

# Early Initiation of Breastfeeding and Vitamin A Supplementation with Nutritional Status of Children Aged 6-59 Months

## Inisiasi Menyusui Dini dan Suplementasi Vitamin A dengan Status Gizi Anak Usia 6-59 Bulan

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### Abstract

Toddler period, especially the first two years of life is considered as golden age for children because of their rapid growth and development. Therefore, the occurrence of nutritional disorders in the period can be permanent and irreversible. This study tried to assess correlation between early initiation of breastfeeding and vitamin A with nutritional status. The total of samples analyzed in this study was 1,592 toddlers aged 6-59 months that were drawn from 2015 Indonesia Nutritional Status Monitoring Survey in Bengkulu. Data including age, sex, early initiation of breastfeeding, birth length, birth weight, vitamin A supplementation were collected by using questionnaire. Weight and height of children were obtained through anthropometric measurements. More than half of the toddlers (54.6%) did not get early initiation of breastfeeding. Based on multivariate analysis results, most dominant variables related to weight/age, height/age and weight/height indicators were early initiation of breastfeeding and Vitamin A supplementation. Toddlers who did not get early initiation of breastfeeding are at risk of 1.555 times stunting compared to toddlers who got early initiation of breastfeeding. The most dominant variable related to height/age is vitamin A supplementation. Children who do not get vitamin A supplementation are at risk of stunting 2.402 times compared to children who get vitamin A supplementation.

**Keywords:** Early initiation of breastfeeding, nutritional status, vitamin A supplementation

### Abstrak

Masa balita, khususnya dua tahun pertama kehidupan merupakan usia emas bagi anak karena pertumbuhannya yang cepat. Oleh karena itu, terjadinya gangguan nutrisi pada masa itu bisa bersifat permanen dan tidak dapat diubah. Penelitian ini mengkaji hubungan antara inisiasi dini pemberian air susu ibu dan vitamin A dengan status gizi. Total sampel yang dianalisis dalam penelitian ini adalah 1.592 anak di bawah lima tahun (balita) berusia 6-59 bulan yang diambil dari Pemantauan Status Gizi Indonesia 2015 di Bengkulu. Data termasuk usia, jenis kelamin, inisiasi menyusui dini, panjang kelahiran, berat lahir, suplementasi vitamin A dikumpulkan dengan menggunakan kuesioner. Berat dan tinggi anak diperoleh melalui pengukuran antropometri. Lebih dari setengah balita (54,6%) tidak mendapat inisiasi menyusui dini. Berdasarkan hasil analisis multivariat, variabel yang paling dominan terkait dengan indikator *weight/age*, *height/age* dan *weight/height* adalah inisiasi menyusui dini dan suplemen vitamin A. Balita yang tidak mendapat inisiasi menyusui dini berisiko 1,555 kali mengalami *stunting* dibanding balita yang mendapat inisiasi menyusui dini. Variabel yang paling dominan terkait dengan *height/age* adalah suplementasi vitamin A. Anak yang tidak mendapatkan suplemen vitamin A berisiko mengalami *stunting* 2,402 kali dibandingkan anak yang mendapat suplemen vitamin A.

**Kata kunci:** Inisiasi menyusui dini, status gizi, suplementasi vitamin A

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## Introduction

The Global Nutrition Report 2014 reported that Indonesia is listed in 17 countries among 117 countries that have three nutritional problems in toddlers. Problems of nutritional deficiencies, such as being underweight, linear growth stunting, and wasting are still the main nutritional problems faced by developing countries in the world, including Indonesia. Prevalence of stunting in developing countries in 2011 reaches 28%, or 165 million children are suffering from stunting and 52 million children are suffering from wasting worldwide.<sup>1</sup> Results of National Basic Health Research 2013 show a decrease in the prevalence of underweight in toddlers (weight/age that is from 17.9% in 2010 to 13.9% in 2013 and a decrease in the prevalence of malnutrition weight/height that is from 0% in 2010 to 5.3% in 2013).<sup>2</sup>

