



Correlation between Socioeconomic Level and Oral Health Related Quality of Life in Egyptian Schoolchildren: An Observational Cross-sectional Study

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Abstract

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AIM: This observational and cross-sectional study aimed to assess the orthodontic treatment need, oral health-related quality of life (OHRQoL), and self-esteem in relation to socioeconomic level as well as investigate the incidence of malocclusion and orthodontic treatment need in Egyptian school children.

MATERIALS AND METHODS: Three hundred and twenty-four schoolchildren from governmental, private, and international schools representing different socioeconomic levels ranging from 11 to 14 years were recruited. Self-esteem and OHRQoL were measured using validated questionnaires. Clinical examination was used to assess the orthodontic treatment need represented by the index of orthodontic treatment need (IOTN) score as well as Angle's classification of occlusion.

RESULTS: International schools showed the lowest total IOTN scores than governmental and private schools ($p = 0.031$). Governmental scores showed the statistically significantly highest mean CPQ11-14 score (Worst OHR-QoL) followed by private schools then international schools ($p = 0.035$). There was no statistically significant difference between Angle's classes of malocclusion as well as self-esteem between the three different socioeconomic level groups.

CONCLUSION: Lower socioeconomic status (SES) was associated with higher orthodontic treatment need according to the total IOTN score and worst OHRQoL. Socioeconomic status did not affect the distribution of malocclusion according to Angle's classification nor did it affect self-esteem.

Introduction

Malocclusion is a condition in which the teeth deviate from their normal relationship or alignment with other teeth within the same arch and/or teeth in the opposite arch [1]. It is one of the most common oral cavity defects, with significant functional and esthetic consequences. Periodontal health, caries incidence, teeth impactions, occlusal interferences, incisal vulnerability, and mandibular dysfunction may all be affected.

Malocclusion has a direct impact on the appearance of the face and smile. Compromised appearance can increase negative stereotyping and can pose detrimental impacts on the quality of life and self-esteem of the individual, hence affecting social and psychological well-being [2], [3], [4].

The quality of life is highly subjective and it is the degree to which a person is healthy, comfortable, and able to participate in or enjoy life events. The word "quality of life" is inherently ambiguous because it can apply to both, an individual's personal experience of life as well as the living situations in which they find themselves. Oral health-related quality of life

(OHRQoL) is a phrase used to assess how oral pain or discomfort impacts a person's well-being in physical, psychological, and social activities. Numerous studies have linked OHRQoL to malocclusion [3], [5].

There is a potential relationship between early life socioeconomic status (SES) and the incidence of malocclusion as a low socioeconomic level was reported to be a risk factor for the prevalence of malocclusion and higher orthodontic treatment need [6], [7] In addition, low SES was reported to be linked to worse OHRQoL and self-esteem [8], [9], [10], [11]. This study aimed to assess the orthodontic treatment need, OHRQoL, and self-esteem in relation to socioeconomic level as well as investigate the incidence of malocclusion and orthodontic treatment need in Egyptian school children.

Material and Methods

The total number of Egyptian schoolchildren from 11 to 14 years of age attending schools in the fifth Settlement, New Cairo Educational Administration

during the academic year 2019/2020 was 2015 students. Governmental, private, and international schools were all categorized representing different socioeconomic levels. Each category had one school picked at random. The total target population in that educational administration (students aged 11–14 years) was determined within

each school. There were 1040 students in governmental school, 656 students in private school, and 319 students in international school according to the central agency for public mobilization and statistics (CAPMAS). The website <http://www.raosoft.com/samplesize.html> was used to calculate the sample size. With a 5% margin of

A few questions about you

- Would you say the **health** of your teeth, lips, jaws and mouth is:
 - Excellent
 - Very good
 - Good
 - Fair
 - poor
- How much does the condition of your teeth, lips, jaws or mouth **affect your life overall** ?
 - Not at all
 - Very little
 - Some
 - A lot
 - Very much

Questions about oral problems

In the past 3 months, how often have you had:

