

## Factors Associated with Primary Teeth Eruption Pattern in Children Under Three Years Old in Beji Depok, West Java

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### Abstract

There are many factors associated with the eruption pattern of primary dentition. One factor is maternal and child health during the first three years of the child's life. This is because primary dentition begins to develop during the fourth month of pregnancy and continues to the last primary tooth eruption in the oral cavity at three years old. There are limited studies about primary dentition eruption in Indonesia. Then the aim of this study is to assess factors related to primary teeth eruption patterns. One hundred and seventy-two mothers and children under three years old, who had a mother and child health book, were selected in Beji Depok. The primary tooth eruption phase was examined using the Hulland method. The eruption age was computed for mean age, starting age, and the duration of each tooth eruption. There were significant differences in the starting age and duration of the eruption process in the groups according to maternal ( $p < 0.05$ ) and child ( $p < 0.01$ ) nutritional status. The eruption process took longer to complete in females than males ( $p < 0.05$ ). The mother's educational level and occupation were also significant. The study showed that the eruption pattern was influenced by maternal and child nutritional status, the child's gender, and the mother's educational level and occupation.

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### Introduction

The emergence of tooth crowns in the oral cavity, which grow in an axial direction from the jaw bone penetrating the gingiva up to its functional position and reaching its occlusion contact—is called tooth eruption.<sup>1</sup> Tooth eruption reflects the growth of the body in general; when tooth eruption is delayed, the growth of the human body in general can also be said to be constrained.<sup>2</sup>

There are many factors associated with eruption patterns of primary dentition. Khalifa et al. showed that primary tooth eruption is affected by gestational age, postpartum nutrition, premature birth, and the severity of neonatal disease.<sup>3</sup> Additionally, socio demographic factors

such as race and gender also impact on tooth eruption. Maternal nutrient intake during pregnancy directly affects tooth development during the period of fetal growth. Therefore, the nutritional status of pregnant women will determine the oral health of her child.<sup>4</sup>

Maternal and child health during the first three years of a child's life is critical because primary dentition starts to develop during the fourth month of pregnancy and continues until the last primary tooth erupts in the oral cavity at three years old.

There are limited studies about primary dentition eruption in Indonesia. We are still using eruption tables of Caucasian children as standard. Knowledge of the chronology and pattern of tooth eruption is very useful for improving standard criteria for preventive dental health care and for diagnosing and implementing dental health care in children.<sup>4</sup>

Therefore, this study assesses factors related to primary tooth eruption patterns.

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## Methods

Health screening in the sub-districts of Posyandu. Posyandu is an integrated mother and child primary health care post in the sub-district level area. It is a routine monthly activity conducted by local health cadres and community health center staff. During the September and October health screening in the Beji sub-district, Depok West Java, five Posyandus participated in this study, and 335 mothers agreed to enroll as a baseline. Mothers with children under three years old with a complete health book were selected. The health book keeps a record of the mother and child's health status since pregnancy. Maternal nutrition status was determined using mid-arm circumference, and the Z score of height for age was used to determine the child's nutritional status.

The primary tooth eruption phase was examined using the Hülland method, which clinically classifies the tooth eruption stage.<sup>5</sup>The beginning of the eruption process was

determined clinically as a gingiva bump through palpation (E1). The duration of the eruption time was the time between the eruption initiation and at least half of the crown having erupted (E4). Calibration was carried out for the Hülland index and gained almost perfect agreement for inter-rater reliability. Several socio demographic factors were also collected.

The study protocol, letter of informational consent, and other supporting documents were approved by the Universitas Indonesia Faculty of Dentistry Ethical Review Board prior to their use. Written informed consent was obtained from all mothers prior to their enrollment.

## Results

One hundred and seventy-two mother-child pairs were analyzed of the 335 enrolled at baseline. The table below is the mean eruption age from this study compared to several others.

