

# Determinant Factors Affecting the Development of Motor, Cognitive and Socioemotional Children Ages 18-12 Months in the District Jeneponto, Indonesia

Sarih Karmila<sup>1</sup>, Siradjuddin Saifuddin<sup>2</sup>, Abdullah Tahir<sup>2</sup>, Hadju Veni<sup>3</sup>

<sup>1</sup>Doctoral Student, Faculty of Public Health, Hasanuddin University, <sup>2</sup>Public Health Faculty, Hasanuddin University, Indonesia

## Abstract

**Background:** Malnutrition during pregnancy and early childhood causes delays in physical growth, the motor development, and cognitive development disorders.

**Objectives:** This study aims to Determine the factors that influence motoric, cognitive and socio-emotional development of children aged 18-24 months in Jenepontodistrict.

**Method:** This study is an analytical study with cross-sectional approach. Samples consisted of 32 children aged 18-24 months. Child development was measured using the Caregiver Reported Early Childhood Development Index (CREDI) instrument. Statistical analysis to test the factors that influence motoric, cognitive and socioemotional development using an unpaired T-test with a significance level of 95%.

**Results:** This study reported that of 32 children born to mothers aged 20-35 years (68.8%), <20 and> 35 years (31.3%) with a primary education level of 34.4% and 65.6% intermediate level. Bivariate analysis found that factors affecting the motor development were birth weight ( $p = 0.004$ ), cognitive development influenced by maternal age ( $p = 0.021$ ) and birth weight ( $p = 0.000$ ) and socioemotional development influenced by maternal education ( $p = 0.050$ ), breastfeeding ( $p = 0.010$ ) and stimulation ( $p = 0.004$ ).

**Conclusion:** The factors that influence motoric development are birth weight, cognitive development influenced by birth weight and maternal age, while maternal education, breast feeding, and stimulation affect socioemotional development.

**Keywords:** Motoric development, Cognitive, and Socioemotional, Children aged 18-24 months.

## Introduction

In 2010, an estimated 33% of children aged 3 and 4 years in countries of low and middle income, 80.8 million children fail to meet basic standards in cognitive development and or socioemotional.<sup>1</sup> In 2013, the national prevalence of malnutrition in children under five years-less by 19.6%, which means heavy-less nutritional problem in Indonesia is still a public health problem of high prevalence approaching. Among the 33 provinces, three provinces, including the very high prevalence categories, namely West Sulawesi, West Papua and East Nusa Tenggara.<sup>2</sup>

The Cognitive development of children is influenced by genetic and environmental factors. The child has the potential of genetically cognitive development.

However, environmental factors, such as adequate nutrition and the ability of parents to improve food and stimulating home environment also has a positive effect on cognitive development of children<sup>3</sup>, Optimal health education in the mother can optimize the growth and development of children.<sup>4</sup>

Adequate support to the development of a child when a child can effect motoric development, language, cognitive, social, emotional and behavior, influencing the long-term health and reduce health inequalities and socioeconomic,<sup>5</sup> In children suspected of having developmental delays or disorders, medical evaluation should be done and development (development assessment) so that early intervention can be done immediately (early intervention) on the child.<sup>6</sup>

Based on the phenomenon of the above results, the main purpose of this study was to determine the determinant factor of motor development, cognitive and socio-emotional in children aged 18 to 24 months in Jenepono Indonesia.

### Research Method

This study consisted of children whose mothers enrolled in trials of Moringa leaf powder supplements provided prenatal and postnatal district Jenepono. Children of mothers who were enrolled in the trial and be eligible to participate in the study of child development when children aged 18 to 24 months time recruitment selection. We chose one district and call mom at random to participate in the study of child development between December 2018 to January 2019, and get as many as 32 children aged 18-24 months. The sample size is limited by those who were not in place when the data collection was done as well as funding constraints.

Child development was assessed using Caregiver Reported Early Childhood Development Index (credi). Credi is a simple device, low cost reported by the caregivers or child care givers, for the household survey. To monitor and measure the child’s development, two research assistants trained in the local language setempet Credi and anthropometric measurements for children and adults, and other study procedures.

