



**Exclusive Breastfeeding and Children's Gross Motor
and Language Development Using the Denver II**

Rini Mustikasari Kurnia Pratama*¹, Damayanti¹, Neng Kurniati¹, Innas Tiara Ardhiani¹

¹Midwifery Study Program, Faculty of Mathematics and Natural Sciences, University of Bengkulu
Jl. W.R. Supratman, Kandang Limun, Kec. Muara Bangkahulu, Kota Bengkulu, Bengkulu 38122, Indonesia

Corresponding author: Rini Mustikasari Kurnia Pratama
Email: rini.mskp@unib.ac.id

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ABSTRACT

Child development is influenced by multiple factors, including exclusive breastfeeding. Previous studies have shown that 50.5% of infants who receive exclusive breastfeeding demonstrate good developmental outcomes. This study aimed to determine the relationship between exclusive breastfeeding and gross motor and language development in infants aged up to 6 months using the Denver II screening test. This study used an analytical observational design with a cross-sectional approach. The study was conducted at Bentiring Health Center, Muara Bangkahulu District, Bengkulu City, which had the highest exclusive breastfeeding coverage in the area, with a population of 228 infants. The sampling technique used purposive sampling based on inclusion and exclusion criteria, resulting in a total sample of 23 infants. The Denver II screening test was used to assess development. Data were analysed using the chi-square test. Most exclusively breastfed infants had normal gross motor development, namely 15 children (65.2%). The analysis showed a significant relationship between exclusive breastfeeding and gross motor development, with a significance value of 0.000. In the language domain, most exclusively breastfed infants also showed normal development, namely 15 children (65.2%). However, the analysis showed no significant relationship between exclusive breastfeeding and language development, with a significance value of 0.111. In conclusion, exclusive breastfeeding was associated with gross motor development but not with language development. In addition to exclusive breastfeeding, parents should provide appropriate stimulation to support their children's gross motor and language development and to optimise overall development.

Keywords: Breast Milk; Denver Developmental Screening Test; Denver II; Gross Motor Skills; Language Development

Introduction

Nutrition during the first 1,000 days of life is a critical period for optimal child growth and development, making exclusive breastfeeding especially important. Breastfeeding provides health benefits for both mothers and infants and is a national priority in many countries. Although support for exclusive breastfeeding has increased, the prevalence of exclusive breastfeeding at 6 months of age remains low, with only about 40% of infants receiving exclusive breastfeeding [1].

In Indonesia, the percentage of infants under 6 months of age who received exclusive breastfeeding was 71.58% in 2021, 72.04% in 2022, 73.97% in 2023, and increased to 74.73% in 2024 [2]. According to the National Socioeconomic Survey conducted by the Central Bureau of Statistics in Bengkulu Province in 2024, 73.94% of infants under 6 months of age were exclusively breastfed. This means that around 26.06% of infants were not exclusively breastfed, while the national target for exclusive breastfeeding coverage is 100% [2].

Breast milk contains a wide range of nutrients required for infant growth and development and supports brain cell growth and nervous system development. It contains carbohydrates, taurine,

docosahexaenoic acid (DHA), and arachidonic acid (AA). DHA and AA are unsaturated fatty acids that play an important role in brain development and the process of myelination [3].

Child development includes psychomotor, personal-social, and language domains, all of which are influenced by many factors, including nutrition. The World Health Organization (WHO) recommends exclusive breastfeeding for the first 6 months of life, followed by continued breastfeeding together with complementary foods until the child reaches 2 years of age. Previous studies have shown a positive correlation between breastfeeding and cognitive development [4]. The growth and development of infants and toddlers are strongly influenced by the amount of breast milk they receive [5].

Child development is assessed based on the maturity of bodily functions, including gross motor skills, fine motor skills, language, and socialisation. Child development can be evaluated using the Denver Developmental Screening Test II (Denver II/DDST II) [6]. Denver II is designed to detect early developmental problems in children aged 0-6 years by assessing gross motor, fine motor, language, and personal-social skills [7], [8].

Child development is influenced by multiple factors, including exclusive breastfeeding. Studies have shown that 50.5% of infants who are exclusively breastfed have good developmental outcomes. Exclusive breastfeeding is the most optimal choice for providing nutrition during the first six months of life. Children who are exclusively breastfed have a lower incidence of diseases such as diarrhea, urinary tract infections, allergies, pneumonia, and protein-energy malnutrition. This contributes to better health status, which in turn supports child development and long-term quality of life [9]. Previous research found that developmental abnormalities were more common in infants who were not exclusively breastfed than in those who were exclusively breastfed, with a p-value of 0.001, indicating a relationship between exclusive breastfeeding and child development [10].