	Never	Once or twice	More than twice	Every day or almost everyday
1- Pain in your teeth, lips, jaws or mouth?				
2- Bleeding gums?				
3- Sores in your mouth?				
4- Bad breath?				
5- Food stuck in or between your teeth?				
6- Food stuck in the top of your mouth?				
7- Breathed through your mouth?				
8- Taken longer than others to eat a meal?				
9- Had trouble sleeping?				
10-Difficulty in biting or chewing hard foods like apples?				
11-Difficulty in opening your mouth wide?				
12-Difficulty in saying any words?				
13-Difficulty in eating foods you would like to eat?				
14-Difficulty in drinking with a straw?				
15-Difficulty in drinking or eating hot or cold foods?				

Figure 1: CPQ₁₁₋₁₄ page 1

error, a 95% confidence interval, and a 50% response distribution, a 5% margin of error was chosen. The minimal sample size was 322 students, but this was increased to 324 students to account for the division by three (108 students from each school).

This investigation used structured questionnaires and clinical dental examinations to collect data after obtaining the required permissions from CAPMAS as well as obtaining permissions from the school principals and informed consent from the schoolchildren and their parents. The school types determined the different socioeconomic levels in Egypt. An internationally applied Child Perception Questionnaire for 11–14-year-old children and adolescents (CPQ₁₁₋₁₄) [12] was used to assess the OHRQoL of students participating in this study (Figures 1-3). CPQ₁₁₋₁₄ is a 37-item questionnaire that assesses oral health-related quality of life (OHRQoL) from four perspectives: Oral symptoms, functional limits, and emotional as well as social well-being. This questionnaire has been used extensively in the previous

studies and was proved to have excellent validity and reliability [12], [13].

Harter's self-perception profile for children [14], [15] was used to evaluate the student's self-esteem (Figures 4 and 5). This is a self-report magnitude estimation scale that assesses children's general sense of self-worth and self-competence in the academic abilities' domain. It was created specifically to assess children's self-esteem between the ages of 8 and 14. Scholastic, athletic, and social competence, as well as physical appearance and behavioral conduct, are the five self-concept areas that this measure delves into. A sixth subscale, Global Self-Worth (or self-esteem), is also included. There are 36 items in total, six for each subscale.

A children psychiatrist evaluated the questionnaires to ensure better applicability to the Egyptian culture and the sample age range. It was additionally translated from English to Arabic in a professional translation facility to meet the common Egyptian language and minimize any potential misunderstandings.

Questions about school

Have you had these experiences **because of your teeth, lips, jaws or mouth**? If it was for another reason, answer **"NEVER"**

	Never	Once or twice	More than twice	Every day or almost everyday
16-Missed school because of pain, appointments or surgery?				
17-Had a hard time paying attention in school?				
18-Had difficulty doing your homework?				
19-Not wanted to speak or read out loud in class?				

Questions about feelings

Have you had these feelings **because of your teeth, lips, jaws or mouth**? If you felt this way for another reason, answer **"NEVER"**

	Never	Once or twice	More than twice	Every day or Almost Everyday
20-Felt irritable or frustrated?				
21-Felt unsure of yourself?				
22-Felt shy or embarrassed?				
23-Been concerned about what other people think about your teeth, lips, mouth or jaws?				
24-Worried that you are not as good-looking as others?				
25-Been upset?				
26-Felt nervous or afraid?				
27-Worried that you are not as healthy as others?				
28-Worried that you are different than other people?				

Figure 2: CPQ₁₁₋₁₄ page 2

A quick clinical examination was done and the student's occlusion was categorized according to Angle's classification of malocclusion [16]. The orthodontic treatment need was evaluated by the index of orthodontic treatment need (IOTN) [17] with its two components, the dental health component (DHC) and esthetic component (AC). The first component of the IOTN scale to be evaluated was the dental health component, which has five grades ranging from "no need" for treatment to "severe need." The single worst occlusal feature was given a grade. If the student received a grade of 3, indicating a need for treatment on the borderline, the esthetic component score was taken into account, and the student received a grade between 3.1 and 3.10.

