	**50.5**	**518**	

Table 6: Age difference of Aesthetic Component\Examiner (ACE).

AC	Age								Total	P
	12 years		13 years		14 years		15 years			
	No.	%	No.	%	No.	%	No.	%		
Little treatment required	74	18.5	97	24.2	118	29.5	111	27.7	400	
Moderate treatment required	18	26.8	17	25.3	21	31.3	11	16.4	67	0.042
Great treatment required	5	9.8	18	35.2	20	39.2	8	15.6	51	
Total	**97**	**18.7**	**132**	**25.4**	**159**	**30.6**	**130**	**25.1**	**518**	

Table 7: The frequency and percentage distribution of student's aesthetic component treatment required in relation to DHC treatment required.

AC treatment required	DHCtreatment required						Total		X² P value
	Little treatment required		Moderate treatment required		Great treatment required				
	No.	%	No.	%	No.	%	No.	%	
Little or no	304	76	25	6.2	71	17.7	400	77.2	< 0.001
Moderate	9	13.4	20	29.8	38	56.7	67	12.9	
Great	1	1.9	1	1.9	49	96.1	51	9.8	
Total	**314**	**100.0**	**46**	**100.0**	**158**	**100.0**	**518**	**100.0**	

There is a highly significant association between ACE and DHC. Each occlusal trait prevalence is shown in Table 8. On excluding the grade 1 it was observed that 52.5% samples had a significant amount of deviation from the normal occlusion. The most prevalent features of malocclusion for the group of the need for orthodontic treatment were the following imbedded eruption teeth, partially erupted and tipped or impacted teeth, increased overjets, crossbites, overbites, contact point displacements (crowding), openbites and reversed overjets. Statistically, insignificant gender differences were observed for aesthetic perception between males and females as shown in Table 9.

Table 8: Worst features of malocclusion.

Malocclusion Features	DHC						Total	
	Little treatment required		Moderate treatment required		Great treatment required			
	No.	%[*]	No.	%	No.	%	No.	%[**]
Increased over jet	22	34.3	18	28.1	24	37.5	64	12.4
Crossbite	1	2.5	6	15.3	32	82.05	39	7.5
Contact point displacement	17	58.6	6	20.6	6	20.6	29	5.6
Open bite	8	38.1	6	28.5	7	33.3	21	4.1
Over bite	22	64.7	10	29.4	2	5.8	34	6.6
Imbedded eruption teeth	0	0	0	0	74	100	74	14.3
Reversed over jet	0	0	0	0	4	100	4	0.8
Partially erupted, tipped or impacted teeth	0	0	0	0	7	100	7	14

* The percentage calculated out of raw.
** The percentage calculated out of total sample (518).

Table 9: Student's gender category of aesthetic components/student AC.

Treatment required	Gender				Total		P
	Male		Female				
	No.	%	No.	%	No.	%	
Little	212	48.4	226	51.5	438	84.5	
Moderate	25	56.8	19	43.1	44	8.4	0.520
Great	19	52.7	17	47.2	36	6.9	
Total	**256**	**49.4**	**262**	**50.5**	**518**	**100**	

Discussion

The present study is the first epidemiological study of malocclusion using IOTN in Ranyia district, which is a big district of Sulaymaniyah governorate in Kurdistan region of Iraq. Increasing international use of this index allows comparison of orthodontic treatment need in this area with other population groups. Also, these data are needed for monitoring the prevalence of malocclusion and development of preventive measures.

The results of this study showed that (Table 3), 30.4% of subjects had an objective orthodontic treatment need according to the DHC of IOTN whereas 60.6% and 8.8% percentage recorded for no/slight treatment need and moderate treatment need category. The statistical differences in DHC scores, related to gender have approved the fact that males need more orthodontic treatment than females. The main occlusal features responsible for allocating subjects in great treatment need of orthodontic treatment according to DHC of IOTN were the following: impeded eruption of teeth (14.3%), openbites (4.1%), partially erupted, tipped or impacted teeth (14%), contact point displacement (5.6%), oversbite (6.6%), and increased overjets (12.4%). Those figures are lower than those reported by Hamdan,[6] for 14-17year-old Jordanians, who found that 45% of subjects with definite treatment need had a severe contact point displacement of more