A child's developmental period cannot be repeated; therefore, any deviation may result in developmental delays relative to age-appropriate milestones. Early detection of developmental disorders and optimisation of age-appropriate stimulation are very important to maximise child growth and development. Denver II is practical and quick to administer, requiring approximately 15-20 minutes, and has high validity [11], [12].

Bengkulu City has 20 public health centres across nine sub-districts. Bentiring Health Center, located in Muara Bangkahulu District, serves a population of 228 infants and has the highest exclusive breastfeeding coverage in the area. The purpose of this study was to determine the relationship between exclusive breastfeeding and gross motor and language development in infants aged up to 6 months using the Denver II screening test.

Methods

This study used an analytical observational design with a cross-sectional approach. The study was conducted at Bentiring Health Center, Muara Bangkahulu District, Bengkulu City, which had the highest exclusive breastfeeding coverage in the area and a population of 228 infants. From this population, a sample of 23 infants was included in the study.

The sampling technique used purposive sampling based on inclusion and exclusion criteria, resulting in a sample of 23 infants. The inclusion criteria were infants aged up to 6 months, infants who visited Bentiring Health Center in Bengkulu City, infants in good health, and infants whose mothers or families were willing to participate as respondents. The sample consisted of infants whose developmental status was assessed in relation to their history of exclusive breastfeeding.

Data collection was conducted during integrated health service post sessions, either at Bentiring Health Center in Bengkulu City or within its service area. Samples were selected according to the inclusion and exclusion criteria. The instrument used was the Denver II, and the data were classified into gross motor and language development domains. The collected data were then processed and analysed to examine their relationship with exclusive breastfeeding.

Child development in infants aged up to 6 months was measured using the Denver II screening test. The interpretation of the overall Denver II results for child development was as follows:

1. Normal, if there is a maximum of 1 caution and no delays.
2. Suspect, if there are at least 2 cautions and/ or at least 1 delay [8].

Data were analysed using the chi-square test. This study received ethical clearance from the Health Research Ethics Committee, Faculty of Medicine and Health Sciences, University of Jambi, with approval number 3067/UN21.8/PT.01.04/2025 dated 21 August 2025.

Results and Discussion

The nutritional content of breast milk greatly supports the growth and development of babies. Breast milk nutrients include protein, fat, electrolytes, hormones, and enzymes. Breast milk also contains Arachidonic Acid (AA), which plays a role in brain tissue formation, as well as Docosahexaenoic Acid (DHA), which contributes to brain development by aiding in the formation of nerve tissue, synapses, and visual senses [13]. The characteristics of the study participants are presented below:

Table 1.

Distribution of the characteristics of respondents' mothers at Bentiring Health Center, Bengkulu City

Characteristic	Frequency (n=23)	Percentage (%)
Mother's last education		
Junior High School	3	13,1
High School	17	73,8
Bachelor's Degree	3	13,1
Working mother		
Yes	5	21,7
No	18	78,3
Exclusive Breastfeeding		
Yes	15	65,2
No	8	34,8

Source: Primary Data (2025)

Table 1 shows that most respondents had mothers with a high school education, namely 17 people (73.8%), mothers who did not work, namely 18 people (78.3%), and children who were exclusively breastfed, namely 15 people (65.2%). Maternal education and employment status may influence child development.

Children who are exclusively breastfed not only receive optimal nutrition but are also protected against infection. Based on previous studies, breast milk provides benefits not only in meeting nutritional needs but also in supporting children's physical, mental, social, and spiritual growth [14]. Other studies have shown that breast milk also contributes to immune protection, thereby supporting healthier and higher-quality human resources [15].

Child development is influenced not only by maternal education but also by maternal employment. Employment may affect the home environment because working parents often entrust childcare to relatives or daycare providers. As a result, some working mothers may have less time to provide direct stimulation to their children [16].

Another factor that affects child development is exclusive breastfeeding. Children who are breastfed receive adequate nutrition that is essential for growth and development, whereas children who are not exclusively breastfed may be less likely to receive optimal nutrition. Breast milk mainly consists of water, protein, fat, lactose, and antibodies that help strengthen a child's immunity, such as lactoferrin, antibodies, and lysozyme. Exclusive breastfeeding supports child growth and development until the age of 6 months, after which complementary feeding is needed alongside continued breastfeeding to meet nutritional needs [17], [18].

Stimulation from parents, especially mothers as primary caregivers, is very important in supporting child development. Parents' knowledge of gross motor and language stimulation contributes to whether children receive sufficient, age-appropriate stimulation, especially during the golden period. This knowledge is also influenced by parental education. Parents with at least junior high school or high school education may find it easier to understand information about appropriate developmental stimulation for their children compared with mothers with lower education levels [19].

Table 2.

