THE NEED FOR ORTHODONTIC TREATMENT IN THE EGYPTIAN CHILD POPULATION OF BENI-SUEF

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ABSTRACT

Objective: To determine the orthodontic treatment need in Egyptian school children living in Beni-Suef Governorate.

Subjects and methods: The sample included three hundred and ninety-six participants aged between 9 and 15 years (189 males, 207 females) that followed the inclusion criteria of the study. The children were assessed to determine their need for orthodontic treatment using the dental health component (DHC) and aesthetic component (AC) of IOTN (Index of Treatment Need).

Results: Considering the total sample, 27.3% and 17.2% showed definite need for orthodontic treatment according to DHC and AC of IOTN respectively. There was no statistically significant difference between males and females in orthodontic treatment needs except in moderate need cases of the AC in which males (10.6%) showed a statistically significant higher percentage than females (3.9%). Regarding the type of dentition, there was no statistically significant difference in orthodontic treatment needs between children having a mixed dentition stage and those with permanent dentition. A strong association was noted between the DHC and AC of IOTN.

Conclusion: The treatment needs of the examined children in Beni-Suef are comparable to other populations worldwide.

KEYWORDS: Orthodontic treatment need, Index of Orthodontic Treatment Need (IOTN), Egyptian school children, Dental Health Component (DHC), Aesthetic Component (AC).

INTRODUCTION

Malocclusion is a highly widespread dental problem that has a negative influence on the individual's quality of life affecting functional ability, appearance, aesthetic self-evaluation, and even interpersonal relationships.[1,2] Therefore early detection of malocclusion allows for immediate intervention that raises the benefit of attaining occlusal harmony and balanced dentofacial aesthetics.[3,4]

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Moreover, the existence of the need for orthodontic treatment is not definitely a crucial factor in seeking treatment as the personal perception of the need for orthodontic treatment can be impacted by different social, economic, and cultural factors. [5,6] Consequently, treatment-need indices were developed to determine the need for orthodontic treatment based on the aberration from normal occlusion, adverse effects on dental health, and lack of aesthetic harmony. [7] Treatment needs indices are also considered a valuable tool for the efficient planning, organization, and establishment of orthodontic services within a public health system [8,9] making the best use of financial resources.[3]

The Index Of Treatment Need (IOTN) developed by Brook and Shaw [10] is considered one of the most commonly used indices in specifying the priority for orthodontic treatment. The index includes two components which are the dental health component (DHC) and the aesthetic component (AC). The dental health component (DHC) was based on a modification of the index of the Swedish Dental Health Board [11] and was used to address functional and dental health by registering and measuring the various occlusal traits. The dental health component was recorded in the form of five grades, grade 1 demonstrating no need for treatment and grade 5 representing extreme need. The aesthetic component (AC) recorded the aesthetic impairment attributed to malocclusion based on the SCAN Index (Standardized Continuum of Aesthetic Need) that was employed by Evans and Shaw.[12] In the aesthetic component (AC), the dental appearance was compared to a ten-point scale of colored photographs representing different levels of dental attractiveness as number 1 outlining the most attractive and number 10 demonstrating the least attractive arrangement. The IOTN was found to be an easy-to-use and reliable method that allowed for comparison between various population groups. [13,14]

Although several studies have been published worldwide assessing the treatment needs in various populations, [3-5,7,9,10,15-22] there is a dearth of reports about the Egyptian one [15] with no available data about the orthodontic treatment needs in children of Beni-Suef Governorate. Therefore, the aim of the current study was to determine the orthodontic treatment needs among Egyptian children living in Beni-Suef, Egypt.

SUBJECTS AND METHODS

Sample

The current study was conducted after attaining the ethical approval of the Research Ethics Committee of the Faculty of Dentistry, Beni-Suef University and the agreement of the educational authorities of the Directorate of Education in Beni-Suef Governorate and the schools' principals. The gathered information from the Directorate of Education showed that 94765 students represented the total population number. Sample size calculation according to Daniel analysis [23] with P=35% and the desired precision ± 0.05 revealed that 349 participants would be the minimum number of subjects that could be included in the study.

A stratified two-stage cluster sample was the sample design as Beni-Suef Governorate is divided into Eastern and Western divisions and the schools represented the clusters. Ten schools (five for each division) were randomly selected from the website of the Ministry of Education and four hundred students were examined as forty students were randomly selected from each school after collecting the informed consents that were signed by the students' parents.

The subjects included in the study fulfilled the following criteria:

1) The children's age ranged from 9 – 15 years old.

2) The subjects should have no history of previous orthodontic treatment.

3) The participants should be free from any systemic diseases, craniofacial anomalies, syndromes, trauma, or surgery that could affect the occlusion.