than 4mm followed by impeded eruption of teeth in 24% of children. In Turkey,[7] one investigator found that 38.8% of 500 Turkish students aged 11-14 year-old have great treatment needs, 24% moderate treatment need and 37.2% no/slight treatment need. The percentage of the population needing orthodontic treatment according to the IOTN DHC in the present study is higher than a study in Iran,[8] in which about 18.4% of 11-14year-old needed treatment. The orthodontic treatment needs are about 21% in 12-16year-old Spanish schoolchildren.[9] The present study shows that the orthodontic treatment needs are lower than the study in Malays[10] of 47.9% in 12-13-year-old. In the Italian children, the treatment needs were about 59.5% in 11-15year-olds.[11] While treatment needs are 37% in 12-13year-old Swedish children,[12] and close to that in Jordanians (31%),[5] 10 year-old of New Zealand schoolchildren (31.3%),[13] and in a survey of 12-year-old Sheffield school children (32%).[14]

When comparing this study to other local studies, we find that the orthodontic treatment needs are higher in percentage than Hasan (2010) study which was 24% in Erbil City populations.[15] And the results of the present study is comparable to Alhuwaizi (2006) study who found 18.5% with treatment elective, 12.5% with treatment highly desirable, and 10.3% with very severe malocclusion, and the sample was from Sulaymaniyah City.[16] The

present study is comparative to other regions of Iraq (Baghdad the capital, Ninevah, Basrah, Diyala, Anbar, and Najaf) 65.8% were found to have no or slight treatment need, 16.8% with treatment elective, 10.2% with treatment highly desirable and 7.2% with very severe malocclusions.[17]

Concerning the aesthetic perception which is judged by the students themselves, 26.8% of them graded themselves attractive i.e. they are not in need of treatment (AC Grade 1). 57.8% decided that their appearance has mild need (Grade 2, 3, 4) for treatment, i.e. (26.8% + 57.8% = 84.5% in Table 9), other constituting 8.5% moderate treatment need, and 6.9% students had great treatment need.

Males who graded themselves less attractive expressed a greater desire for treatment in the contrary to females who graded themselves more attractive and expressed comparatively less desire for treatment. This clearly shows differences in the self-esteem of students in relation to their aesthetic perception. However, statistically, insignificant gender differences were observed for aesthetic perception between males and females (Table 9).

Regarding the ACE (Examiner) the results (Table 5) showed that 9.8% are in great treatment need. Orthodontist's viewpoint is more accurate and reliable to judge student's treatment needs against his perception of aesthetics. However, statistically, there was insignificant gender difference in examiner's opinion of aesthetics for student (Table 6). The important difference which is observed between DHC and AC scores regarding the number of students, who are in need of orthodontic treatment, is due to the fact that both components of IOTN evaluate distinctive characteristics. According to DHC, some malocclusions have been defined as being harmful to oral health, although no aesthetic impairment is involved, such as crossbites or absence of posterior teeth, non-erupted or impacted canines and premolars.[13,18,19]

On the other hand, some cases are only defined by AC as being of great treatment need because certain malocclusions considered to produce unattractive aesthetics are not evaluated by DHC (e.g. anterior spacing).[13,17] Although AC is more subjective, it also brings difficulties in assessing some parameters, such as the degree of overjet and overbite.[19, 21]

The statistical differences in DHC scores regarding gender were confirmed. The interesting finding is that males are more likely to have a definite need of orthodontic treatment since other studies found no statistically significant difference regarding the gender distribution of DHC.[7, 22]

Conclusion

The prevalence of malocclusion in Ranyia district population is comparative to other studies; however, the IOTN data gives support for early treatment needs. The results of this study are pioneer and are suitable for planning community dental health resources. To conclude, boys represented more orthodontic treatment need than girls according to DHC component. Despite the assessment differences in DHC and AC scores, their association was found to be very important, for the greater the aesthetic need, the greater the chance of a definite need for treatment.

Conflicts of interest

The authors reported no conflicts of interest.

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