**Table 1.** Comparison of Mean Age Eruption Starting Time by Tooth Type

Tooth Type	Caucasian		Australia	Nepal	Indonesia
	Nelson	Schour & Masseler	Baral	Hülland	Beji Depok
<b>Maxilla</b>					
dl <sub>1</sub>	10	6-8	13	9,5	11.19
dl <sub>2</sub>	11	9-11	14	11	13.45
dC	19	18-21	21	17,4	15.06
dM <sub>1</sub>	16	15-18	19	14,2	20.40
dM <sub>2</sub>	29	18-30	31	24,4	24.85
<b>Mandible</b>					
dl <sub>1</sub>	8	6-8	11	10,1	15.93
dl <sub>2</sub>	13	6-11	16	12	11.60
dC	20	18-21	23	16	16.43
dM <sub>1</sub>	16	12-15	19	14,1	19.73
dM <sub>2</sub>	27	15-30	30	26,1	25.73

Table 1 shows the mean age comparison of this study in the Beji sub-district with studies in other countries, including the Caucasian mean age that is usually set as the standard for eruption pattern. It is surprising that the eruption patterns of the Beji sub-district children were different for the deciduous molar in either the upper or lower jaw.

It is common that the first deciduous molars erupt before the canines, which is shown in other studies (Table 1). However, in this study, the first deciduous molars erupted after the deciduous canines. The first deciduous incisors and molars eruption mean age in this study was much later than other studies in the table.

**Table 2.** Distribution of Sample Characteristics

	n (%)	Mean
Age		
Child	172(100)	20.4(SD 8.6)
Mother	172(100)	29.7(SD 5.5)
Child gender		
Female	80(46.5)	
Male	92(53.5)	
Mothers' educational level		
Below Junior high	49(9.5)	
High School-Diploma	103(61.3)	
At least strata 1	49(29.2)	
Mothers' occupation		
Not working (housewives)	147(87.0)	
Working	22(13.0)	
Child's nutritional status		Z Score height/age
Stunting	54(31.4)	-1.1(-8.5 – 8.9)
Normal	118(68.6)	
Mother's nutritional status		Maternal mid-arm circumference
Undernourished	31(18.0)	
Normal	141(82.0)	25.3(18.0-31.0)

The children's average age was 20.4(SD=8.6) months, ranging from 6 to 37 months. The mothers' average age was 29.7(SD=5.5) years, ranging from 22 to 40 years old. There were more male children (53.3%) than female (46.5%). The mothers' educational level was mostly high school or diploma graduate (61.3%), and

87% were housewives. The prevalence of mothers and children with poor nutritional status were 18.0% and 31.4%, respectively. The mean of Z score for height/age and maternal mid-arm circumference as mother and child nutritional indicators was in a normal range.

**Table 3.** Relation of Socio demographic and Nutrition Factors to Eruption Age

	Eruption age		
	mean	starting	duration
Child's gender <sup>+</sup>	.326	.733	.010 <sup>‡</sup>
Mothers' educational level <sup>‡</sup>	.286	.001	.001
Mothers' occupation <sup>+</sup>	.029	.001	.023 <sup>‡</sup>
Child's nutritional status <sup>+</sup>	.033	.001	.017 <sup>‡</sup>
Mother's nutritional status <sup>+</sup>	.755	.009	.030 <sup>†</sup>

<sup>‡</sup>kruskal-wallis<sup>+</sup>mann-whitney<sup>‡</sup>minimum value <sup>†</sup>mean value

There was significant difference between males and females in the duration of the eruption process. The mother's educational level and occupation showed a significant relationship to the starting age and the duration of the eruption process. The eruption process differed significantly between good and a poor nutritional status mothers and children. Mean age, starting age, and the duration of the eruption stages significantly differed according to children's nutritional status.

The same was seen regarding the mothers' nutritional status, with the exception of mean age. Eruption time between the upper and lower jaw and the right-side and left side were not significantly different.

