

Original Article

The prevalence of orthodontic treatment need and malocclusion problems in 8–9-year-old schoolchildren: A study in the south of Thailand

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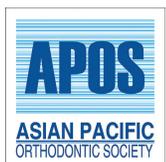
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ABSTRACT

Aims: This study aims to find the prevalence of orthodontic treatment need and malocclusion problems in 8–9-year-old schoolchildren in the south of Thailand.

Materials and Methods: A number of 202 children (100 boys and 102 girls) samples were randomly selected from all schools in Hat Yai District, Songkhla Province, Thailand. A cross-sectional survey of dental health component (DHC) of the Index of Orthodontic Treatment Need (IOTN) and malocclusion problems was investigated by clinical examination and dental model.

Results: Levels 4 and 5 of orthodontic treatment need according to DHC of IOTN of the sample were presented in 18.8% and 1.49%, respectively. Children who need orthodontic treatment (Grade 2–4) showed more than one highest DHC problem that indicated the level of treatment need (39.68%). Normal occlusion was found at 6.43%. Malocclusions such as Class I, Class II division 1, Class II division 2, and Class III malocclusion were observed in 78.71%, 7.92%, 3.47%, and 3.47%, respectively. Reversed overjet and overjet >9 mm were detected in 5.64% and 1.58%, respectively. Approximately half of the children (46.67%) had overbite >3.5 mm.

Conclusions: High percentage of children in mixed dentition period who need orthodontic treatment was found in this study. Some children who presented with the orthodontic treatment need Grade 2–4 had more than one DHC problem which identified the grade of treatment need. Class I malocclusion was most frequently found in this group of children.

Keywords: Children, Index of Orthodontic Treatment Need, Malocclusion, Orthodontic treatment need

INTRODUCTION

Although malocclusion is not considered a disease but a normal deviated condition, evidence showed that it was related to the whole physical health and quality of life.^[1] In general, orthodontic treatment in permanent dentition is a time-consuming treatment because all permanent teeth were erupted. Early treatment would, therefore, be beneficial to most of the children.^[2,3]

In countries with a high need in orthodontic treatment, experienced practitioners could perform preventive and interceptive orthodontic treatments as primary dental care before referring to the orthodontists. Two previous studies in Thailand showed that non-orthodontists were willing and welcomed to do some preventive and interceptive orthodontic treatments.^[4,5] However,

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continuing studies and short-course trainings on preventive and interceptive orthodontic treatments were recommended for the non-orthodontist to increase their experiences and performances.^[4,5]

To provide appropriate further education for the health authorities, the study of the prevalence of orthodontic treatment need and malocclusion problems in mixed dentition is necessary. In many western countries, widely different distributions of each malocclusion and the prevalence of orthodontic treatment need are noted. It is, therefore, difficult to compare as each survey used different methods of evaluation.^[6-11] In Thailand, however, there was only one study in mixed dentition in 1986. This study showed that the distribution of malocclusion in Thai children was different from that of western countries.^[6] To date, the orthodontic treatment need in mixed dentition in Thailand needs to be investigated and updated.

The Index of Orthodontic Treatment Need (IOTN) is one of the indexes widely used to evaluate the orthodontic treatment need in permanent dentition. It consisted of two main components: Dental health component (DHC) and esthetic component (AC).^[12,13] In mixed dentition, the DHC could be used for the evaluation of orthodontic treatment need.^[9,11,14-16]

This study aimed to determine the prevalence of orthodontic treatment need using DHC of IOTN and identify the prevalence of malocclusion in a group of 8–9-year-old schoolchildren in the South of Thailand.

MATERIALS AND METHODS

Ethical approval of this study was granted in November 2015 (EC5810-30-P-LR) by the Research Ethics Committee, Faculty of Dentistry, Prince of Songkhla University. Population of the study consisted of all 8–9-year-old children who are registered in primary schools in Hat Yai District, Songkhla Province, Thailand, without any present orthodontic treatment and congenital deformity. Non-cooperative children who refuse to be examined or those who lack parents' consent forms were excluded from the study.