The AC is intended to supplement the DHC by recording the severity of anterior esthetic tooth arrangement using ten images that are evaluated from 1 to 10 in terms of tooth esthetics, with Grade 1 indicating no esthetic need and Grade 10 indicating a severe esthetic need for treatment [18].

According to the British orthodontic society's recommendations, a DHC of 4 or 5 suggests orthodontic treatment need, and a DHC of 3 (combined with an AC of higher than 6) also indicates orthodontic treatment need or severe malocclusion. A DHC of <4 and an AC score of <7 do not appear to necessitate treatment, according to most experts.

Statistical analysis

Qualitative data were presented as frequencies and percentages. Numerical data were explored for

normality by checking the distribution of data and using tests of normality (Kolmogorov–Smirnov and Shapiro–Wilk tests). IOTN and Harter's self-esteem as well as CPQ₁₁₋₁₄ questionnaire scores data showed non-normal (non-parametric) distribution. Quantitative data were presented as mean and standard deviation (SD) values.

For qualitative data, the Chi-square test or Fisher's Exact test was used for comparisons between groups. For non-parametric data, Kruskal–Wallis's test was used to compare between the groups. Dunn's test was used for pair-wise comparisons when Kruskal–Wallis's test is significant. The significance level was set at $P \leq 0.05$. Statistical analysis was performed with IBM SPSS Statistics for Windows, Version 23.0. Armonk, NY: IBM Corp.

Results

Distribution of malocclusion according to angle's classification

There was no statistically significant difference between classes of malocclusion in the three groups (Table 1 and Figure 6).

Assessment of detailed IOTN in the three groups/socioeconomic levels

There was a statistically significant difference between IOTN scores in the three groups. Pair-wise comparisons between the groups revealed that there

Questions about your spare-time activities & being with other people

Have you had these experiences **because of your teeth, lips, jaws or mouth?** If it was for another reason, answer "NEVER"

	Never	Once or twice	More than twice	Every day or almost everyday
29-Avoided taking part in activities like sports, clubs, music or school trips?				
30-Not wanted to talk to other people?				
31-Avoided smiling or laughing when around other people?				
32-Had difficulty playing a musical instrument such as a flute, clarinet or trumpet?				
33-Not wanted to spend time with other children?				
34-Argued with other people?				
35-Been teased or called names?				
36-Felt left out?				
37-Been asked questions about your teeth, lips, jaws or mouth?				

Figure 3: CPQ₁₁₋₁₄ page 3

was no statistically significant difference between governmental and private schools; both showed statistically significantly higher median IOTN scores than international schools. The comparison between IOTN scores in the three groups is shown in Table 2.

DHC components of IOTN

There was no statistically significant difference between DHC components of IOTN in the three groups. A comparison between the DHC components of IOTN in the three groups is shown in Table 3 and the bar chart representing the DHC components of IOTN in the three groups is shown in Figure 7.

AC components of IOTN

There was no statistically significant difference between AC components of IOTN in the three groups. The total number of participants is changed because these are the cases with DHC 3 only and not all cases. A comparison between AC components of IOTN in the three groups is shown in Table 4 and represented by a bar chart in Figure 8.

CPQ₁₁₋₁₄ scores in the three groups

Regarding the total CPQ₁₁₋₁₄ scores as shown in Table 5, there was a statistically significant difference between the three groups. Pair-wise comparisons between the groups revealed that governmental scores showed the statistically significantly highest mean CPQ₁₁₋₁₄ score (Worst OHR-QOL). Private schools showed statistically significantly lower mean scores.

International scores showed the statistically significantly lowest mean CPQ₁₁₋₁₄ score (Best OHR-QOL).

groups Harter's self-esteem scores in the three groups

There was no statistically significant difference between mean Harter's self-esteem scores of different domains in the three groups as shown in Table 6.

Discussion

The current observational and cross-sectional study investigated whether the socioeconomic status affected the incidence of malocclusion according to Angle's classification as well as the orthodontic treatment need evaluated by the IOTN score. Moreover, the study investigated the oral health-related quality of life (OHRQoL) and self-esteem in relation to the socioeconomic level.

