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An epidemiological survey using the Treatment Priority Index (TPI)

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SUMMARY The purpose of this study was to evaluate the prevalence of malocclusion and to assess the need for orthodontic treatment among 6–10 year old Turkish primary school children. The Treatment Priority Index (TPI) was used to record and measure the malocclusions. The findings were that 40.38 per cent of the observed population showed normal occlusion, 21.85 per cent had minor manifestations of malocclusion and treatment need was slight, 25.17 per cent of the subjects showed definite malocclusion, 7.54 per cent had severe malocclusion and 5.06 per cent had a very severe handicap with a mandatory treatment requirement. Orthodontic treatment need increased between 6 and 10 years of age. No statistically significant difference was found between the mean TPI values of male and female subjects.

Introduction

Measuring and recording the severity and prevalence of malocclusion is not only important for evaluating the occlusal status of subjects in a community and establishing the treatment priority, but it can be used as an epidemiological tool for preventive procedures or for training orthodontic specialists.

There are several methods that may be used to evaluate, describe and classify occlusion. These can be classified basically as qualitative and quantitative (Tang and Wei, 1993). Qualitative variables define only the presence or absence of a selected malocclusion criteria. A series of malocclusion studies have been undertaken using qualitative methods of assessment (Helm, 1968; Wood, 1971; Baume, 1974; Infante, 1975; Kerosuo, 1990; Kristneli and Shim, 1992). Later, attempts were made to develop an objective method for measuring and recording occlusal features. Two of these quantitative methods were the Occlusal Index (OI; Summers, 1971) and the Treatment Priority Index (TPI; Grainger, 1967). Both the OI and the TPI were similar in many aspects as they were based on the same principle. Although the OI was found to have the least amount of bias (Grewe and Hagan, 1972), its use was too complicated to be applied on large population groups. On the other hand, the TPI had the advantage of being simple and efficient to enable epidemiological surveys of malocclusion possible without undue cost and energy (Slakter *et al.*, 1980).

The purpose of this study was to rank malocclusions and assess the need for orthodontic treatment in relation to age and sex by using the TPI in a group of Turkish primary school children.

Subjects and methods

Data were collected from 572 students of the Middle East Primary School with a high socioeconomic standard in Ankara. Two-hundred-and-fifty-nine girls and 312 boys were examined ranging in age between 6 and 10 years.

Clinical examinations were performed by two experienced orthodontists and the TPI data collection forms were recorded by two others. These four orthodontists were trained and standardized in the use of the TPI. The items measured described the occlusal anomaly such as incisor relationship horizontally and vertically, occlusion of buccal segments and tooth displacement.

