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Identifying Occlusal Traits as Indicators of Interceptive Orthodontic Treatment Need

Yohana Yusra¹, Faruk Hoesin², Anton Rahardjo³, M.R.A.Mieke Sylvia⁴

¹ Department of Preventive and Public Health Dentistry, Faculty of Dentistry,

University of Indonesia, ² Department of Orthodontic, Faculty of Dentistry, University of Indonesia,

³ Department of Preventive and Public Health Dentistry, Faculty of Dentistry, University of Indonesia,

⁴ Department of Orthodontic, Faculty of Dentistry, Airlangga University

Abstract

In Indonesia there is high prevalence of malocclusion and treatment need of orthodontic. Required treatment can be reduced by early treatment during the period of mixed dentition (interceptive treatment). Because of the limited number of orthodontists, an interceptive orthodontic treatment by general dentist has been proposed. For early screening a specific index for an interceptive orthodontic treatment need is required. The objective of this study was to find indicators that can be utilized to develop an index of this treatment. Using qualitative method, by combining literature review and experts opinion. Four orthodontists evaluated fifty study casts of 8-11-year old children and they were asked about diagnosis and type of treatment. Discussions were conducted to construct an agreement about indicators of interceptive orthodontic treatment need. A consensus was that indicators such as interproximal caries on second primary molars, premature loss of primary canines and second molars, supernumerary teeth, diastema and missing permanent incisors, anterior and posterior cross-bite, frenulum, molar relationship can be utilized to construct an index of interceptive orthodontic treatment need. Our analysis indicates that numerous occlusal traits can be identified as indicators to perform an index of interceptive orthodontic treatment need.

Keywords: Qualitative Method, indicator, Index of Interceptive Orthodontic Treatment Needs, Expert opinion.

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Introduction

Malocclusion is identified as an ideal occlusion deviation that can still be deemed acceptable aesthetically or based on its function.¹ World Health Organization (WHO) defines malocclusion as a dentofacial anomaly that hinders and affects a person's aesthetics, chewing or speech function.²

Prevalence of malocclusion and orthodontic treatment needs in Indonesia are still high. A few epidemiologic studies concerning malocclusion have been conducted in numerous areas within Indonesia. In 2008, prevalence of malocclusion in West Jakarta was 69,3% and Index of Orthodontic Treatment Need was 58,2%.³

One of the efforts that can be made to decrease orthodontic treatment need is to do interceptive orthodontic care. Interceptive is early orthodontic treatment during mixed dentition period.⁴ A prospective study led by Kerosuo, *et al.* which was conducted over a period of 7 years, starting when the children were 8 years old and ended when at the age of 15 reports that strategic early orthodontic treatment could reduce the need for orthodontic treatment through community health care services in limited orthodontists.⁵

In Indonesia, the population in 2010 was 237.641.326 people with the limited number of orthodontists, which were only 402 per December 2010.⁶ Thus the interceptive orthodontic treatment, which can be performed by dentists through local health care services, can be one of the solutions to decrease the number of needed orthodontic treatment. The dentists' standard of competency in Indonesia issued by the Indonesian Medical Council states that a dentist could perform preventive and treatment of dental malocclusion on children and adult patients.⁷

Correspondence

Yohana Yusra, Department of Preventive and Public Health Dentistry, Faculty of Dentistry, University of Indonesia, Salemba Raya 4, Jakarta 10430; phone/fax 062-21-31930270, E-mail: yohanayusra@yahoo.com

In correlation to the above statement, it would be advantageous if a specific screening could be conducted to identify children on their mixed dentition period that would have benefit from interceptive orthodontic treatment. This screening is required because interceptive orthodontic treatment has limitation in terms of its 'timing'. The treatment can only be executed in a certain growth period, which is the mixed dentition period.⁸

At this moment, there is no early detection instrument that could be utilized to calculate the need of interceptive orthodontic treatment, which dentists in Indonesia can specifically perform the treatment based on their competency. Data that have been gathered from this screening can be used to make a plan for dental care especially interceptive orthodontic treatment through local health services.