Regarding the distribution of the occlusal status in the current sample, normal occlusion was found in 12% of the total sample. There was no statistically significant difference between classes of malocclusion in the three school groups. Class I was the most prevalent type of malocclusion at 58.3% followed by Class II division 1 at 21.3% then Class III at 5.9% and the least class of malocclusion in prevalence was Class II division 2 which was 2.4%. There were no significant differences between the school types in the distribution of malocclusion classes which suggests that

		Please tick ONE box only					
	Really true for me	Sort of true for me		Sort of true for me	Really true for me		
1	<input type="checkbox"/>	<input type="checkbox"/>	Some kids find their school work easy	But	Other kids find their school work hard	<input type="checkbox"/>	<input type="checkbox"/>
2	<input type="checkbox"/>	<input type="checkbox"/>	Some kids find it hard to make friends	But	Other kids find it easy to make friends	<input type="checkbox"/>	<input type="checkbox"/>
3	<input type="checkbox"/>	<input type="checkbox"/>	Some kids are good at all sports	But	Other kids find sports very hard	<input type="checkbox"/>	<input type="checkbox"/>
4	<input type="checkbox"/>	<input type="checkbox"/>	Some kids think they look good	But	Other kids are not happy with the way they look	<input type="checkbox"/>	<input type="checkbox"/>
5	<input type="checkbox"/>	<input type="checkbox"/>	Some kids behave badly sometimes	But	Other kids are well behaved	<input type="checkbox"/>	<input type="checkbox"/>
6	<input type="checkbox"/>	<input type="checkbox"/>	Some kids often don't like themselves	But	Other kids are pretty pleased with themselves	<input type="checkbox"/>	<input type="checkbox"/>
7	<input type="checkbox"/>	<input type="checkbox"/>	Some kids feel they are as clever as other people	But	Other kids think they are not as clever as other people	<input type="checkbox"/>	<input type="checkbox"/>
8	<input type="checkbox"/>	<input type="checkbox"/>	Some kids have loads of friends	But	Other kids don't have many friends	<input type="checkbox"/>	<input type="checkbox"/>
9	<input type="checkbox"/>	<input type="checkbox"/>	Some kids wish they were a lot better at sport	But	Other kids feel they are good at sport	<input type="checkbox"/>	<input type="checkbox"/>
10	<input type="checkbox"/>	<input type="checkbox"/>	Some kids are happy with their height and weight	But	Other kids wish they could change their height and weight	<input type="checkbox"/>	<input type="checkbox"/>
11	<input type="checkbox"/>	<input type="checkbox"/>	Some kids usually do the right thing	But	Other kids often don't do right things	<input type="checkbox"/>	<input type="checkbox"/>
12	<input type="checkbox"/>	<input type="checkbox"/>	Some kids are not happy with the way they lead their life	But	Other kids are happy with the way they lead their life	<input type="checkbox"/>	<input type="checkbox"/>
13	<input type="checkbox"/>	<input type="checkbox"/>	Some kids are slow at finishing their schoolwork	But	Other kids finish their schoolwork quickly	<input type="checkbox"/>	<input type="checkbox"/>
14	<input type="checkbox"/>	<input type="checkbox"/>	Some kids wish they had more friends	But	Other kids have as many friends as they want	<input type="checkbox"/>	<input type="checkbox"/>
15	<input type="checkbox"/>	<input type="checkbox"/>	Some kids feel they could do well at any new sport	But	Other kids are scared that they will do badly at a new sport	<input type="checkbox"/>	<input type="checkbox"/>
16	<input type="checkbox"/>	<input type="checkbox"/>	Some kids are not happy with their body	But	Other kids like the way their body is	<input type="checkbox"/>	<input type="checkbox"/>
17	<input type="checkbox"/>	<input type="checkbox"/>	Some kids usually behave the way they know they are supposed to	But	Other kids often do not behave the way they know they are supposed to	<input type="checkbox"/>	<input type="checkbox"/>
18	<input type="checkbox"/>	<input type="checkbox"/>	Some kids are happy with themselves as a person	But	Other kids are often not happy with themselves	<input type="checkbox"/>	<input type="checkbox"/>
19	<input type="checkbox"/>	<input type="checkbox"/>	Some kids can't remember what the leam	But	Other kids can remember things easily	<input type="checkbox"/>	<input type="checkbox"/>
20	<input type="checkbox"/>	<input type="checkbox"/>	Some kids are always doing things with a lot of people	But	Other kids do things by themselves	<input type="checkbox"/>	<input type="checkbox"/>
21	<input type="checkbox"/>	<input type="checkbox"/>	Some kids feel they are better at sport than their friends	But	Other kids don't feel they can play sport as well as their friends	<input type="checkbox"/>	<input type="checkbox"/>
22	<input type="checkbox"/>	<input type="checkbox"/>	Some kids wished they looked different	But	Other kids are happy with their appearance	<input type="checkbox"/>	<input type="checkbox"/>