We did a statistical analysis to examine the factors that influence a child’s development using an unpaired t test with significance level of 95%, and a linear regression model that is tailored to the characteristics

of mothers and children with a significance values at  $p < 0.05$ .

### Results

- a. **Maternal characteristics, prenatal and child development:** The relationship between mother and child development characteristics are presented in Table 1. This study found that children whose mothers aged 20-35 years scored significantly higher on cognitive development CREDI ( $p = 0.021$ ) compared with children whose mothers aged over 35 years. Children whose mothers complete high school education earned scored significantly lower on socio-emotional development ( $p = 0.05$ ) compared to children whose mothers completed primary education. Maternal body mass index, Moringa leaf powder supplementation and second-trimester anemia status did not significantly affect any of the scales of child development.
- b. **Characteristics of children, follow-up and development of children:** The relationship between the characteristics of children, follow-up and development of children are presented in Table 1. In this study, it was found that children who had birth weight  $\geq 2500$  grams have significantly higher scores ( $p = 0.004$ ) in motoric development, and  $p = 0.001$  on cognitive development than children who had birth weight  $< 2500$  g. Children who were breastfed exclusively had lower scores were significantly ( $p = 0.01$ ) in the socio-emotional development compared with children given non-exclusive breastfeeding.

**Table 1. Effect of the characteristics of the mother and child to the development of motoric, cognitive and socioemotional children aged 18-24 months in Jenepono**

Characteristics	Motor		Cognitive		Socioemotional	
	Mean (SD)	p	Mean (SD)	p	Mean (SD)	p
<b>Characteristics of Mother</b>						
<b>Age Mothers</b>						
Age 20-35 years	4.13 (0.69)	0705	14.65 (1.49)	0021 *	13.6 (3.26)	0494
Age <20 and> 35 years	4.00 (1.22)		12.66 (3.16)		12.77 (2.39)	
<b>Education</b>						
Secondary school	4:14 (0.65)	0661	14.14 (1.45)	0867	12:47 (2:20)	0050
Primary school	4:00 (1:18)		14.00 (3.34)		15.09 (3.70)	
<b>IMT mother</b>						
Normal + skinny	3.95 (0.58)	0202	14:57 (1:50)	0095	12.76 (2.68)	0114
Obese + obese	4.36 (1.20)		13.18 (3.09)		14.54 (3.41)	

Characteristics	Motor		Cognitive		Socioemotional	
	Mean (SD)	p	Mean (SD)	p	Mean (SD)	p
<b>Supplementation</b>						
Moringa flour	3.88 (0.35)	0.71	15:38 (1:50)	0:14	14.25 (3.49)	0.63
Moringa extract	4:18 (0.75)		14.00 (1.67)		13.27 (3.26)	
Tablet Fe	4.15 (1.14)		13.38 (2.75)		12.92 (2.63)	
<b>Prenatal Anemia Status</b>						
Hb $\geq$ 11 g/dl	4:05 (0.99)	0715	13.65 (2.45)	0:15	13.30 (3.01)	0.86
Hb <11 g/dl	4:16 (0:57)		14.83 (1.64)		13:50 (3:17)	
<b>Characteristics of Children</b>						
<b>Sex of the Child</b>						
Man	4:05 (0.93)	0.78	14.05 (2.79)	0915	13.50 (2.57)	0796
Woman	4:14 (0.77)		14.14 (1.29)		13.21 (3.62)	
<b>Birthweight</b>						
Normal ( $\geq$ 2,500 g)	4.25 (0.64)	0004 *	14.6 (1.42)	0.00 *	13.5 (3.01)	0545
LBW (<2,500 g)	3.00 (1.41)		10.5 (3.69)		12.5 (3.41)	
<b>Age Pregnancy</b>						
At term ( $\geq$ 37 weeks)	4.09 (0.97)	0978	14.13 (2.55)	0876	13.81 (3.12)	0224
Preterm (<37 weeks)	4:10 (0:56)		14:00 (1:41)		12.40 (2.67)	
<b>Nutritional Status of Children</b>						
<b>Index BB/U (WAZ)</b>						
Normal	4.00 (0.89)	0202	13.84 (2.37)	0197	13:00 (2.91)	0147
Under weight	4.50 (0.54)		15:16 (0.98)		15.00 (3.22)	
<b>Index PB/U (HAZ)</b>						
Normal	4.00 (0.81)	0683	14:20 (1:13)	0.86	12:50 (2:46)	0277
Stunting	4:13 (0.88)		14.04 (2.60)		13.77 (3.22)	
<b>Index BB/PB (WHZ)</b>						
Normal	4:06 (0.86)	0497	14:03 (2:29)	0562	13:40 (3:11)	0.86
Wasting	4.50 (0.70)		15:00 (0:00)		13:00 (1:41)	
<b>Breastfeeding 6 Months First</b>						
Exclusive breastfeeding	4:07 (0.75)	0928	14.30 (1.03)	0661	11.92 (1.32)	0010 *
Non exclusive breastfeeding	4:10 (0.93)		13.94 (2.79)		14.36 (3.46)	
<b>Giving Stimulation</b>						
High scores (score 6-11)	4.3 (0.63)	0249	14.84 (1.67)	1,116	15.3 (3.19)	0004 *
Low score (score 0-5)	3.94 (0.97)		13:57 (2:45)		12.05 (2.09)	
<b>Verbal and Physical Punishment</b>						
Not	4.37 (0.74)	0291	14.75 (1.98)	0346	12.87 (1.8)	0483
Yes	4.00 (0.88)		13.87 (2.3)		13.54 (3.34)	