### Discussion

Table 1 showed mean age comparison of this study in Beji Sub-district with other studies in some countries, including Caucasian mean age

that usually set as standar for eruption pattern. In Beji Sub-district children, there were few differences. The first deciduous molars erupted after deciduous canine, and the eruption mean age for the first deciduous incisor and molars were much later than other studies in the table. There are many factors associated with eruption pattern of primary dentition. Tooth eruption is a developmental process and occurs over a broad chronological age range. Khalifa et al showed that primary teeth eruption is affected by gestational age, postpartum nutrition, premature birth, and severity of neonatal disease.<sup>3</sup> In addition, genetic factors, gender, and systemic conditions can also affect tooth eruption.<sup>6</sup>

There was no significant relationship between gender and the mean or starting age for the eruption of primary teeth, but the duration of eruption process differed. The female eruption process took longer to complete than the male ( $p < 0.05$ ). These results are supported by several research studies that state that there is no significant relationship between gender and the time of eruption of primary teeth.<sup>7-9</sup>

The education level of mothers in this study aimed to find how the mother's level of knowledge and literacy affected their children's oral health. Maternal literacy is important in children's health in general, including the formation and development of the child's teeth. Mothers with higher levels of education are usually more thoughtful about their needs and those of their families, one of which is their nutritional requirements.<sup>4</sup> Ali showed that educated mothers had a significant edge over uneducated mothers regarding nutritional status, both in terms of weight, height, and the nutritional requirements of their children ( $p < 0.005$ ).<sup>10</sup> Sixty-one percent of mothers in this study graduated from high school or had a diploma; it appears that this educational status was related to the starting age and duration of the eruption process ( $p < 0.001$ ). This study indicated that there was a significant relationship between tooth eruption and the mother's occupation status ( $p < 0.05$ ). However, other studies suggest that the infants of working mothers do not differ from those of non-working mothers with respect to their developmental status.<sup>11</sup> Non-working mothers have an important role in the family at home. Usually, non-working mothers can be more attentive to the growth and needs of children, including the need for a balanced nutritional

intake. It is becoming more benefit for non-working mothers to maintain the good development of the child. However, a limitation of this study is that non-working mothers are not distinguished by their levels of literacy, so it is unknown whether there is a difference between non-working mothers with a high level of literacy and those non-working mothers with a low level of literacy.

Malnutrition is the cellular imbalance between the supply of nutrients and energy and the body's demand for them to ensure growth, maintenance, and specific functions.<sup>12</sup> A lack of some nutrients such as protein, calcium, and vitamins D, A, C, E can cause disturbances in the growth and development of teeth. Nutritional status an indication of health condition associated with food and nutrient intake, absorption, metabolism, and excretion. Nutritional status is represented by certain variables, which indicate the balance between nutrient intake and needs. The measurement of nutritional status can help differentiate between good, excessive, and poor nutritional conditions.<sup>13</sup> The results in this study showed that there is a significant relationship between the nutritional status of children and tooth eruption patterns. These results are supported by studies in Iran that also show that there is a significant relationship between the first eruption of primary teeth and a child's nutritional status.<sup>14</sup>

Maternal nutrient intake during pregnancy directly affects tooth development during the period of fetal growth. Therefore, the nutritional status of pregnant women will determine the oral health of her child.<sup>4</sup> As a developing country, Indonesia is still experiencing nutrition problems, which is also a common problem in many other developing countries. According to Indonesian Health Basic Research (Riskesmas) 2013<sup>15</sup>, as much as 24.2% of pregnant women have a poor nutritional status. Meanwhile, the national prevalence of low protein consumption is equal to 58.5%, while protein is important for dental growth and development, especially during the period of tooth eruption.

There was a significant difference between the mother's poor maternal nutritional status and the delayed timing and extended duration of her child's tooth eruption ( $p < 0.05$ ). These results are supported by several studies that concluded that malnourished children will experience delayed primary tooth eruption.<sup>16</sup> This

may occur due to an imbalance in the intake of nutrients during pregnancy that leads to macro- and micro-nutrient deficiencies. Macro-nutrient deficiencies, such as protein deficiency, can affect the growth and development of teeth. One form of this is delayed tooth eruption. Protein deficiency can also create tooth formation disorders, an irregular pre-dentin layer, and hypoplasia. Micro-nutrient deficiencies, such as deficiencies of calcium and vitamins C, A, D, and E may also delay tooth eruption. These nutrient deficiencies can lead to the imperfect formation and development of the teeth, causing tooth eruption process to be delayed or to take a longer period to complete.