Figure 4: Harter's Self Perception Profile for Children from question pages 1-2

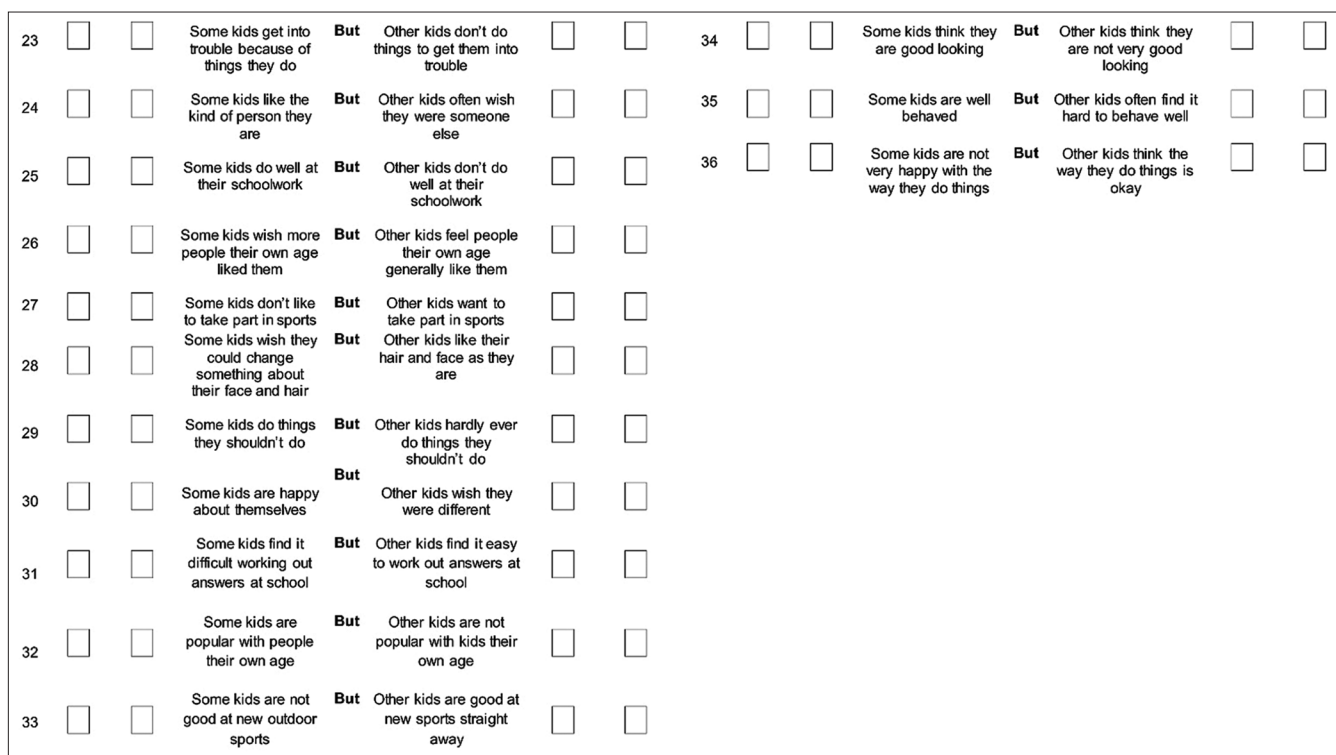


Figure 5: Harter's self-perception profile for children pages 3-4

Table 1: Descriptive statistics and results of Fisher's exact test for comparison between classes of malocclusion in the three groups