FIRST MOLAR RELATION Choose appropriate column		(6) Distoclusion				Neutroclusion	(7) Mesioclusion				Weights	Syndrome Type
		2 sides full c	1 side c to c and 1 side full	2 sides c to c or 1 side full	1 side c to c		1 side c to c	2 sides c to c or 1 side full	1 side c to c and 1 side full	2 sides full c		
Horizontal incisor relation	mm											
(1) Upper Overjet	9+	2.0	3.4	5.4	9.3	10+	9.3	5.4	3.4	2.0		Retrognathism
	9	1.4	2.5	4.0	6 9	10+	6.9	4.0	2.5	1.4		
	8	1.0	1.8	2.8	4.8	8.0	4.8	2.8	1.8	1.0		
	7	.6	1.1	1.8	3.0	5.1	3.0	1.8	1.1	.6		
	6	.4	.6	1.0	1.7	2.9	1.7	1.0	.6	.4		
2-4 mm. NORMAL Score 0	5	.2	.3	.4	.8	1.3	.8	.4	.3	.2		
	1	.2	.3	.4	.8	1.3	.8	.4	.3	.2		Prognathism
	0	.4	.6	1.0	1.7	2.9	1.7	1.0	.6	.4		
(2) Lower Overjet	1	.6	1.1	1.8	3.0	5.	3.0	1.8	1.1	.6		
	2	1.0	1.8	2.8	4.8	8.0	4.8	2.8	1.8	1.0		
	3	1.4	2.5	4.0	6.9	10+	6.9	4.0	2.5	1.4		
	3+	2.0	3.4	5.4	9.3	10+	9.3	5.4	3.4	2.0		
Vertical incisor relation												
(3) Overbite in crown thirds	Bite	2.9	3.8	4.8	.6.2	8.0	6.2	4.8	3.8	2.9		Overbite
	3/3+	1.5	2.0	2.4	3.2	4.1	3.2	2.4	2.0	1.5		
	2/3-3/3	.5	.7	.9	1.1	1.5	1.1	.9	.7	.5		
0-2/3 NORMAL Score 0												
	<2	1.5	2.0	2.4	3.2	4.1	3.2	2.4	2.0	1.5		Openbite
	2-4	2.9	3.8	4.8	6.2	8.0	6.2	4.8	3.8	2.9		
(4) Openbite in mm.	4+	4.9	6.3	7.9	10+	10+	10+	7.9	6.3	4.9		
(10) Tooth displacement score												
Count teeth rotated about 45° or displaced about 2 mm.	2	.1	.1	.2	.3	.4	.3	.2	.1	.1		Is distoclusion and/or posterior crossbite max. to buccal
	3	.2	.3	.4	.7	1.1	.7	.4	.3	.2		
	4	.3	.5	.9	1.2	1.9	1.2	.9	.5	.3		
Count teeth rotated >45° or displaced more than 2mm x 2	5	.5	.8	1.2	1.9	3.0	1.9	1.2	.8	.5		PRESENT
	6	.7	1.1	1.8	2.8	4.3	2.8	1.8	1.1	.7		
Total (0, 1 no score)	7	1.0	1.5	2.4	3.9	5.9	3.9	2.4	1.5	1.0		YES: Max. Expansion Syndrome
	8	1.3	1.9	3.1	4.9	7.7	4.9	3.1	1.9	1.3		
	9	1.7	2.5	4.1	6.2	9.7	6.2	4.1	2.5	1.7		NO: Max. Collapse Syndrome
	9+	2.0	3.0	4.9	7.7	10+	7.7	4.9	3.0	2.0		
CONSTANT		5.17	3.95	2.72	1.50	0.27	1.50	2.72	3.95	5.17		
(8) Posterior Crossbite Count No. of teeth												
MAX. TO BUCCAL	No.	0	1	2	3	4	5	6	7	8	more	
	Weight	0	.1	.6	1.3	2.2	3.5	5.0	6.9	9.0	10	
MAX. TO LINGUAL	No.	0	1	2	3	4	5	6	more			
	Weight	0	.3	1.0	2.3	4.2	6.5	9.4	10			
SUM OF WEIGHTS IS TREATMENT PRIORITY INDEX												

Figure 1 The TPI data collection form.

These syndromes were weighted according to the first molar relationship as mesio, neutro and distoclusion (Figure 1). The weights that corresponded to the recorded syndromes were summed and a total TPI score was calculated for each subject. The level of severity of a malocclusion was assessed according to the Malocclusion Severity Estimate (MSE) (Grainger, 1967). A modification of this scale was used in the present study (Ghafari *et al.*, 1989) with the exception that the constant value for neutroclusion on the TPI form was scored for normal occlusion. In this

Table 1 Levels of severity of a malocclusion as established by the malocclusion severity estimate (MSE) and for the present study.

Interpretation	MSE	Study
I. Virtually classic normal occlusion	0	≤0.27
II. Minor manifestations of malocclusion and treatment need is slight	1–3	0.27–≤3.99
III. Definite malocclusion, but treatment elective	4–6	3.99–≤6.99
IV. Severe handicap, treatment highly desirable	7–9	6.99–≤9.99
V. Very severe handicap with treatment mandatory	>10	>10

regard, the severity level for normal occlusion was assessed as 0.27 and for minor manifestations of malocclusion as 0.27–≤ 3.99 (Table 1). Subjects who had previous orthodontic treatment were excluded from the evaluation.

Statistical analysis

The TPI differences between 6–10 years were examined using the Kruskal–Wallis one-way analysis of variance. Age groups were then compared two by two using the Mann–Whitney *U*-test. Sex difference was also evaluated using the Mann–Whitney *U*-test.