The aim of this study was to use qualitative research methods to find indicators and their weighting factors as a first step to develop an index of interceptive orthodontic treatment need.

Materials and Methods

This study utilized qualitative method, which was combining experts' opinion with literature review.^{9,10} A panel of four orthodontists from four universities in Indonesia analyzed 50 pairs of study casts of children aged 8-11-year old in their mixed dentition period. Study casts of 25 males and 25 females with the mean age of 10 years old were selected randomly from the archive of Orthodontic Department Faculty of Dentistry, Trisakti University. This study was approved by Ethical Committee of Faculty of Dentistry, University of Indonesia.

First, literature review of interceptive orthodontic treatment, dimension, and indicators, were conducted. Then the experts were confirmed to provide consensus regarding the dimension and indicators of interceptive orthodontic treatment in Indonesia. Referring to the criteria that were required, four experts from four universities were assigned by recommendation of Indonesian Association of Orthodontist. The experts were calibrated by asking them to analyze 50 pairs of study casts, whether the case can be classified as an interceptive orthodontic treatment, corrective treatment by an orthodontist or no required treatment at all. Due to time and distance barrier of the experts (Jakarta, Jogjakarta, and East Java), initial discussions were individually held. In every meeting, dimension, applicable indicators determine interceptive orthodontic treatment and its weighting factor were discussed. Every discussion were recorded using voice recorder. After individual discussion with the experts completed, all data were transcribed in verbatim, as material for plenary discussion.

Plenary discussion which were attended by the experts was completed and concluded with consensus result of dimension, indicators, and its weighting factors, which enable to develop an index of interceptive orthodontic treatment needs in Indonesia. This study workflow can be viewed on figure 1.

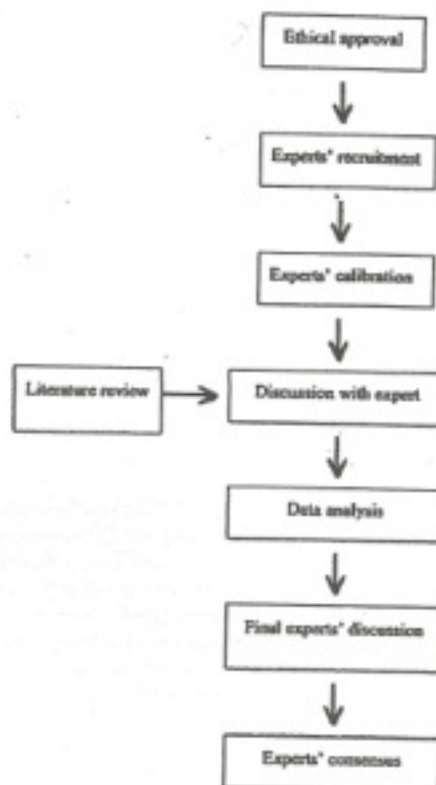


Figure 1. Study Workflow

Results

Initial results from the expert's calibration showed 11 cases had different evaluation. After conducting a final discussion, a consensus was established for the diagnosis of 50 pairs study casts with a few important notes.

Dimensions

Four dimensions were agreed to be utilized to visualize the needs of interceptive orthodontic treatment. The dimensions are as follows: primary teeth component, anterior and posterior permanent teeth component, and occlusion component. All those dimensions were all in the mixed dentition period.

Table 1.

<i>Dimensions and Indicators of Interceptive Orthodontic Treatment Need</i>		
No.	Dimension	Indicator
1	Primary teeth in mixed dentition	<ol style="list-style-type: none"> 1. Interproximal caries second primary molars 2. Premature loss primary canines 3. Premature loss first primary molars 4. Premature loss second primary molars 5. Prolonged retention primary anterior teeth
2	Anterior permanent teeth in mixed dentition	<ol style="list-style-type: none"> 1. Frenulum 2. Diastema 3. Supernumerary teeth 4. Anterior crowding 5. Missing anterior teeth 6. Peg shape lateral incisors
3	Posterior permanent teeth in mixed dentition	<ol style="list-style-type: none"> 1. Mesial drifting of first permanent molars
4	Occlusion in mixed dentition	<ol style="list-style-type: none"> 1. First permanent molar relationship 2. Overjet 3. Overbite 4. Anterior open bite 5. Anterior crossbite 6. Posterior crossbite