Classes of malocclusion	Total (n = 324), n (%)	Governmental (n = 108), n (%)	Private (n = 108), n (%)	International (n = 108), n (%)	p	Effect size (v)
Normal	39 (12)	8 (7.4)	12 (11.1)	19 (17.6)	0.426	0.115
Class I	189 (58.3)	64 (59.3)	65 (60.2)	60 (55.5)		
Class II Division 1	69 (21.3)	25 (23.1)	22 (20.4)	22 (20.4)		
Class II Division 2	8 (2.4)	5 (4.6)	2 (1.8)	1 (0.9)		
Class III	19 (5.9)	6 (5.6)	7 (6.5)	6 (5.6)		

Table 2: Descriptive statistics and results of Kruskal-Wallis's test for comparison between index of orthodontic treatment need scores in the three groups

Governmental (n = 108)		Private (n = 108)		International (n = 108)		p	Effect size (eta squared)
Mean (SD)	Median (range)	Mean (SD)	Median (range)	Mean (SD)	Median (range)		
3.13 (1.14)	3.4 (1-5) ^a	3.31 (1.27)	3.5 (1-5) ^a	2.89 (1.23)	3.2 (1-5) ^b	0.031*	0.016

*Significant at p ≤ 0.05. Different superscripts indicate statistically significant differences according to Dunn's test. SD: Standard deviation.

Table 3: Descriptive statistics and results of Chi-square test for comparison between dental health component of index of orthodontic treatment need in the three groups

DHC grades	Governmental (n = 108), n (%)	Private (n = 108), n (%)	International (n = 108), n (%)	p	Effect size (v)
1	8 (7.4)	12 (11.1)	19 (17.6)	0.289	0.122
2	27 (25)	25 (23.1)	28 (25.9)		
3	31 (28.7)	27 (25)	31 (28.7)		
4	25 (23.1)	27 (25)	22 (20.4)		
5	17 (15.7)	17 (15.7)	8 (7.4)		

AQ4 *Significant at p ≤ 0.05. DHC: Dental health component.

socioeconomic level likely does not affect malocclusion through Angle's classification.

The prevalence of Class III malocclusion in the present study was in agreement with an Egyptian

Table 4: Descriptive statistics and results of Fisher's exact test for comparison between aesthetic component of index of orthodontic treatment need in the three groups

AC grades	Governmental (n = 31), n (%)	Private (n = 27), n (%)	International (n = 31), n (%)	p	Effect size (v)
1	4 (12.9)	3 (11.1)	2 (6.5)	0.995	0.192
2	4 (12.9)	2 (7.4)	5 (16.1)		
3	3 (9.7)	6 (22.2)	6 (19.4)		
4	8 (25.8)	5 (18.5)	5 (16.1)		
5	2 (6.5)	4 (14.8)	4 (12.9)		
6	1 (3.2)	1 (3.7)	1 (3.2)		
7	1 (3.2)	0	1 (3.2)		
8	1 (3.2)	1 (3.7)	2 (6.5)		
9	4 (12.9)	3 (11.1)	3 (9.7)		
10	3 (9.7)	2 (7.4)	2 (6.5)		

AQ4 *Significant at p ≤ 0.05. AC: Esthetic component.