After examination, four students were excluded from the study because they did not follow the specified criteria as shown in Fig. 1 resulting in including 396 (189 males and 207 females) students in the present study who were divided according to age into two groups: 9 – 12 years (215 students) and > 12 – 15 years (181 students). Regarding the dentition stage, 244 students were in the mixed dentition period, while 152 students were in the permanent dentition stage.

Methods:

Examination of the participants was performed by the two authors in the school clinic with the subject seated on a chair under daylight illumination. The diagnosis was conducted using latex gloves, disposable mouth mirrors, and plastic rulers excluding the use of radiographs or study models in collecting the diagnostic data. The examination was performed over a period of 3 months.
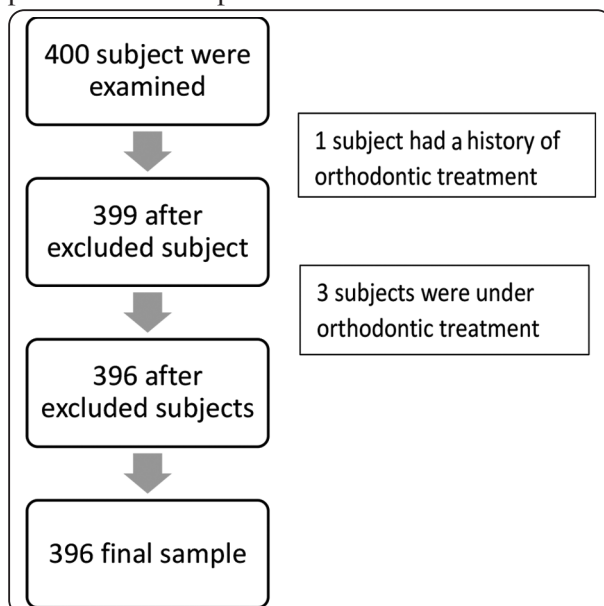

Fig. (1): Flow of sample selection

The IOTN index had two components, the dental health component (DHC) and the aesthetic component (AC). The dental health component (DHC) involved the evaluation and assessment of different occlusal traits. The molar relationship was assessed according to Angle's classification. The overjet and overbite were measured and recorded. The presence of anterior crossbite, posterior crossbite, and crowding was registered. The orthodontic treatment need was assessed and calculated according to the DHC of IOTN which is presented in five grades, grade 1 represents no need for treatment while grade 2 outlines mild/little need for treatment, grade 3 shows borderline (moderate) need, grade 4 displays severe need, and grade 5 exhibits an extreme need for treatment.

The aesthetic need for treatment was recorded using the aesthetic component (AC) of IOTN which is based on comparing the aesthetic appearance of the child with standard graded ten colored photographs with different levels of dental attractiveness. Each child was given a score according to the scale which is graded from 1 to 10. Grade 1 to 4 represents no or slight need for treatment, while grade 5 to 7 shows a moderate or borderline need. A definite aesthetic need for treatment is indicated by scores 8 to 10.

In order to assess the inter-observer and intra-observer variability, 10% of the sample was re-examined. The intraclass correlation coefficient (ICC) indicated strong agreement for inter-observer reliability (0.999) and high reproducibility as the intra-observer reliability was 0.991 and 0.995 for observers 1 and 2 respectively.

Statistical analysis

Statistical analysis was performed with R statistical analysis software version 4.1.2 for Windows.* Categorical data were presented as frequency and percentage values. The data were analyzed using Fisher's exact test. Multiple Z-tests

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* R Core Team (2021). R: A language and environment for statistical computing. R Foundation for Statistical Computing, Vienna, Austria. URL https://www.R-project.org/.

with Bonferroni correction were used for multiple pairwise comparisons. The significance level was set at p≤ 0.05 within all tests.

RESULTS

The present study was conducted on 396 students (189 males and 207 females). Mixed and permanent dentition stages were found in 244 and 152 subjects respectively. The distribution of the different levels of the aesthetic component (AC) and dental health component (DHC) of IOTN among the examined population was presented in Table (1).

Table (2) showed the association between the AC and DHC of IOTN and gender. For the AC of IOTN, there was no statistically significant difference between males and females in the aesthetic need

except in moderate/ borderline need (grades 5 to 7) which showed a statistically significant higher need for orthodontic treatment in males (10.6%) than females (3.9%). For the DHC of IOTN, there was no statistically significant difference between both genders in all grades.

The association between the AC and DHC of IOTN and the type of dentition was demonstrated in Table (3). There was no statistically significant difference in the treatment need between the mixed and permanent dentition periods.

Table (4) showed the association between the dental health component (DHC) and aesthetic component (AC) of IOTN. The results demonstrated a strong association between the two components of IOTN.