Indicator

Other than dimensions, experts have also formed consensus on indicators, which can be visualized in every dimension. Referring to the component of primary teeth, indicators that can be used are interproximal caries of second primary molars, premature loss of primary canines, premature loss first of primary molars, premature loss of second primary molars and prolonged retention of primary anterior teeth. Indicators of anterior permanent teeth components are frenulum, diastema, supernumerary teeth, anterior crowding, missing anterior teeth and peg shape lateral incisors. Indicator of posterior permanent teeth component is mesial drifting of first permanent molars and indicators of occlusion components are second primary molar relationship, first permanent molar relationship, overjet, overbite, open bite, anterior crossbite and posterior crossbite. Dimension and indicator for interceptive orthodontic treatment based on consensus of the experts can be viewed on table 1.

Weighting factor

After the required indicators were confirmed, then the experts confirmed the weighting factors. Scores 1-10 were given to illustrate the impact of a particular indicator for the needs of interceptive orthodontic treatment. The weighting factor was determined for each indicator. The higher weighting factor showed the bigger impact of that particular indicator on the interceptive orthodontic treatment need. The weighting factor of the indicators can be viewed on Table 2.

Discussion

Several obstacles were met throughout this study; among them were the difficulties to gather the experts for discussion due to their busy activities and the distance to their residing cities. At initial stage we had to do discussion one by one with the experts.

At the plenary discussion, several important notes were found. To determine whether the abnormality is dental or skeletal, all experts feel that other than the study cast, they need more diagnostic supporting data such as profile photograph of the subject. Also in regards to Indonesian dentist' competency, it was agreed that treatment of class II malocclusion with functional appliance should be referred to the orthodontist.

When discussion took place, it was also determine portion of weighting factor for every indicator. Indicators of premature loss of mandibular second primary molars, prolonged retention of primary incisors, mesial drifting of mandibular first molar, supernumerary teeth, relationship of second primary molars, open bite because of bad habit, anterior and posterior crossbite has the highest score (9 and 10).

Above result was different compared with other research that was conducted by Coetzee that has given the highest score for indicator of anterior crossbite, posterior crossbite with functional lateral of the mandible shift during cross-

ing.¹² Index which is going to be produce based on this initial study is index of interceptive orthodontic treatment need, and refers to the competency of Indonesian dentist, which is only to prevent and do the treatment of dental malocclusion. Especially for posterior crossbite, the experts put together a consensus, that interceptive orthodontic treatment for this case is taken cares by orthodontist, even the etiology is due to functional shift. Referring to their experience, they have difficulties in doing this treatment with removable appliance.

Table 2.

Weighting factor		
No.	Indicator	Weighting Factor
1	Interproximal caries of second primary molar	5
2	Premature loss of primary canine	8
3	Premature loss of first primary molar	7
4	Premature loss of second primary molar	10
5	Prolonged retention of primary anterior teeth	10
6	Frenulum	5
7	Diastema	8
8	Supernumerary teeth	9
9	Anterior crowding	7
10	Missing anterior teeth	5
11	Peg shape lateral incisors	5
12	Mesial drifting of lower first permanent molar	10
13	First permanent molar relationship	7
14	Overjet	8
15	Overbite	8
16	Anterior open bite	10
17	Anterior crossbite	10
18	Posterior crossbite	10

Limitation of the study

This qualitative study has limitation, that the results are mostly based on expert's subjectivities. Combining the experts' opinions with literature review can reduce this study limitation.

Conclusion

This qualitative study has identified dimensions, indicators, and weighting factors of interceptive orthodontic treatment need that in the future study will be used to develop an index of interceptive orthodontic treatment need.

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