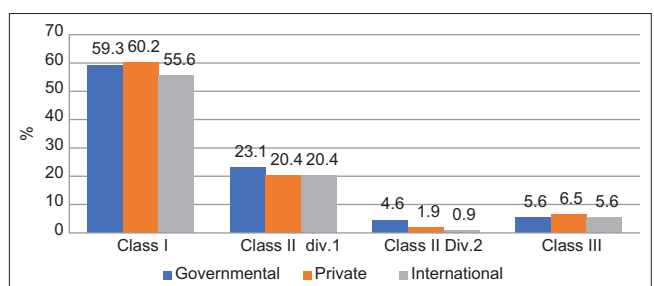


Figure 6: Bar chart representing the distribution of malocclusion according to Angle's classification in the three groups

Table 5: Descriptive statistics and results of Kruskal–Wallis’s test for comparison between CPQ₁₁₋₁₄ questionnaire scores in the three groups

CPQ ₁₁₋₁₄ domains	Governmental (n = 108)		Private (n = 108)		International (n = 108)		p	Effect size (Eta squared)
	Mean	SD	Mean	SD	Mean	SD		
Oral symptoms	5.12	2.15	4.88	2.31	4.6	2.11	0.218	0.018
Functional limitation	3.89	1.5	3.31	1.34	3.11	1.26	0.175	0.033
Emotional well-being	5.34	2.29	5	3.1	4.75	2.81	0.328	0.012
Social well-being	4.31	2.06	4.16	2.45	3.92	1.94	0.206	0.017
Total score	18.66 ^A	9.13	17.35 ^B	10.09	16.38 ^C	9.67	0.035*	0.108

*Significant at p ≤ 0.05, different superscripts in the same row indicate statistically significant differences according to Dunn’s test. SD: Standard deviation.

survey study evaluating the prevalence of malocclusion among schoolchildren in Cairo by Fsfis *et al.* [19] (5.9%). However, compared to the same study, there was a tendency toward a decrease in the prevalence of accepted occlusion (25.7%) and an increase in Angle Class I (51.5%) and II (16.4%) malocclusion.

In the present study, the distribution of IOTN DHC and AC components in the studied sample showed the highest prevalence of DHC3 and AC4 which is considered borderline orthodontic treatment need. Moreover, 36% of the population aged 11–14 years old required orthodontic treatment, according to the IOTN DHC. As regards the AC, according to the results of the present investigation, 25% were assigned to the need for treatment in AC Grades 7–10. The results showed comparable results to a study investigating the orthodontic treatment need in urban Iranian schoolchildren aged 11–14 years which showed 36.1% had definite need according to the IOTN DC and 17.9% according to the IOTN AC [20].

The results of the present study revealed that the total IOTN score was lower in international schools than in governmental and private schools. In other words, orthodontic treatment need (IOTN) was greater in the lower socioeconomic level groups and this agrees with findings and conclusions by the previous studies [21], [22]. Participants with a higher socioeconomic level and those living in comparative social deprivation are likely to have different social norms in relation to oral health, this possibly leads to oral health inequality. Parents with a higher education level and socioeconomic status are more likely to pay greater attention to children’s dental care as well as keeping their teeth healthy and influencing them to maintain their oral health and avoid early childhood caries and extractions.

Regarding the oral health-related quality of life (OHR-QoL), total CPQ₁₁₋₁₄ scores in the current study showed that the OHR-QoL was worst in governmental schools and the best in international schools which

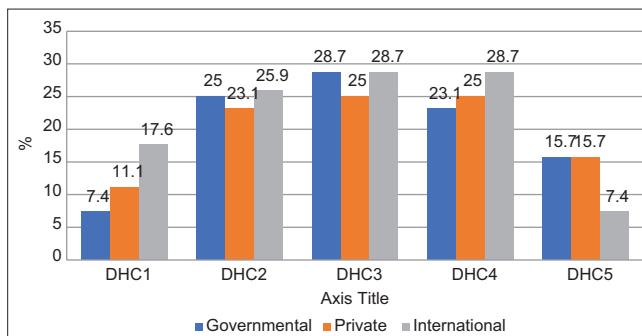


Figure 7: Bar chart representing DHC components of IOTN in the three groups

indicates that socioeconomic status (SES) plays an important role in the OHRQoL. These findings are in accordance with the findings of a meta-analysis study by Knorst *et al.* [23] which concluded that individuals with low SES had poorer OHRQoL, regardless of the country’s economic classification, SES indicator, and age group.

On the other hand, the self-esteem of the students, according to the current questionnaire results, was not likely affected by the difference in socioeconomic level as it showed no significant differences between the school types. The link between self-esteem and SES is possibly weaker in children than in adults and we would have likely come to quite different findings if the current investigation had studied different age groups.