Nutrition is one of the environmental factors which support growth and development for the process to run satisfactorily. This means that provision of food in good quantity and quality supports growth and development, so that toddlers can grow normally and healthy. Toddlers who do not get food in good quality and adequate quantity can be underweight, malnourished, stunted, and they can suffer from wasting.<sup>3</sup>

The anthropometric composite index is an anthropometric index that combines the three indexes, namely weight-for-age (weight/age), height-for-age (height/age), and weight-for-height (weight/height) to determine the nutritional status of toddlers. Nutritional status categories of the composite index are divided into failure to grow and normal. Failure to grow is a combination of six categories that are nutritional deficiency, stunting, thin, nutritional deficiency and stunting, nutritional deficiency and thin, and nutritional deficiency, stunting and thin.<sup>3</sup> Toddlers have normal status if they do not suffer from malnutrition, stunting, and if they are thin.<sup>2</sup>

A toddler period, especially the first two years of life is the golden age as it is critical for toddlers because they experience growth and development very rapidly. Therefore, the incidence of nutritional disorders in those days can be permanent and irreversible even if the nutritional needs of the next period are met.<sup>4</sup> In addition, the nutritional problems found in toddlers increase because at this age, a child's activities begin to increase, but food intake tends to decrease because they have difficulty in eating. Thus nutritional disorders are prevalent in children aged less than 2 years old or more than 2 years.<sup>5</sup>

In efforts to achieve optimal health status to improve the quality of life of a nation, good nutrition is one of most important elements. Malnutrition, high mortality and morbidity rates, especially in infants and toddlers will hamper the developmental process. Infant mortality rate (IMR) and under-five mortality rate are important

indicators of a child's health. One effort to prevent infant mortality during this period is through breastfeeding.

Implementation of early initiation of breastfeeding, namely breastfeeding in the first hour after birth is one of the programs undertaken to improve the quality and quantity of breastfeeding. Early initiation of breastfeeding is important for both the mother and the child.<sup>6</sup> In Ghana, early initiation of breastfeeding can protect newborns. A total of 22% of newborn mortality can be prevented by breastfeeding within one hour after birth.<sup>7</sup>

Breast milk can reduce morbidity and mortality because in addition to high nutritional value, it also contains immunological substances that protect infants and toddlers from various infections. Exclusive breastfeeding accounts for 13% in reducing child mortality.<sup>8</sup> Low levels of breastfeeding, both from breastfeeding in the first hour after birth and exclusive breastfeeding, result in stunted infant growth, especially weight gain and infant length.<sup>4</sup>

In Indonesia, micronutrient deficiency is quite high, as indicated by 54% of children with vitamin A deficiency, 50% iron deficiency anemia and 17% zinc deficiency. Vitamin A is important micronutrient. Vitamin A deficiency affects protein synthesis, thus affecting cell growth and differentiation.<sup>9</sup> In Indonesia, vitamin A that was given only a single supplementation has been reported to decrease mortality and morbidity. Therefore, children with vitamin A deficiency will get a failure of growth.<sup>10,11</sup> Study by Adhi,<sup>12</sup> in Surabaya found that among toddlers with retinol levels less than 20 µg/dL, stunting (height/age) was found at 33.3% and severe stunting 26.7%. This aim of study aimed to assess correlation between early initiation of breastfeeding and vitamin A supplementation with nutritional status (height/age, weight/height, and height/age).

## Method

This study with cross-sectional design was conducted in ten districts in Bengkulu Province (Bengkulu, Rejang Lebong, Lebong, North Bengkulu, Muko-Muko, Seluma, South Bengkulu, Kaur, Central Bengkulu, Kepahyang) from May to September 2015. The population of study was mothers who had children aged 6-59 months. Multistage cluster sampling was applied to select the study population. Eligible mothers were invited to interview using questionnaires for data collection.