\* Correlation is significant at the 0:05 level (2-tailed)

c. Factors affecting the development of motoric, cognitive and socioemotional children ages 18-24 months

The results of multiple linear regression analysis (Table 3) to test the independent variables that most influence on the high score between maternal characteristics of child development characteristics of children. In this study it was found that all of the variables examined in linear regression simultaneous effect on motoric development (p = 0.001), cognitive

development (p = 0.000), and on socio-emotional development (p = 0.001). The results that the birth weight of 28.5% a negative effect on the development of motoric (p = 0.003, t = -3.283), and 65.1% negative effect on cognitive development (p = 0.000, t = -5.348). Giving stimulation 65.1% negative effect on cognitive development (p = 0.035, t = -2.234), and a negative effect on the development of socioemotional 48.4% (p = 0.002, t = -3.519).

**Table 2. Results of Regression Testing Factors that influence Motoric development, cognitive and socioemotional children aged 18-24 months**

Independent Variables		Dependent Variables	t	Sig.
Motor Trend	(Constant)		6242	0
	Birth Weight		-3283	0003
	Children's nutritional status (WAZ)		0734	0469
	Stimulation Award		-1327	0196
	IMT Capital		1,473	0152
R2 (R2adj) 0.614 (0.285) F (Sig) 4.082 (0.010)				
Cognitive Development	(Constant)		10 843	0
	Birth Weight		-5348	0,000
	Status of Child Nutrition (WAZ)		1,345	0191
	Stimulation		-2234	0035
	age Mothers		-1621	0118
	IMT Capital		-1.2	0242
	Anemia Status		1402	0174
	Prenatal supplements		-1866	0074
R2 (R2adj) 0.854 (0.651) F (Sig) 9.263 (0.000)				
Developments Socioemotional	(Constant)		4,891	0
	Age Pregnancy		-0824	0416
	Children's nutritional status (WAZ)		-1.64	0113
	breastfeeding		2,499	0019
	Stimulation		-3473	0002
	Mother education		1,122	0273
	IMT Capital		0171	0866
R2 (R2adj) 0.764 (0.484) F (Sig) 5.838 (0.001)				

**Discussion**

**Effect of Age Mothers with Children's Cognitive Development:** In this study, the results obtained with p value = 0,021 which means there is an influence between

the characteristics of the mother's age with cognitive development in children. A child requires special attention to the optimization of growth. Optimizing the development of the necessary interaction between

children and parents, especially the mother's role is very beneficial to the overall process of development of children because parents can immediately recognize the disorder as early as possible the process of development of their children.<sup>7</sup>