TABLE (1) The distribution of the aesthetic component (AC) and dental health component (DHC) of IOTN.

Parameter	Value	N	%
Aesthetic Component (AC) (n=396)	No need / Slight need (Grades 1-4)	300	75.8%
	Moderate or borderline need (Grades 5-7)	28	7 %
	Definite need (Grades 8-10)	68	17.2%
Dental Health Component (DHC) (n=396)	No Need (Grade 1)	113	28.5%
	Little Need (Grade 2)	146	36.9%
	Borderline (Grade 3)	29	7.3%
	Severe Need (Grade 4)	102	25.8%
	Extreme Need (Grade 5)	6	1.5%

TABLE (2) The association between gender and IOTN.

Parameter	Value	Male		Female		p-value
		N	%	N	%	
Aesthetic Component (n=396)	No need / Slight need (Grades 1-4)	135	71.4%	165	79.7%	
	Moderate or borderline need (Grades 5-7)	20[A]	10.6%	8[B]	3.9%	0.025*
	Definite need (Grades 8-10)	34	18.0%	34	16.4%	
Dental Health Component (n=396)	No Need (Grade 1)	48	25.4%	65	31.4%	
	Little Need (Grade 2)	71	37.6%	75	36.2%	
	Borderline (Grade 3)	16	8.5%	13	6.3%	0.074
	Severe Need (Grade 4)	48	25.4%	54	26.1%	
	Extreme Need (Grade 5)	6	3.1%	0	0.0%	

*Values with different superscript letters within the same horizontal row are significantly different. * = Significant (p ≤ 0.05)*

TABLE (3) The association between the dentition period and IOTN.

Parameter	Value	Mixed		Permanent		p-value
		N	%	N	%	
Aesthetic Component (n=396)	No need / Slight need (Grades 1-4)	189	77.5%	111	73.0%	
	Moderate or borderline need (Grades 5-7)	16	6.5%	12	7.9%	0.606
	Definite need (Grades 8-10)	39	16.0%	29	19.1%	
Dental Health Component (n=396)	No Need (Grade 1)	72	29.5%	41	27.0%	
	Little Need (Grade 2)	98	40.2%	48	31.6%	
	Borderline (Grade 3)	18	7.4%	11	7.2%	
	Severe Need (Grade 4)	51	20.9%	51	33.6%	0.059
	Extreme Need (Grade 5)	5	2.0%	1	0.6%	

TABLE (4) The association between the dental health component (DHC) and aesthetic component (AC) of (IOTN).

	No need / Slight need		Moderate or borderline need		Definite need		p-value
	N	%	N	%	N	%	
No Need	113[A]	37.7%	0[B]	0.0%	0[B]	0.0%	
Little Need	140[A]	46.7%	6[B]	21.4%	0[C]	0.0%	
Borderline Need	10[B]	3.3%	19[A]	67.9%	0[B]	0.0%	
Severe Need	37[B]	12.3%	2[B]	7.1%	63[A]	92.6%	<0.001*
Extreme Need	0[A]	0.0%	1[A]	3.6%	5[A]	7.4%	

Values with different superscript letters within the same horizontal row are significantly different.

*= significant (p ≤ 0.05)

DISCUSSION

The current study is considered one of the few studies assessing orthodontic treatment needs using the IOTN in Egypt [15] and the only one in Beni-Suef Governorate. Using such an index which is widely used internationally [4,7,16-21] allows for the comparison between orthodontic treatment needs in Beni-Suef and other population groups whether in Egypt or even worldwide.

The present study was conducted on 396 subjects who fulfilled the inclusion criteria. The age of the examined children ranged from 9-15 years. This age range allows for early detection of malocclusion and subsequently early intervention which permits better resource allocation.[24]

Regarding the AC of IOTN, the results of the present study displayed that 75.8% of the examined population showed no or slight need for orthodontic treatment, 7% demonstrated moderate or borderline need and 17.2% revealed definite orthodontic treatment need. Concerning the DHC of IOTN, 28.5% of the examined children showed no need for orthodontic treatment, 36.9% displayed

mild /little need, 7.3% exhibited moderate/ borderline need, 25.8% demonstrated severe need and 1.5% manifested an extreme need for orthodontic treatment. The sample of the current study was derived from school children and not from those seeking orthodontic treatment at the outpatient clinics of the pediatric dentistry and orthodontic departments of the Faculty of Dentistry of Beni-Suef University. If the sample had only included those seeking treatment, the percentage of treatment needs would have been higher.