The total of samples analyzed in this study was 1592 toddlers aged 6-59 months. Data including age, sex, early initiation of breastfeeding, birth weight, birth length, vitamin A supplementation were collected by using questionnaire. The weight and height of infants were obtained through anthropometric measurements. The weights and heights of the children were converted to z-score. Data were analyzed using the computer program. Chi-square

test was used for comparing proportions. Multivariate logistic regression analysis was used to determine factor of nutritional status (height/age, weight/height, and height/age) which age, early initiation of breastfeeding, birth length, birth weight and vitamin A supplementation. Statistical significance level was set with p value <0.05.

**Results**

The total of samples analyzed in this study was 1,592 toddlers aged 6-59 months. Frequency distribution was based on toddler characteristics, such as age, sex, early initiation of breastfeeding, birth weight and length, getting vitamin A supplementation, and nutritional status of toddlers.

Based on the results of the study, most (81.6%) of 1,592 toddlers were at the age of 13-59 months. More than half of the toddlers (54.9%) were male. As much as 54.6% of the toddlers did not get early initiation of breastfeeding. Almost all (97.3%) of the toddlers were born with birth weight ≥ 2.5 kg. Majority (84.3%) of the toddlers were born with a birth length ≥ 48 cm. As much as 88.1% of toddlers got vitamin A supplementation on February and August. This study attempted to construct three nutritional status indexes. Almost all (89.1%) of the toddlers had a normal by weight/age nutritional status. A child whose height-for-age was less than 2 SD was considered stunted. As much as 26.8% the toddlers had a stunting by height/age nutritional status, and 89.8% of the toddlers had normal weight/height nutritional status.

Chi-square analysis was done to find the association between age, sex, early initiation of breastfeeding, birth weight, birth length, and vitamin A supplementation and nutritional status of toddlers (weight/age, height/age, weight/height).

Table 2 presents that variables which had significant association with weight/age nutritional status of the

toddlers were age, early initiation of breastfeeding and vitamin A supplementation. Meanwhile, variables that did not have significant correlation with the weight/age nutritional status of the toddlers were sex, birth weight and birth length.

Table 3 shows that variables which had significant association with the height/age nutritional status of the toddlers were early initiation of breastfeeding, birth length, and vitamin A supplementation (p value < 0.05). Meanwhile, the variables that had no significant association with the height/age nutritional status of toddlers were age, sex, and birth weight.

From Table 4, variables that had significant association with the weight/height nutritional status of toddlers were early initiation of breastfeeding and vitamin A supplementation. This is indicated by p value < 0.05. Meanwhile, the variables that did not have any significant correlation with the weight/height nutritional status of

**Table 1. Distribution of Characteristics of Toddlers Aged 6-59 Months**

Variables	Category	n	%
Age	6-12 months	293	18.4
	13-59 months	1,299	81.6
Sex	Male	874	54.9
	Female	718	45.1
Early initiation of breastfeeding	Yes	722	45.4
	No	870	54.6
Birth weight	< 2.5 kg	43	2.7
	≥ 2.5 kg	1,549	97.3
Birth length	< 48 cm	250	15.7
	≥ 48 cm	1,342	84.3
Vitamin A supplementation	Yes	1,402	88.1
	No	190	11.9
Nutritional status (weight/age)	Underweight	174	10.9
	Normal	1,418	89.1
Nutritional status (height/age)	Stunting	426	26.8
	Normal	1,166	73.2
Nutritional status (weight/height)	Wasting	163	10.2
	Normal	1,429	89.8