If adjusted to international opinion, then an early age in Indonesia are those from birth (age 0 years) until well into the early primary school level. However, some studies show that since the time of conception (in the womb), the developing fetus and have proven to do stimulation to develop a variety of sensitivity and basic abilities.<sup>8</sup> Given the 80% growth and brain development in children currently developing an early age, at the age of 1 year of brain growth reached 70% of the adult brain, and in the age of 3 years of a child's brain has reached 90% of the adult brain. Thus, this period should be best utilized to improve the intelligence of children.<sup>9</sup>

**The influence of birth weight with Motor and Cognitive Development of Children:** Prenatal and natal factors that affect the development of children one of whom is the birth weight. An estimated 10-15% of premature infants with low birth weight or impaired development, as well as infants born with very low birth weight 3-4 times greater risk for experiencing a developmental disorder. Babies with low birth weight have a brain disorder that can be observed through MRI and a greater risk of an abnormal signal by a larger amount. Besides infants with low birth weight, premature and very low birth weight had serum CRP levels were higher.<sup>10</sup>

According to Piaget, the first stage lasts Cognitive Development in children from birth until the age of 2 years is a sensory motoric development. At this stage the baby to build an understanding of the world by coordinating sensory experiences (sensory) them, such as seeing and hearing) with motoric movement (physical) they, like grabbing, or touched, because that is called sensorimotor. At the beginning of this stage, the baby showed no more than a reflective pattern for adapt with the world, towards the end of this stage, babies showed a pattern more complex sensory-motor.<sup>11</sup>

The results of previous studies which stated that infants with a history of premature or low birth weight risk of impaired cognitive development and motor development and research shows that babies born with low weight the potential to have a developmental disorder in the future.<sup>12</sup> Babies born with low birth

weight, especially in infants born with very low birth weight, may have abnormalities in brain structure. Abnormalities of the brain in infancy can affect the child's development in the future.<sup>13</sup>

**Effect of Breastfeeding with socioemotional development Children:** Breastfeeding is one of the environmental factors are known to provide a variety of nutritional and immunological advantages in infants.<sup>14</sup>

The American Academy of Pediatrics recommends breastfeeding for human use as an ideal source of nutrition for infant feeding. Infant formula is the second choice and third choice of soy formula.<sup>15</sup>

In this study showed that breastfeeding for 6 months had a significant influence on socio-emotional development in infants aged 18-24 months. The development of socio-emotional during infancy and early childhood is described as the ability of children who thrive on experience, control and express feelings, establish connections close interpersonal and secure, investigate the environment and learn, all within the scope of the family, society and culture.

Some studies in the encyclopedia concluded that breastfeeding is not a panacea, but as a mother can breastfeed optimally, the infant or child they will get many benefits, one of them for psychosocial and emotional development in children.

**The influence of Stimulation with socioemotional development Children:** The development of socio-emotional during infancy and early childhood is described as the ability of children who thrive on experience, control and express feelings, establish connections close interpersonal and secure, investigate the environment and learn, all within the scope of the family, society and culture.

Results of research on the behavior of giving stimulation to the 32 mothers found that children were stimulated high by their parents have higher scores were significantly ( $p = 0.004$ ) on the development of socio-emotional compared to children who are less stimulated by their parents.

According to research results Supinah, mostly by 53% stimulation skills are good mothers and produce the majority of children aged 2-3 years at 71% had the appropriate gross motor development. Analysis Spearman rho rank generating value calculated at 0.687

indicates that the stimulation skills of mothers with gross motor development in children aged 2-3 years have a strong closeness. That is a good or bad skill in stimulating her mother will be very influential in his gross motor development.

### Conclusions

Based on research that has been done above, it can be concluded that factors affecting motor development is birth weight ( $p = 0.004$ ), cognitive development is influenced by maternal age ( $p = 0.021$ ) and birth weight ( $p = 0.000$ ) and the development of socioemotional affected by breast feeding ( $p = 0.010$ ) and providing stimulation ( $0,004$ ).

**Ethical Clearance:** Ethical clearance was issued by the Health Research Ethics Committee of the Hasanuddin University School of Public Health, and subjects were asked to sign an agreement before being included in the study.

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**Conflict of Interest:** Nil

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