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Interceptive orthodontic treatment needs and its relating demographic factors in Jakarta and Kepulauan Seribu

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ABSTRACT: Interceptive orthodontic is an orthodontic treatment procedure that aims to minimize malocclusion's effect and decrease the need for more complex, high-cost treatment, eventually declining the need for corrective orthodontic treatment. Jakarta and Kepulauan Seribu have more than 763,666 primary school-aged children; thus, screening for the need for interceptive orthodontic treatment would be beneficial in identifying these children who may benefit from treatment. This study aims to investigate the need for interceptive orthodontic treatment and identify its related factors in 8-11 years old children in Jakarta and Kepulauan Seribu. This study was observational analytic with a cross-sectional design utilizing the Index of Interceptive Orthodontic Treatment Need (IIOTN). Each indicator was scored based on the subjects' intra-oral conditions and then analyzed by the Spearman correlation test. Based on 2,020 subjects, it was found that 18.96% of subjects do not need orthodontic treatment, 59.36% need interceptive orthodontic treatment, and 21.68% need corrective orthodontic treatment. There was a significant correlation between the need for interceptive orthodontic treatment with parents' income ($r = -0.07$; $p = 0.02$). IIOTN could be used as an interceptive orthodontic treatment screening instrument. More than half of the subjects require interceptive orthodontic treatment. Parents' income is the only demographic factor related to the need for interceptive orthodontic treatment.

5 1 INTRODUCTION

Malocclusion is one of the most prevalent oral conditions and has wide-ranging physical, social, economic, and physiological effects (Ukra et al. 2013). Early orthodontic treatment consists of preventive and interceptive orthodontics during the active growth period of the children's teeth development (Rapeepattana, S., Suntornlohanakul, S. & Thearmontree, 2019). Preventive and interceptive orthodontic aims to prevent or lessen occlusal problems that could occur during the transition period from the primary dentition period to the permanent dentition period (Artese 2019). Interceptive orthodontic treatment attempts to prevent or minimize dental development abnormalities while enabling craniofacial growth modification. This treatment also entails monitoring for various conditions, including excessive space, severe crowding, open or deep bites, anterior and posterior crossbites, severe overjet, and abnormal eruption patterns (Song et al. 2020).

Screening in children in their mixed dentition period is required because interceptive orthodontic treatment has a limited timeframe, in which it can only be conducted in the mixed dentition period (Nimri & Richardson 1997). One of the methods in screening for interceptive orthodontic treatment is utilizing a specific index, the Index of Interceptive Orthodontic Treatment Need (IIOTN), for children aged 8-11 years old (Yusra 2013).

IOTN is an index explicitly designed to measure the need for interceptive orthodontic treatment in children aged 8-11 (mixed dentition period). This index consists of 18 indicators evaluating various occlusion aspects (Yusra 2013). Due to limited data in Jakarta, this study aims to investigate the need for orthodontic treatment using IOTN on 8-11 years old children in Jakarta.

Jakarta is the capital of the Republic of Indonesia and divided into five municipalities and one district, Kepulauan Seribu. Data shows that there are around 763,666 children within the Primary School age in Jakarta; therefore, screening for the needs for interceptive orthodontic treatment in the mixed dentition period was expected to identify children that will benefit from this treatment. Interceptive orthodontic treatment had an overall success rate of 75.5%, an improvement rate of 9.5%, and a failure rate of 15.0%. The most common reason for treatment failure was attributed to non-compliance (Song et al. 2020).

2 METHODS

This study has attained ethical clearance number 126/S3/KEPK/FKG/3/2018 by Universitas Trisakti Faculty of Dentistry Research Ethics Committee. The population of the study was primary school children enrolled in six of Jakarta's administrative areas (5 municipalities and 1 district) and their parents. The population was primary school children in mixed dentition period aged 8-11 years old in six Jakarta areas, and their parents were chosen by cluster random sampling. The minimum sample size calculation shows 1,938 children and their parents (mother/ father) need to be examined. The actual number of samples in this study is 2,020 children.

After completing informed consent, each subject's parent filled out the questionnaire. Meanwhile, intra-oral examinations were conducted on subjects using the Index of Interceptive Orthodontic Treatment Need (IOTN). Before the intra-oral examination, training and calibration were applied to five examiners with excellent agreement.

IOTN consists of 18 indicators such as anterior crossbite, posterior crossbite, anterior open bite, anterior crowding, central diastema, molar relationship, supernumerary teeth (mesiodens), peg-shaped, frenulum position, prolonged retention of primary teeth, mesial drifting of the first molar, premature loss of first primary molar, premature loss of second primary molar, premature loss of deciduous canine, missing of anterior teeth, overjet, deep bite and caries of second primary molar. Every item consists of three grades (0-2). Every grade was scored based on the severity of the malocclusion. The lowest score means normal occlusion, score one and two show mild malocclusion and more severe condition, respectively. The total score from each component will determine the patient's needs for interceptive orthodontic treatment. A total score less than five means there is no need for orthodontic treatment, scores 6-47 indicate a need for interceptive orthodontic treatment, and scores over 47 indicate the need for corrective orthodontic treatment (Yusra 2013). The data was analyzed using Spearman's correlation test at a significance level of $p < 0.05$.

