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# Differences in Gross Motor Development for Infants 6-12 Months Based on Exclusive Breastfeeding

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## Abstract

Gross motor and large muscle which are basic movement skills. The golden age of motor development is 6-12 months. The impact of basic motoric stages is not passed, namely not having basic motoric conceptions, the long-term effect will affect children's emotional and mental intelligence. One of the factors that influence the process of growth and development is offering breastfeeding exclusively. Breast milk contains taurine which functions as a neurotransmitter and the maturation process of brain cells.. This study aims to observe gross motoric development in infants 6-12 months between those who were exclusively breastfeeding and non-exclusively breast milk at the Sawah Besar Health Center in 2020. The method of this research is an analytic observational study with a cross-sectional approach. The study population was mothers and infants aged 6-12 months at the Sawah Besar Public Health Center in Jakarta. The number of samples was 39 respondents with purposive sampling technique. Data collection used KPSP, KMS and questioner. Statistical analysis using Chi Square test and Logistic Regression. The results of this study are maternal age (p = 0.015), maternal education (p = 0.023), exclusive breastfeeding (p = 0.001) and infant growth (p = 0.003) had an impact on gross motor development of infants aged 6-12 months. It indicates that exclusive breastfeeding is the main factor determining the gross motor development of infants aged 6-12 months. The difference in gross motor development of babies who are given exclusive breastfeeding will be 25,002 times earlier than babies who are non-exclusive breast milk.

**Keywords:** exclusive breastfeeding; gross motor development; non-exclusive breast milk

Motorik kasar melibatkan keterampilan otot-otot besar yang merupakan kemampuan gerak dasar. Usia emas perkembangan motorik adalah 6-12 bulan. Dampak apabila tahapan motorik dasar tidak terlalui yaitu tidak mempunyai konsepsi motorik dasar, efek jangka panjangnya akan mempengaruhi kecerdasan emosi dan mental anak. Kemampuan motorik halus berkembang setelah kemampuan motorik kasar berkembang secara optimal. Salah satu faktor yang mempengaruhi proses tumbuh kembang adalah pemberian ASI secara eksklusif. ASI mengandung taurin yang berfungsi sebagai neurotransmitter dan proses maturasi sel otak. Penelitian ini bertujuan untuk mengetahui perbedaan perkembangan motorik kasar pada bayi 6 – 12 bulan antara yang diberikan ASI eksklusif dengan non ASI eksklusif di Puskesmas Sawah Besar Tahun 2020. Metode penelitian ini bersifat observasional analitik dengan pendekatan *cross sectional.* Sampel penelitian berjumlah 39 responden dengan teknik *purposive sampling*. Pengumpulan data menggunakan KPSP, KMS dan kuesioner. Analisis statistik menggunakan uji *Chi Square* dan Regresi Logistik. Hasil uji *Chi Square* dengan nilai $\alpha$ 0,05 diperoleh bahwa umur ibu (p=0,015), pendidikan ibu (p=0,023), pemberian ASI Eksklusif (p=0,001) dan pertumbuhan bayi (p=0,003) memberikan dampak terhadap perkembangan motorik kasar bayi umur 6-12 bulan. Oleh karena itu, dapat disimpulkan bahwa pemberian ASI Eksklusif menjadi faktor utama yang menentukan perkembangan motorik kasar bayi

umur 6-12 bulan. Perbedaan perkembangan motorik kasar bayi yang diberikan ASI Eksklusif akan lebih awal 25,002 kali dibandingkan bayi yang tidak diberikan ASI Eksklusif.

**Kata Kunci**: ASI Eksklusif, Motorik Kasar, Non-ASI Eksklusif.

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## Introduction

Growth and development are two events that are different but interrelated and difficult to separate(Soetjiningsih, 2015).Monitoring the growth and development of the baby is an important phase, because it determines the quality of health, welfare, learning and behavior in the future.The number of targets for infant and toddler health in 2018 in Indonesia is very large, namely around 19,270,715 or 7.5% of the entire population of Indonesia(RI Ministry of Health, 2018). So the quality of growth and development of infants and toddlers in Indonesia needs serious attention, namely getting good nutrition, adequate stimulation and affordable by quality health services including early detection and intervention of developmental deviations.(Soetjiningsih, 2015).