Relevant to the AC of IOTN, the results of the current study were consistent with another Egyptian study performed in El Mansoura city [15], a French study [19], Senegalese [6], Syrian [17] and Anatolian[7] ones in which the majority of the population showed no or slight need for orthodontic treatment as their results were 87.5%, 75%, 69.6%, 50%, and 43.1% respectively. Comparing the borderline cases of the current study with the previous studies showed that our results were similar to the former Egyptian study [15] (8.1%), the French [19] population (18%), and the Senegalese [6] (21.7%). Despite that, higher percentages of borderline cases were detected in the Syrian [17] (39.5%) and Anatolian [7] (40.2%) populations. The current finding of the definite need for orthodontic treatment was compatible with previous Egyptian [15], French[19], Senegalese[6], Syrian [17], and Anatolian [7] studies which percentages were 4.4%, 7%, 8.7%, 10.5 %, and 16.7% respectively. In contrast to the existing results, different values were detected in a study on the German population [4] which reported that 34% of the examined children showed no or little need for orthodontic treatment, 44.5% demonstrated moderate or borderline need, whereas 21.5% of the subjects needed orthodontic treatment. The differed percentages of the slight and borderline need cases in the German study may be attributed to temporary changes in the dentition and discrepancies in the overbite and overjet relation that accompanied the early mixed dentition stage as the age of the examined children ranged from 6 – 8 years.

Regarding the DHC of IOTN, the present study demonstrated that 28.5 % of the subjects exhibited no need for treatment and 36.9 % showed little need with a total of 65.4 % of the sample revealing no or little need for treatment. This finding demonstrated that the majority of the population showed no or little need for orthodontic treatment which was in accordance with former studies on the Egyptians[15] (58.6%), Saudis [16] (49.4%), Omanis [18] (65.8%), Syrians[17] (40.5%), Germans[4] (48.3%), Anatolians[7] (45.6%), and the French population[19] (50.1%). In the current study, borderline or moderate need cases were reported in 7.3 % of the examined children which was consistent with another study on the Omani population [18] (10.9 %) but slightly lower than observed cases in a preceding Egyptian[15] study in El Mansoura city (21.6 %). Furthermore, other studies recorded higher percentages of borderline need in populations of Saudi Arabia [16] (29.6%), Syria [17] (21.5%), France [19] (28.6%), Germany[4] (25.5%) and Anatolia[7] (25.7%). In our study, severe (25.8%) and extreme need (1.5%) for orthodontic treatment were reported in 27.3% of the sample which corresponded with the findings of previous studies on Egyptians[15] (19.8%), Germans[4] (26.2%), Anatolians[7] (28.7%), Saudis [16] (21%), Omanis [18] (23.3%), and the French population [19] (21.3%). On the other hand, our results differed from the findings of Senegalese [6], Nepalese [20], and Kosovar [3] populations as they reported that the majority of the subjects showed high need for orthodontic treatment as documented in 42.6%, 46.26%, and 66.5% of the samples respectively. While the percentages of the borderline cases in the Senegalese [6], Nepalese [20], and Kosovar [3] populations were 34.1%, 24.07%, and 16.2% of the examined subjects, the cases that showed no/slight need for orthodontic treatment were 23.3%, 29.72%, and 17.3% of the samples respectively. Such a variation between the populations could be attributed to several genetic and environmental factors which interact together causing malocclusion in children.[18]

In the current study, the association between both components of the IOTN index and gender was tested. The results showed that there was no statistically significant difference between males and females in all grades of both components except in moderate/ borderline need cases of the AC in which males (10.6%) showed a statistically significant higher need for orthodontic treatment than females (3.9%). Our finding agreed with reports of previous studies on Egyptians [15], Moroccans [25], Syrians [17], Saudis [16], Senegalese [6], Kosovans [3], Britons [8], and the French population [19] in which there was no significant difference between males and females in the treatment need. Regarding the significant difference between males and females in the treatment needs, similar findings were found in Turkey [7] and Nepal [26] as they reported significant differences between boys and girls in the treatment need when IOTN is used.

The results of the present study revealed that there was no statistically significant difference between the type of dentition whether mixed or permanent and both components of IOTN. Our finding was harmonious with a study in Morocco[25] which found no significant difference by age regarding the treatment need.

In the current investigation, there was a strong association between the AC and DHC of IOTN which coincided with other studies performed on the Syrian [17] and French [19] populations. Other studies such as the Egyptian [15], Senegalese [6], and Anatolian [7] differed from our result and didn't show such an association between both components of IOTN.

CONCLUSION

Orthodontic treatment needs of school children living in Beni-Suef Governorate resemble the needs of children in other populations. It is also worth noting that there was no gender difference regarding orthodontic treatment needs when the DHC of IOTN is used. IOTN is a very useful tool for comparing the treatment needs of various populations.

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