3 RESULTS AND DISCUSSION

A total of 2,020 subjects were recruited, consisting of 51.09% females and 48.91% males, with a predominance of ten years old (33.86%). Samples distribution based on interceptive orthodontic treatment needs is displayed in Table 1. This study also found that 59.36% of children aged 8-11 need interceptive orthodontic treatment. This result is in line with the study result conducted by Adiguna in Denpasar, Bali, and Kevin in Banjarmasin, Kalimantan Selatan, which confirms that half and a third of the total research sample needs interceptive orthodontic treatment (unpublished data). This outcome is consistent with a study conducted on children in mixed dentition periods in Austria and Brazil, where 30.6% and a third of the sample needs orthodontic treatment by utilizing the Index of Orthodontic Need (Steinmassl et al. 2017). A study by Alatrach et al. showed that more than one-third of the subjects in the sample were in moderate to a significant need for orthodontic treatment (Alatrach et al. 2014).

Table 1. Distribution of interceptive orthodontic treatment needs.

IOTN	n	%	Age				Gender	
			8	9	10	11	Male	Female
Grade 0 Do not need orthodontic treatment	383	18.96	25	106	138	114	185	198
Grade 1 Need interceptive orthodontic treatment	1199	59.36	123	396	410	270	580	619
Grade 2 Need corrective orthodontic treatment	438	21.68	44	139	136	119	223	215
TOTAL	2020	100	192	641	684	503	988	1032

This study indicates that malocclusion in children's mixed dentition period is relatively high in Jakarta; therefore, this data supports the opinion that conducting orthodontic screening on children during their mixed dentition period is highly important (Steinmassl et al. 2017). Besides providing orthodontic treatment, dentists may also be utilized to educate the community on dental and oral health, especially for parents of primary school children. (Indonesia Medical Council, 2015) The first orthodontic screening can be performed at age 4 or 5. In certain conditions, this early examination is needed to identify if there is an anterior or posterior crossbite, bad habits such as mouth breathing, abnormal tongue position, and other bad habits (Bahreman A 2013).

Based on the age characteristics, children aged ten years old shows a higher need for interceptive orthodontic treatment with 410 children (34.20%). Based on gender, female (619 children) displays a higher need for interceptive orthodontic treatment than male (580 children). However, statistically, there is no significant correlation between age and gender with the need for interceptive orthodontic treatment. This result is consistent with the study by dos Santos et al. that there was no correlation between the age and gender of the child in terms of the need for orthodontic treatment (dos Santos et al. 2016).

This study also assessed the parent subjects consisting of 59.06% mother and 40.94% father. Most parents have a low-income level (1-3 million Rupiah) with 68.56% and a low education level (primary, junior high, and high school), making up 76.34% of the sample. The distribution of sample parents' characteristics is shown in Table 2.

Table 2. Distribution of sample parents' characteristics.

Characteristics	n	%
Parent	827	40.94
Father		
Mother	1193	59.06
Education level	1542	76.34
Low (primary, junior high, and high school)		
High (university)	478	23.66
Job	1105	54.70
Employed		
Unemployed	915	45.30
Income	1385	68.56
Low (1-3 million Rupiah)		
High (more than 3 million Rupiah)	635	31.44

Table 3 shows that only the parent's income level correlates significantly negatively ($p=0.02$) against interceptive orthodontic treatment needs. The higher the income level lowers the need for interceptive orthodontic treatment. This result also aligns with a study by Nuca et al. (2009) who stated that a higher level of social economy, knowledge, and good personality would decrease the need for orthodontic treatment. However, dos Santos et al. stated that there was no correlation between the child's need for orthodontic treatment with the family's income level (dos Santos et al. 2016).

Table 3. Correlation between independent variables and needs for interceptive orthodontic treatment.

IHOTN	r	p-value
Child's age	-0.041	0.063
Child's gender	0.017	0.435
Parent's education level	-0.43	0.54
Parent's income level	-0.07	0.02*
Parent's employment status	-0.005	0.833

*p-value <0,05

4 CONCLUSION

This study concludes that the need for interceptive orthodontic treatment for children aged 8-11 in Jakarta is 1,199 children (59.36%) and there is a negative correlation between the parents' income level with the need for interceptive orthodontic treatment ($r = -0.07$, $p = 0.02$). It also can be concluded that Index of Interceptive Orthodontic Treatment Need (IHOTN) can be used as a screening instrument for interceptive orthodontic treatment.

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