Conclusions

1. Lower SES was associated with higher orthodontic treatment need according to the total IOTN score and worst OHRQoL.
2. Socioeconomic status did not affect the distribution of malocclusion according to Angle’s

Table 6: Descriptive statistics and results of Kruskal–Wallis’s test for comparison between Harter’s self-esteem scores in the three groups

Harter’s self-esteem domains	Governmental (n = 108)		Private (n = 108)		International (n = 108)		p	Effect size (Eta squared)
	Mean	SD	Mean	SD	Mean	SD		
Scholastic competence	2.39	1.2	2.55	1.18	2.79	1.06	0.152	0.04
Social competence	2.42	1.26	2.6	0.94	2.88	1.34	0.215	0.021
Athletic competence	2.55	1.31	2.71	1.07	2.79	1.64	0.247	0.011
Physical appearance	2.3	1.15	2.45	1.24	2.68	1.17	0.195	0.026
Behavioral conduct	2.42	1.42	2.75	1.36	2.9	1.27	0.087	0.094
General mean	2.41	1.38	2.61	1.42	2.81	1.42	0.060	0.105

*Significant at p ≤ 0.05. SD: Standard deviation.

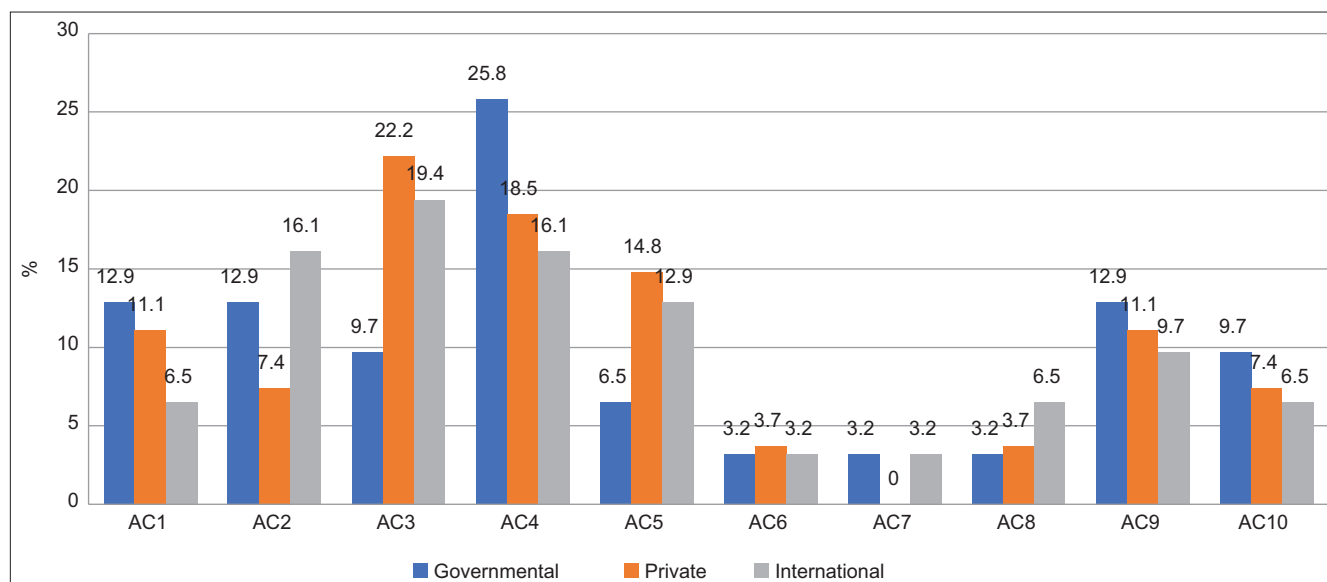


Figure 8: Bar chart representing AC components of IOTN in the three groups

- classification nor did it affect self-esteem.
3. There was a tendency toward decrease in the prevalence of accepted occlusion in the total sample and an increase in Angle Class I and II malocclusion.

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