Development is an increase in ability in the structure and function of the body which involves the process of differentiation of body cells, body tissues, organs and organ systems that develop so that each can fulfill its function. This includes emotional, intellectual and behavioral development as a result of interaction with the environment(Soetjiningsih, 2015).

Motor development is the process of growth and development of a child's movement abilities which are coordinated by nerves, nerve centers and muscles. In general, motor development is divided into two, namely gross motor and fine motor. Gross motor is part of motor activity that involves large or gross muscle skills(Soetjiningsih, 2015). while fine motor skills are activities involving small muscle movements, such as drawing, writing, beading, embroidering, eating. Fine motor skills develop after gross motor skills develop optimally(Santrock, 2007).

Gross motor skills (gross motor skills) are all children's skills in moving and balancing their bodies. It can also be interpreted as the movements of a child who are still simple, such as jumping and running(Rahma, 2018).

Gross motor movements begin to form when children begin to have coordination and balance. Gross motor movements involve the whole body of the child, such as the activity of the muscles of the hands and feet.(Sujiono et al., 2014).

One of the factors that influence the process of growth and development is providing adequate nutrition, especially when babies are born with exclusive breastfeeding. WHO recommends that children be given exclusive breastfeeding until the age of six months without any liquids or solid food(Lissauer TF, 2009) (Wieland & Santesso, 2016), whereas in Indonesia, the average mother who gives exclusive breastfeeding is only 2 months, even at the same time, giving formula milk increases 3 times(Lestari et al., 2013).

Breast milk has ingredients that are useful for the process of myelination or the formation of membranes in the nerves of the brain which can speed up the work of the nerves, namely AA and DHA(Khamzah, 2012). In addition, breast milk contains taurine which functions as a neurotransmitter and plays an important role in the maturation process of brain cells. The ability of mental and motor development, especially children's gross motor skills, correlates with taurine concentrations in infancy(Hartono, NP, Wilujeng, CS and Andarini, 2016). Breast milk also contains LPUFAs that babies need because they can improve mental function, vision and psychomotor development of babies. This indicates that increasing cognitive reflex abilities is the role of LPUFAs during the baby's neurodevelopment.(Wieland & Santesso, 2016).

The golden age for motor development is middle childhood, which is 6-12 months old. At this age, the child's physical health has begun to stabilize. Children do not experience pain like the previous age (< 6 months). This causes physical development to be more optimal than the previous age(Santrock, 2007).

Based on the results of Larasati's research (2019) stated that there were 26 children (56.5%) with malnutrition status in toddlers based on weight / age at the Sawah Besar District Health Center.(Larasati, 2019). Furthermore, the authors conducted a preliminary survey in early January 2020 of 12 mothers who had babies aged 6-12 months, four of whom experienced developmental deviations and did not exclusively breastfeed. Therefore, there is a link between exclusive and non-exclusive breastfeeding with children's gross motor development, so researchers need to conduct a study entitled "Differences in gross motor development in infants aged 6-12 months at the Sawah Besar District Health Center".

## Method

This research is an analytic observational study which was carried out in cross-sectional ways to determine differences in the gross motor development of infants who were given exclusive breastfeeding at the age of 6-12 months in the working area of the Sawah Besar District Health Center. The research was conducted from January to March 2020. The sample for this research was mothers with babies aged 6-12 months who had their babies checked at the KIA Polyclinic at the Community Health Center in Sawah Besar District, a total of 39 people using a purposive sampling technique.