Frequency distribution of interpretations of children's development in gross motor skills and language

Development Aspect	Normal		Suspect	
	n	(%)	n	(%)
Gross motor skills	17	73,9	6	26,1
Language	21	91,3	2	8,7

Source: Primary Data (2025)

Table 2 shows that most children had normal gross motor development, namely 17 children (73.9%), and most also had normal language development, namely 21 children (91.3%). During the golden period, children's growth and development require the best stimulation. During this period, developmental disorders can occur in gross motor skills. Children with gross motor disorders will have difficulty adapting and understanding their surroundings. One of the most common gross motor disorders experienced by children aged 1-6 months is the inability to roll over or turn over on their own, lift their head, or even crawl [20]. Child development can also be observed in terms of language. A child can be said to have delayed language development if their language and vocabulary expression is still low compared to children of the same age. The qualitative development of children who experience delays and disorders in vocabulary and language expression differs from that of children in general [21].

Table 3.

Results of data analysis on exclusive breastfeeding and child development in the gross motor aspect

exclusive breastfeeding	gross motor skills				total		p-value
	normal		suspect				
	f	%	f	%	f	%	
yes	15	65,2	0	0	15	65,2	0,000
no	2	8,7	6	26,1	8	34,8	
total	17	73,9	6	26,1	23	100	

Source: Primary Data (2025)

Table 3 shows that most children who were exclusively breastfed had normal gross motor development, namely 15 children (65.2%), whereas most children who were not exclusively breastfed were classified as suspected of having abnormal gross motor development, namely 6 children (26.1%). The data analysis showed a relationship between exclusive breastfeeding and gross motor development, with a significance value of 0.000.

This finding is consistent with previous research showing that exclusive breastfeeding is associated with better gross motor development in children (p-value 0.000) with an average score of 66.50 [22]. Motor development refers to the maturation and control of body movements and is closely related to the development of the child's motor centres. Gross motor skills involve most parts of the body and generally require muscle strength. On average, infants who are exclusively breastfed have better gross motor skills [23].

One factor associated with developmental delay in children is obesity, which may reduce infants' movement and physical performance, including abilities such as rolling over or crawling. Infants who are not exclusively breastfed may be more likely to experience delays. In addition to nutritional factors, the environment also influences gross motor development. Environmental factors include positive stimulation from parents or the surrounding environment, such as talking to the baby and playing with them in age-appropriate ways, as reflected in the Denver II screening items [24]. Maternal knowledge may also contribute to developmental outcomes, particularly when mothers have limited information about the importance of exclusive breastfeeding, while formula milk is widely promoted through media advertisements [25].

Table 4.

Results of data analysis on exclusive breastfeeding and child development in the language domain

exclusive breastfeeding	language				total		p-value
	normal		suspect				
	f	%	f	%	f	%	
yes	15	65,2	0	0	15	65,2	0,111
no	6	26,1	2	8,7	8	34,8	
total	21	91,3	2	8,7	23	100	

Source: Primary Data (2025)

Table 4 shows that most children who were exclusively breastfed had normal language development, namely 15 children (65.2%), while most children who were not exclusively breastfed also had normal language development, namely 6 children (26.1%). The data analysis showed no relationship between exclusive breastfeeding and language development, with a significance value of 0.111.

Some infants who were not exclusively breastfed showed suspected language development problems. This may be because they did not receive the full range of nutrients contained in breast milk. Breast milk has comprehensive nutritional content that supports child growth and development. Language stimulation

also plays an important role in children's language development through repeated exposure to vocabulary and opportunities to communicate. Children tend to imitate and repeat vocabulary that they hear frequently [21].

Based on the findings of this study, there was no relationship between exclusive breastfeeding and child language development, with a p-value of 0.111. This may be influenced by other factors such as suboptimal stimulation, inadequate nutritional intake, and limited parental knowledge of child language development. Language development may progress more effectively when parents frequently engage children in conversation and introduce them to objects in their surroundings. Children cared for directly by their parents may receive different levels of stimulation from those cared for by grandparents or babysitters, who may focus more on supervision than on active language stimulation. Other factors that may influence language development include maternal employment, parental education, number of children, and parenting style, whereas children who receive sufficient affection may show better language development [26].

This study has several limitations. First, the relatively short study period limited the depth of data collection and analysis. Second, the sample size was small, so the findings cannot be widely generalised. Third, this study included only a limited number of variables and therefore could not describe the phenomenon comprehensively. Future studies are expected to use a longer study period, include a larger sample, and examine more variables so that the findings will be more comprehensive.

Conclusion

There was a relationship between exclusive breastfeeding and children's gross motor development. In addition to exclusive breastfeeding, it is important for parents to provide appropriate stimulation to support their children's gross motor and language development. Such stimulation is intended to optimise overall child development.

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