Since there is no previous study on the prevalence of orthodontic treatment need in mixed dentition in Thailand, the sample size was estimated at 50% prevalence with 5% precision and power of 80%. The calculated total sample size was 165 children. According to the number of children lived in central area of Hat Yai district was less than the suburb area. The stratified random sampling was used in this study by dividing the school into two groups which were central area and suburb area. The school in central area was firstly picked by simple random sampling method, then picked the school in suburb area to a proportional of children at central: suburb at 1:3 until getting the equal number of required

sample size. Four hundred permission forms were sent to the children's parents with 216 positive consents returned. However, 14 children had to be excluded from the study due to lack of cooperation and incomplete data. As a result, 202 children were included in the study.

Before the period of data collection, the researcher was trained and calibrated all DHC components with orthodontic expert in 31 schoolchildren in both clinical and dental model examination. The Kappa value for inter-reliability was 0.87. The same dental models were used to re-examination in 2 weeks by the researcher. The Kappa value for intra- reliability was 0.86.

Data were collected during June to November 2016 in selected schools under daylight condition. The dental model was obtained and the intercuspal position was registered using wax bite. The data included both clinical and dental model examination. The dental models were examined to access orthodontic treatment need and malocclusion. The orthodontic treatment need was evaluated according to the DHC of IOTN. The details of DHC of IOTN, specifically used in this study, is presented in Table 1.

The malocclusion problems were evaluated in the intercuspal position and registered as follows:

1. Occlusion

- Normal occlusion defined as Class I or flush terminal plane of molar relationship, 1–2 mm of overjet and overbite, no crowing or large spacing, no transverse discrepancy, no reduction of posterior arch length due to caries, or early loss of primary dentition.
- Malocclusion was defined when the children did not meet the normal occlusion criteria, using both permanent molars and incisors relationship, as Class I malocclusion, Class II malocclusion, and Class III malocclusion.

2. Overjet, overbite, and open bite

The overjet, overbite, and open bite were recorded as unmeasurable when the upper and/or lower incisors that provided the measurable landmark were not presented.

- Overjet: It was measured by periodontal probe from labial surface of the most protruded lower incisor to labial surface of the most protrude upper incisor. Reverse overjet was defined as all erupted lower incisors were labial to upper incisors.
- Overbite and open bite: It was measured by periodontal probe from the most vertical overlapping of upper incisor and lower incisor.

3. Anterior crossbite: It was measured according to the IOTN criteria. The amount of discrepancy between retruded contact position and intercuspal position was measured with periodontal probe during clinical examination.

Table 1: Malocclusion traits, level of severity, and grades of the DHC in the IOTN*.

Malocclusion traits	Level of severity	Grade of DHC
Overjet	>9 mm	5
	>6 mm but ≤9 mm	4
	>3.5 mm but ≤6 mm with incompetent lips at rest	3
	>3.5 mm but ≤6 mm with competent lips at rest	2
	0–3.5 mm	1
Reverse overjet	>3.5 mm with reported masticatory or speech difficulties	5
	>3.5 mm with no reported masticatory or speech difficulties	4
	>1 mm but ≤3.5 mm	3
	>0 mm but ≤1 mm	2
Impeded eruption of teeth	Due to crowding, displacement, the presence of supernumerary teeth, retained primary teeth, and any other pathological cause (exception of third molars)	5
Hypodontia	Extensive hypodontia with restorative implication (more than one tooth missing in any quadrant) requiring pre-restorative orthodontics	5
	Less extensive hypodontia requiring pre-restorative orthodontics or orthodontic space closure to obviate the need for a prosthesis (not more than one tooth missing in any quadrant)	4
Anterior or posterior cross bites	>2 mm displacement between retruded contact position and intercuspal position	4
	≤2 mm but >1 mm displacement between retruded contact position and intercuspal position	3
	≤1 mm displacement between retruded contact position and intercuspal position	2
Posterior lingual cross bites	No occlusal contact in one or both buccal segments	4
Extreme lateral or anterior open bite	>4 mm	4
	>2 mm but ≤4 mm	3
	>1 mm but ≤2 mm	2
Overbite	Increased and complete overbite causing notable indentation on the palate or labial gingivae	4
	Increased and complete overbite with gingival contact but without indentations or signs of trauma	3
	Increased overbite >3.5 mm with no gingival contact	2
	0–3.5 mm	1
Occlusion	Pre-normal or post-normal occlusion with no other anomalies	2

*Defects of cleft lip and/or palate (Grade 5), displacement of teeth (Grade 1–4), and patient referred by colleague were not measured in this study.
DHC: Dental health component, IOTN: Index of Orthodontic Treatment Need

4. Transverse problems: Complete lingual crossbite and posterior buccal crossbite were identified as a pair of upper and lower corresponding teeth. All posterior deciduous and first permanent molar were measured.