Data collection methods used the Pre-Developmental Screening Questionnaire (KPSP), Healthy Menju Card (KMS) and a questionnaire to record the characteristics of the baby's age, sex, age and education of the mother, while specific data included gross motor development and infant growth and exclusive breastfeeding. Data on the infant's psychomotor development was carried out by observation using the Developmental Pre Screening Questionnaire (KPSP) with 10 questions(MOH, 2016). Exclusive breastfeeding data was obtained based on interviews and observations on the Towards Health Card (KMS) and Maternal and Child Health (MCH) books. The additional variable, namely the growth of the baby, was carried out by observation of the baby's weight gain chart using the KMS. Data analysis using SPSS software version 21 includes univariate, bivariate and multivariate analysis. Normality and homogeneity tests were carried out prior to the analysis process to determine the statistical test used. Bivariate analysis uses the Chi Square test because variables include categorical data. The process is continued with multivariate analysis to determine two independent variables (exclusive breastfeeding and infant growth) with one dependent variable (gross motor development) at the same time.(Sabri, L., & Sutanto, 2006)

## Results and Discussion

Based on Table 1, it is known that the characteristics of the respondents based on age, most were 6 and 8 months old, each of which was 8 babies (20.5%), female sex as many as 22 babies (56.4%), most mothers were between 20- 35 years as many as 21 respondents (53.8%). The education level of mothers was almost evenly distributed between high school/university graduates and elementary/junior high school graduates, respectively 19 respondents (48.7%) and 20 respondents (51.3%). It is known that the largest proportion of gross motor

development is in the normal category as many as 26 babies (66.7%) and 18 babies (46.2%) who are exclusively breastfed. According to KMS, the biggest proportion of infant growth is in the green line, namely 28 babies (71.8%)

**Table 1**. Frequency distribution based on the characteristics of the respondents, gross motor development, growth and exclusive breastfeeding

| Baby Age (months) | Frequency (f) | Percentage (%) |
|---|---|---|
| 6 | 8 | 20.5 |
| 7 | 6 | 15,4 |
| 8 | 8 | 20.5 |
| 9 | 5 | 12,8 |
| 10 | 4 | 10,3 |
| 11 | 2 | 5,1 |
| 12 | 6 | 15,4 |
| Gender | Frequency (f) | Percentage (%) |
| Man | 17 | 43,6 |
| Woman | 22 | 56,4 |
| Mother's Age (years) | Frequency (f) | Percentage (%) |
| <20 | 1 | 2,6 |
| 20 – 35 | 21 | 53,8 |
| > 35 | 17 | 43,6 |
| Mother's Education | Frequency (f) | Percentage (%) |
| Height (SMA, PT) | 19 | 48,7 |
| Low (SD, SMP) | 20 | 51,3 |
| Gross Motor Development | Frequency (f) | Percentage (%) |
| Normal | 26 | 66,7 |
| Abnormal | 13 | 33,3 |
| Exclusive breastfeeding | Frequency (f) | Percentage (%) |
| Yes | 18 | 46,2 |
| No | 21 | 53,8 |
| Baby Growth | Frequency (f) | Percentage (%) |
| Green line | 28 | 71.8 |
| Yellow line | 9 | 23,1 |
| Red line | 2 | 5,1 |
| Amount | 39 | 100 |

Source: Processed primary data.

Based on Table 2, information was obtained that the motor development in the normal category was relatively almost the same between male and female babies respectively, namely 12 babies (46.2%) and 14 babies (53.8%) obtained a p value of 0.648 > 0. 05. According to(Aulia & Batubara, 2019)every healthy baby has the same development, starting from lying on his stomach, crawling, walking and so on, but hereditary factors such as gender have a different influence. As in adolescents, changes in the endocrine system. The growth and development of children with male sex

after birth will tend to be faster than girls and will last for a certain time. This is influenced by the hormone testosterone which is higher in baby boys compared to baby girls. Babies or boys are more interested in organized activities, being more aggressive and impulsive when compared to baby girls who prefer quiet and comfortable activities.(Aulia & Batubara, 2019).