### Conclusion

Nutritional status and socio demographic factors were related to primary dentition eruption in this study. Since this study was cross-sectional, a prospective study can determine more accurate causal factors related to tooth eruption. Another study of a different design with more thorough risk factors will be carried out. This information will be very useful for oral health prevention programs for the primary dentition period.

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### References

1. Utami N. Hubungan Status Gizi dengan Tahap Erupsi Gigi Molar Dua Bawah Sulung pada Anak Usia 23-32 Bulan. Jakarta: Universitas Indonesia; 2004.
2. Soliman NL, El-Zainy MA, Hassan RM, Aly RM. Relationship of Deciduous Teeth Emergence with Physical Growth. *Indian J Dent Res* 2012;23(2):236-40.
3. Khalifa MA, Gendy RAE, El-Mohsen MMA, Hammour AA, Aly RSAEL. Relationship between Gestational Age, Birth Weight and Deciduous Tooth Eruption. *Gaz Egypt Paediatr Assoc* 2014;62(2):41-5.
4. Hernández M, Espasa E, Boj JR. Eruption Chronology of the Permanent Dentition in Spanish Children. *J Clin Pediatr Dent* 2008;32(4):347-50.
5. Hulland SA, Lucas JO, Wake MA, and Hesketh KD. Eruption of the Primary Dentition in Human Infants: A Prospective Descriptive Study. *Pediatr Dent* 2000;22(5):415-21.
6. Almonaitiene R, Balciuniene I, Tutkuviene J. Factors Influencing Permanent Teeth Eruption: Part One - General Factors. *Stomatologija* 2010;12(3):67-72.
7. Sajjadian N, Shajari H, Jahadi R, Barakat MG, Sajjadian A. Relationship Between Birth Weight and Time of First Deciduous Tooth Eruption in 143 Consecutively Born Infants. *Pediatr Neonatol* 2010;51(4):235-7.
8. Sahin F, Camurdian AD, Camurdian MO, Olmez A, Oznurhan F, Beyazova U. Factors Affecting the Timing of Teething in Healthy Turkish Infants: A Prospective Cohort Study. *Int J Paediatr Dent* 2008;18(4):262-6.
9. Kohli MV, Patil GB, Kulkarni NB, et al. A Changing Trend in Eruption Age and Pattern of First Deciduous Tooth Correlation to Feeding Pattern. *J Clin Diagn Res* 2014;8(3):199-201.
10. Ali, Saima, Chaudry T, Naqvi Q. Effect of Maternal Literacy on Child Health: Myth or Reality. *Ann Pak Inst Med Sci* 2011;7(2):100-3.
11. Hock E. Working and Nonworking Mothers and Their Infants: A Comparative Study of Maternal Caregiving Characteristics and Infants Social Behaviour. Weyne State University Press 1980;26(2):79-101.
12. Sheetal A1, Hiremath VK, Patil AG, Sajjansetty S, Kumar SR. Malnutrition and Its Oral Outcome - A Review. *J Clin Diagn Res* 2013;7(1):178-80.
13. Papas N. Nutrition in Clinical Dentistry. 3th ed. Philadelphia: WB.Saunders; 1989.
14. Javaneh V, Abtin H, Mohammad EDS. Eruption Time of the First Primary Tooth and Its Relationship with Growth Parameters in Children. *Journal of Dentomaxillofacial Radiology, Pathology and Surgery* 2015;3(4):15-9.
15. Center for Health Research and Development. Riset Kesehatan Dasar (Basic Health Research). Jakarta: Indonesian Ministry of Health; 2013:223-31.
16. Eskeli R, Lösönen M, Ikävalko T, Myllykangas R, Lakka T, Laine-Alava MT. Secular Trends Affect Timing of Emergence of Permanent Teeth. *Angle Orthod* 2016;86(1):53-8.