Data were analyzed by SPSS Statistics Bass version 17.0 for window EDU (SPSS Inc., Chicago, USA), using descriptive statistic.

RESULTS

The proportion of boys and girls in this study was 1:1 (100 and 102). Approximately one-thirds of children (29.2%) came from the schools in the central area, whereas the rest (70.8%) came from the suburb area. The mean age of the sample was 8.49 ± 0.50 years.

Table 2 shows that one-fifth of children fell into DHC of IOTN Grade 5 (1.49%) and Grade 4 (18.81%). Orthodontic

treatment need at DHC of IOTN Grade 1 and 2 (no need and very little need) was found at 26.73% and 30.20%, respectively. Most of children in DHC of IOTN Grade 4 and 5 had only one highest DHC problem, 89.13% and 89.47%, respectively. Approximately one-thirds of children in DHC of IOTN Grade 2 (34.43%) had two highest DHC problems. The DHC of IOTN Grade 5 was found in three cases which came from the increased overjet >9 mm [Tables 2 and 3].

Distribution of malocclusion is presented in Table 3. Normal occlusion was found at 6.43%. Class I malocclusion, Class II division 1, Class II division 2, and class III were observed in 78.71%, 7.92%, 3.47%, and 3.47%, respectively. Among children who presented both the upper and lower incisors, normal overjet (0–3.5 mm) was found at 46.37% and normal overbite (0–3.5 mm) was found at 50.26%. Anterior crossbite which had discrepancy between retruded contact position and intercuspal position at <1 mm, 1–2 mm, and

Table 2: Different grading in DHC of IOTN and the amount of the highest DHC problem (s) of IOTN.

Grade of treatment need (DHC of IOTN)	n (%)	Amount of the highest DHC problem (s) of IOTN in each child		
		1	2	3
1	54 (26.73)	6 (11.11)	48 (88.89)	0 (0.00)
2	61 (30.20)	38 (62.30)	21 (34.43)	2 (3.27)
3	46 (22.77)	41 (89.13)	4 (8.70)	1 (2.17)
4	38 (18.81)	34 (89.47)	4 (10.53)	0 (0.00)
5	3 (1.49)	3 (100.00)	0 (0.00)	0 (0.00)
Total	202 (100.00)	122 (60.39)	73 (38.12)	3 (1.49)

DHC: Dental health component, IOTN: Index of Orthodontic Treatment Need

>2 mm was found at 6.15%, 4.62%, and 8.21%, respectively. Most of the children had no transverse problem (96.53%). Supernumerary tooth, impeded eruption, and hypodontia were rarely found (<1.50%).

DISCUSSION

Dental model together with clinical examination were used in this study. This method was expected to increase the precision of the data because it was more easier to evaluate from the dental model than directly from the child, especially in the lateral intermaxillary relationship. During the data collection in this age group, there were occurrences of some problems such as the difficulty to guide the child to bite his/her teeth at the intercuspal position and the lack of their cooperation during taking the dental impression.

Due to limited availability to contact the schools and receiving of the consent form back from their parents, the number of children from the central and suburb areas was much different. The results from this study might be valid for the population that had limited possibility to access dental health service.

To assess the orthodontic treatment need in mixed dentition, the components in DHC of IOTN were easy to be used and measured. It could thus be an alternative tool for evaluation and help in public health service planning. This suggestion was supported by the previous studies which use IOTN to identify orthodontic treatment need in mixed dentition.^[9-11,15,16] However, the AC and the contact point deviation could not be calculated because these parameters were used in permanent dentition.^[9]

To be noted in using DHC of IOTN to evaluate orthodontic treatment need from this study, many children presented with multiple highest DHC problems in each grade of treatment need. This occurrence may lead to the underestimation of the orthodontic treatment need level in some children who actually need the treatment in the mixed dentition period. In addition, the complexity of the orthodontic treatment could not truly be determined using only one malocclusion

characteristic. Therefore, the future development and modification of the IOTN for screening orthodontic treatment need in mixed dentition would be beneficial and contribute to future study. The unmeasurable parameters of IOTN in mixed dentition and space analysis for unerupted permanent teeth are interested to be included when using IOTN in mixed dentition.