**Table 2**. Cross-tabulation of gross motor development by sex

| Gender | Gross Motor Development | | | | Total | | *P-values* | OR |
|---|---|---|---|---|---|---|---|---|
| | Normal | | Abnormal | | | | | |
| | F | % | F | % | f | % | | |
| Man | 12 | 46,2 | 5 | 38.5 | 17 | 100 | 0.909 | 1,371 |
| Woman | 14 | 53,8 | 8 | 61.5 | 22 | 100 | | |
| Total | 26 | 100 | 13 | 100 | 39 | 100 | | |

Source: Processed primary data.

**Table 3**. Cross-tabulation of gross motor development based on maternal age

| Mother's age (years) | Gross Motor Development | | | | Total | | *P-values* | OR |
|---|---|---|---|---|---|---|---|---|
| | Normal | | Abnormal | | | | | |
| | F | % | F | % | f | % | | |
| <20 | 0 | 0 | 1 | 7,7 | 1 | 100 | 0.015 | 3,046 |
| 20-35 | 18 | 69,2 | 3 | 23,1 | 21 | 100 | | |
| > 35 | 8 | 30,8 | 9 | 69,2 | 17 | | | |
| Total | 26 | 100 | 13 | 100 | 39 | 100 | | |

Source: Processed primary data.

Based on table 3, it was found that there were 18 mothers (69.2%) aged 20-35 years whose baby's motoric development was in the normal category, while there were 8 persons (30.8%) mothers aged > 35 years who had babies with abnormal development.(Megawati, 2012)Mother's age is one of the characteristics that influence parenting patterns and child growth. According to this theory,(Arini, 2012)stated that the age of the mother greatly determines maternal health because it is related to the conditions of pregnancy, childbirth and postpartum, as well as how to care for and breastfeed her baby. The results of this study indicate that there is an effect of maternal age on the gross motor development of infants 6-12 months (p value 0.015 <0.05). The existence of this influence is due to the older the mother, the more emotionally mature, the more knowledge and experience, and the higher the awareness and responsibility so that it affects the gross motor development of the baby.

**Table 4**. Cross-tabulation of gross motor development based on mother's education

| Mother's Education | Gross Motor Development | | | | Total | | *P-values* | OR |
|---|---|---|---|---|---|---|---|---|
| | Normal | | Abnormal | | | | | |
| | F | % | F | % | f | % | | |
| Height (SMA, PT) | 16 | 61.5 | 3 | 23,1 | 19 | 100 | 0.023 | 5,333 |
| Low (SD, SMP) | 10 | 38.5 | 10 | 76.9 | 20 | 100 | | |
| | 26 | 100 | 13 | 100 | 39 | 100 | | |

Source: Processed primary data.

Based on Table 4, it is known that the gross motor development category is normal in 16 mothers with high education (61.5%) while those with low education are 10 people (38.5%). This study shows that there is an effect of mother's education on gross motor development of infants aged 6-12 months (p value 0.023 <0.05). This means that the higher the education, the better the mother's understanding of the importance of carrying out a stimulus so that it can support the normal motoric development of the baby according to the stages of its development.

The gross motor development of infants based on their growth using KMS can be seen in table 5. The results of this study stated that there was a difference between the gross motoric development of infants and growth (p value 0.003 <0.05) meaning that babies whose weight gain was not according to age according to the KMS graph then 10.248 times the risk of experiencing gross motor development disorders compared to babies whose growth is appropriate.

Based on Table 6, it shows that there were 17 babies (65.4%) whose gross motor development was normal according to age and 1 baby (7.7%) whose development was not normal, while there were 12 babies (92.3%) whose gross motor skills were not normal and not given exclusive breastfeeding. According to(Proverawati, A. & Rahmawati, 2012)Babies who get exclusive breastfeeding for 6 months without any additional food will stimulate normal baby development because they get more nutrients according to the baby's needs, and as a stimulus for motor development with communication between mother and baby as well as emotional bonding.(Proverawati, A. & Rahmawati, 2012).