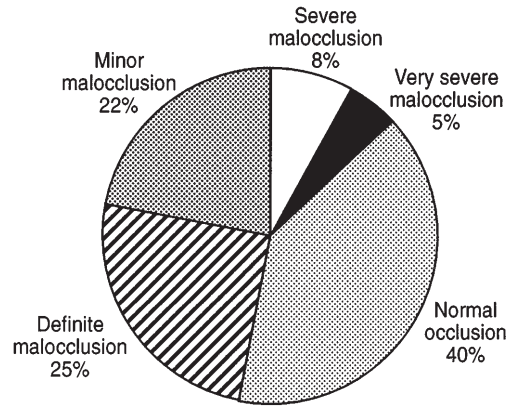

Figure 2 The distribution of malocclusion severity.

Results

A normal occlusion was present in 40.38 per cent of the population, 21.85 per cent had a slight malocclusion, 25.17 per cent had a definite malocclusion, 7.52 per cent had a severe malocclusion and 5.08 per cent had a very severe malocclusion (Table 2, Figure 2).

The mean TPI values showed a significant increase between 6–8, 6–9, 6–10, and 7–8, 7–9, 7–10 years of age ($P < 0.05$) (Table 3).

The difference between the mean TPI values of boys and girls was not found to be significant (Table 4).

Discussion

The purpose of this study was to measure the prevalence and severity of malocclusions in 6–10-year-old Turkish primary school children. The TPI was selected for this evaluation as it has

Table 2 Percentage of the subjects according to malocclusion severity.

Subjects (%)	Malocclusion	Treatment need
40.38	Normal occlusion	–
21.85	Minor	Slight
25.17	Definite	Elective
7.52	Severe	Highly desirable
5.08	Very severe	Mandatory

Table 3 The TPI statistics between ages 6–10.

Age	*n*	Mean	Min	Max	SD
6	120	2.31	0.27	16.77	2.99
7	129	3.02	0.27	15.37	3.71
8	117	3.24	0.27	12.17	3.17
9	117	4.14	0.27	19.17	3.75
10	89	3.31	0.27	11.57	3.08

Table 4 The TPI statistics of boys and girls.

	n	Mean	Min	Max	SD	*P*
Boys	312	3.34	0.27	16.77	3.31	>0.05
Girls	259	3.08	0.27	19.17	3.50	

proved to be a useful epidemiological indicator of malocclusion (Ghafari *et al.*, 1989). Some disadvantages were noted about the TPI such as deleting the mixed dentition analysis when the original MSE was revised, and giving the same score for distal and mesial molar relationships. On the other hand, there is no universally accepted index that defines all characteristics of a malocclusion as this is a multifactorial problem (Tang and Wei, 1993). In addition, the advantages of this index are much more important. It has been found to be highly reproducible and valid (Hermanson and Grewe, 1970; Albino *et al.*, 1978). Application of the TPI is practicable and requires less clerical time when compared with the OI (Tang and Wei, 1993). Thus, the TPI is a useful index for measuring need for treatment and as an aid in the identification of children who can most benefit from orthodontic treatment (Slakter *et al.*, 1980).

In this study, 572 children with a high socio-economic standard were evaluated and 40.38 per cent showed normal occlusion, 21.85 per cent had minor manifestations of malocclusion, 25.17 per cent had a definite malocclusion, 7.52 per cent had a severe, and 5.08 per cent had very severe malocclusions. By using the TPI, Güray *et al.* (1994) found 72.26 per cent of 483 students required orthodontic treatment in a primary school with a low socio-economic standard from Konya district. Güray *et al.* (1994) used the modified MSE (Ghafari *et al.*, 1989).

Orthodontic treatment need increased with age in the present study. Güray *et al.* (1994) found no age differences, whereas Ghafari *et al.* (1989) reported a decrease in TPI values with increasing age and explained this as the inability of the TPI to depict crowding of the unerupted permanent canines and premolars.

The mean TPI values of male and female subjects showed no statistically significant difference and this is in agreement with Güray *et al.* (1994). However, Ghafari *et al.* (1989) found that crowding and rotation were more severe in males than female subjects, and made the assumption that growth proceeding over a longer period of time contributed to the development of greater displacement in boys.

This study was undertaken in a primary school with a high socio-economic standard. However, similar TPI scores were recorded from an area with a low socio-economic standard (Güray *et al.*, 1994). These results underscore the high percentage of orthodontic treatment need in Turkey and indicate the importance of preventive orthodontic procedures.

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