The number of children who were in Grade 4 (great need) and Grade 5 (very great need) (20.30%) was lower than the previous study that covered children aged between 12 and 14 years old in the same location (45.51%).^[17] This finding might indicate that the malocclusion was increasing when the children grow up.

The prevalence of Class I malocclusion showed the highest prevalence (78.71%). This percentage is contrasting with the studies in western countries which had a lesser in Class I malocclusion but had a higher Class II characteristic.^[9,11] The overjet and over bite were not measured in some children due to the late eruption of the upper and lower incisors. Dental age in Thai children seemingly had a variation in the eruption of incisors such as the western countries.^[9,18] In Thailand, the study in 1986 found that the prevalence of children who had overjet >6 mm was 5.5%.^[6] This percentage slightly decreased when compared with the current study (4.57%). It appears that overjet problem is still not reduced even the orthodontic treatment was introduced in Thailand since 1987.^[19] Open bite was found only 1% and this characteristic may be hard to diagnose between the normal gap during the incisor eruption and the actual open bite which is related with skeleton discrepancy. Due to this limitation, only the children with fully erupted upper and lower central incisors were evaluated in the open bite component.

Rather, a high percentage of anterior crossbite was found in this study (18.98%). These characteristics should be concerned as an urgent need for orthodontic treatment since it might cause the occlusal interference and traumatic occlusion of the incisors.^[20,21] In contrast, ectopic eruption, submerge tooth, and impacted tooth were rarely found. The reasons might come from the low prevalence of these

Table 3: Distribution of malocclusion of the sample (n=202).

Occlusal traits	Total, n (%)
Occlusal abnormality	
Normal occlusion	13 (6.43)
Class I malocclusion	159 (78.71)
Class II division 1 malocclusion	16 (7.92)
Class II division 2 malocclusion	7 (3.47)
Class III malocclusion	7 (3.47)
Overjet*	
Reverse OJ	11 (5.64)
0–3.5 mm	91 (46.67)
3.5–6.0 mm with competent lip	79 (40.51)
3.5–6.0 mm with incompetent lip	5 (2.56)
6.0–9.0 mm	6 (3.08)
>9.0 mm	3 (1.54)
Overbite*	
Open bite	3 (1.54)
0–3.5 mm	98 (50.26)
>3.5 without gingival contact	40 (20.51)
>3.5 mm with gingival contact	41 (21.02)
>3.5 mm with gingival trauma	13 (6.67)
Anterior crossbite with discrepancy between RCP and ICP	
No	158 (81.02)
<1 mm	12 (6.15)
1–2 mm	9 (4.62)
>2 mm	16 (8.21)
Transverse problems	
No	195 (96.53)
Complete lingual crossbite	5 (2.48)
Posterior buccal crossbite	2 (0.99)
Supernumerary	
No	200 (99.0)
Yes	2 (1.0)
Impeded eruption	
No	201 (99.5)
Yes	1 (0.5)
Hypodontia	
No	199 (98.5)
Yes	3 (1.5)

*Excluded unmeasurable case (total, n=195)

abnormalities, limited sample size, and the exclusion criteria which excluded children who had congenital deformity. To improve the examination, the use of periapical and/or panoramic X-ray to screen the children in this period is recommended.^[22]

Even though the setting of the study was only in the south of Thailand which had a high number of children who need orthodontic treatment, the results would be beneficial and could be used for dental public health service planning. Moreover, these finding could be applied in other areas sharing the same socioeconomic conditions. The public health policy which included preventive and promotive dentistry is

strongly recommended to reduce the malocclusion problems such as fluoridation, oral health education, and oral health services.^[23]

CONCLUSIONS

- Approximately one-fifth of children in this study were in DHC of IOTN Grade 4 and 5 which indicated a high need of orthodontic treatment.
- Modification of IOTN is recommended to evaluate the orthodontic treatment need in mixed dentition.
- Class I malocclusion was a dominant trait in 8–9-year old in a group of Southern Thai children (78.71%), followed by Class II division 1 (7.92%), Class II division 2 (3.47%), and Class III malocclusion (3.47%).

Declaration of patient consent

Patient's consent not required as patients identity is not disclosed or compromised.

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Conflicts of interest

There are no conflicts of interest.

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