**Table 5**. Cross-tabulation of gross motor development based on growth charts on KMS

| Growth (KMS) | Gross Motor Development | | | | Total | | *P-values* | OR |
|---|---|---|---|---|---|---|---|---|
| | Normal | | Abnormal | | | | | |
| | F | % | F | % | f | % | | |
| Green line | 23 | 88.5 | 5 | 38.5 | 28 | 100 | 0.003 | 10.248 |
| Yellow line | 3 | 11.5 | 6 | 46,2 | 9 | 100 | | |
| Red line | 0 | 0 | 2 | 15,4 | 2 | 100 | | |
| | 26 | 100 | 13 | 100 | 39 | 100 | | |

Source: Processed primary data.

**Table 6**. Cross tabulation of gross motor development based on exclusive breastfeeding

| Exclusive breastfeeding | Gross Motor Development | | | | Total | | *P-values* | OR |
|---|---|---|---|---|---|---|---|---|
| | Normal | | Abnormal | | | | | |
| | F | % | F | % | f | % | | |
| Yes | 17 | | 1 | | 18 | 100 | 0.002 | 22,667 |
| No | 9 | | 12 | | 21 | 100 | | |
| Total | 26 | | 13 | | 39 | 100 | | |

Source: Processed primary data.

The results of research conducted by(Anisha, 2016)that babies who are exclusively breastfed experience normal growth and development. The results of this study agree with(Aisha, 2017)that babies who get exclusive breastfeeding experience faster growth and development. Babies who are exclusively breastfed have good nutritional status so that babies are able to perform gross and fine motor skills well(Aisha, 2017). Theory(Bahrudin, 2016), babies who get breast milk will have normal gross motor skills, while babies who do not get breast milk will have more potential to experience gross motor development disorders.

Researchers argue that exclusive breastfeeding is very influential on the baby's gross motor skills. Exclusive breastfeeding for 6 months will ensure better motor development, then breastfeeding is continued for up to 2 years, because the duration of breastfeeding also affects the baby's gross motor skills. There are several factors that influence gross motor development. The main factor is nutrition, where babies who are exclusively breastfed will have better development. Babies who get exclusive breastfeeding will get good nutritional status so that in carrying out motor development activities the baby can do well.

In addition, many compositions of breast milk are very useful for supporting gross motor development, including DHA and AA,

which are long-chain saturated fats that form more optimal brain cells for motor development. Breast milk is also a complex fluid that contains all the nutrients needed for the development of a baby's gross motor skills. Babies really need exclusive breastfeeding because it is rich in antibodies to help the baby's body fight infections and other diseases so that the process of gross motor development is not disturbed and runs optimally(Bahrudin, 2016).

In this study, only 1 baby (7.7%) was given exclusive breastfeeding but experienced abnormal gross motoric development, that is, a 12-month-old baby was unable to stand for 30 seconds or hold on and was unable to walk even though he was guided. According to(Santoso, Patience. Mina Yumei Santi, Y., & Nasyiatush Sholihah, 2020). The baby's gross motor skills are not only affected by exclusive breastfeeding, but are also influenced by the stimulation given to the baby. Researchers assume that the lack of stimulation to the baby causes the development of the baby's gross motor skills to be delayed even though the baby has been exclusively breastfed. The child's motor development will depend heavily on how much stimulation and encouragement is given.

Of the 21 respondents who did not give exclusive breastfeeding, there were 9 respondents (34.6%) who had normal gross motor skills according to their age and 12 respondents (92.3%) had abnormal gross motor skills, namely a 6 month old baby could not lift his head up to 900 , sitting head straight, and the body rests on the feet. At the age of 8 months the child cannot turn over and hold his head upright. At the age of 10 months the child cannot get up to stand, gets up and sits, and stands on his own. Anggraeni (2016) good genetic factors from the family will form gross motor skills that develop and become good too(Anggraini et al., 2016). According to Anggraeni (2016) genetics is the basic capital in achieving the results of children's motor development. From the existing phenomena, researchers assume normal gross motor skills are caused because babies have good and supportive genetic factors so that the formation of gross motor development of babies will be optimal. This research is in line with what was done(Lisa, 2012), out of 192 children, 60 (31.2%) non-exclusively breastfed children had normal gross motor development(Lisa, 2012).

Based on the results of the study, there was a significant difference in the average

gross motor development of infants aged 6-12 months between babies who were exclusively breastfed and those who were not exclusively breastfed. The mean difference in the gross motor development of babies who were given exclusive breastfeeding was 1.54 ± 0.81 (Mean ± SEM). When compared with the average gross motor development of babies who were not given exclusive breastfeeding, namely 1.33 ± 0.76, the difference was 0. 21±0.05.

Based on the results of bivariate analysis with values$\alpha$0.05, it is known that gross motor development is determined by mother's age (p=0.015), mother's education (p=0.023), exclusive breastfeeding (p=0.002) and growth (p=0.003). So, the variables of mother's age, mother's education, exclusive breastfeeding and baby's growth will be followed by multivariate analysis.

To get the best logistic regression model, a possibility analysis will be carried out which can be formed using SPSS software showing that to test the variable mother's age (X1), mother's education (X2), exclusive breastfeeding (X3), growth (X4), test the variable age and mother's education (X1 and X2), test variables of exclusive breastfeeding and infant growth (X3 and X4), test variables of mother's age, mother's education, and exclusive breastfeeding (X1, X2, X3), test variables of mother's age, mother's education and infant growth (X1, X2, X4), mother's age variable test, mother's education, exclusive breastfeeding and infant growth (X1, X2, X3, X4). Test variables with logistic regression analysis are presented in table 7.

The p value of the significance of the variable of exclusive breastfeeding is 0.024 <0.05, so H0 is rejected. So, it can be concluded that there is a significant difference between the gross motor development of infants and exclusive breastfeeding with a coefficient of difference of 3.219. The variable is exclusive breastfeeding (p value 0.024 <0.05). Then the best model formed is:

$$\hat{\pi}(x) = \frac{\exp(-8{,}651 + 3{,}219\ X_1)}{1 + \exp(-8{,}651 + 3{,}219\ X_1)}$$

Based on the results above, we can interpret the Odds ratio that exclusive breastfeeding is the main factor that distinguishes gross motor development in infants aged 6-12 months (p value 0.024 <0.05) compared to other factors, namely mother's age, mother's education and baby's growth according to KMS. Infants who

are not exclusively breastfed have a risk of 25,002 times experiencing impaired gross motor development compared to infants who are exclusively breastfed for 6 months.

**Table 7**. Multivariate analysis of logistic regression test

| | | | | | | | 95% CI for EXP(B) | |
|---|---|---|---|---|---|---|---|---|
| | | B | SE | Wald | df | Sig. | Exp(B) | Lower | Upper |
| Step 1a | ASI_E | 3,219 | 1,804 | 3,184 | 1 | 024 | 25,002 | .729 | 858,077 |
| | Age_mother | 1,057 | .863 | 1,501 | 1 | .220 | 2,878 | .531 | 15,614 |
| | Dik_ibu | -1,241 | 1,583 | .615 | 1 | .433 | .289 | 013 | 6,427 |
| | Grow | 1,382 | .842 | 2,693 | 1 | .101 | 3,982 | .764 | 20,743 |
| | Constant | -8,651 | 3,044 | 8,079 | 1 | .004 | .000 | | |

## Conclusion

Based on the results of the logistic regression test, it was concluded that there was a significant difference between the gross motor development of infants and exclusive breastfeeding, the coefficient of difference was 3.219. Exclusive breastfeeding is the main factor that determines the gross motor development of infants aged 6-12 months. Differences in gross motor development of babies who are given exclusive breastfeeding will be 25,002 times earlier than babies who are not given exclusive breastfeeding.

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