Notes:  
n = The Number of Samples, % = Percentages

**Table 2. Variables Associated with Weight/Age Nutritional Status**

Variables	Category	Underweight		Normal		p Value	OR (95% CI)
		n	%	n	%		
Age	6-12 months	19	6.5	274	93.5	0.009	0.512 (0.312-0.839)
	13-59 months	155	11.9	1,144	88.1		
Sex	Male	105	12.1	76.9	87.9	0.147	1.284 (0.931-1.771)
	Female	69	9.6	649	90.4		
Early breastfeeding initiation	No	96	13.2	626	86.8	0.007	1.557 (1.135-2.137)
	Yes	78	8.9	792	91.1		
Birth weight	< 2.5 kg	6	13.9	37	86.1	0.461	1.333 (0.554-3.205)
	≥ 2.5 kg	168	10.8	1,381	89.2		
Birth length	< 48 cm	29	11.6	221	88.4	0.795	1.083 (0.709-1.655)
	≥ 48 cm	145	10.8	1,197	89.2		
Vitamin A supplementation	No	162	11.5	1,240	88.5	0.041	1.938 (1.056-3.556)
	Yes	12	63	178	93.7		

Notes:  
n = The Number of Samples, % = Percentages, OR = Odds Ratio, CI = Confidence Interval

**Table 3. Variables Associated with Height/Age Nutritional Status**

Variable	Category	Stunting		Normal		p Value	OR (95% CI)
		n	%	n	%		
Age	6-12 month	61	20.8	232	79.2	0.140	
	13-59 month	365	28.1	934	71.9		
Sex	Male	238	27.2	636	72.8	0.680	
	Female	188	26.1	530	73.9		
Early initiation of breastfeeding	No	236	32.6	486	67.4	0.000	1.738 (1.390-2.174)
	Yes	190	21.9	680	78.1		
Birth weight	< 2.5 kg	14	32.5	29	67.5	0.486	
	≥ 2.5 kg	41.2	26.6	1,137	73.4		
Birth length	< 48 cm	82	32.8	168	67.2	0.023	1.416 (1.058-1.894)
	≥ 48 cm	344	25.7	998	74.3		
Vitamin A supplementation	No	399	28.4	1,003	71.6	0.000	2.402 (1.573-3.668)
	Yes	27	14.2	163	85.8		

Notes:

n = The Number of Samples, % = Percentage, OR = Odds Ratio, CI = Confidence Interval

**Table 4. Variable Associated with Weight/Height Nutritional Status**

Variables	Category	Wasting		Normal		p Value	OR (95% CI)
		n	%	n	%		
Age	6-12 months	27	9.2	266	90.8	0.594	
	13-59 months	136	10.4	1,163	89.6		
Sex	Male	98	11.2	776	88.8	0.183	
	Female	65	9.1	653	90.9		
Early initiation of breastfeeding	No	90	12.4	632	87.0	0.010	1.555 (1.122-2.154)
	Yes	73	8.3	797	91.7		
Birth weight	< 2.5 kg	4	9.3	39	90.7	1.000	
	≥ 2.5 kg	159	10.2	1,390	89.8		
Birth length	< 48 cm	31	12.4	219	87.6	0.265	
	≥ 48 cm	132	9.8	1,210	90.2		
Vitamin A supplementation	No	152	10.8	1,250	89.2	0.043	1.979 (1.052-3.722)
	Yes	11	5.7	179	94.3		

Notes:

n = The Number of Samples, % = Percentage, OR = Odds Ratio, CI = Confidence Interval

**Table 5. Final Variables of Multivariate Analysis**

Anthropometric Index	Variable	p Value	Exp(β)	95% CI for Exp(β)	
				Lower	Upper
Weight/age	Early initiation of getting breast milk	0.006	1.556	1.132	2.139
Height/age	Vitamin A supplementation	0.000	2.402	1.573	3.668
Weight/height	Early initiation of breastfeeding	0.008	1.555	1.122	2.154

Notes:

CI = Confidence Interval

the toddler were age, sex, birth length, and birth weight as shown by p value > 0.05.

The variable selection to be included in the multivariate analysis was analyzed using multiple logistic regression. The variable candidate for multivariate analysis can be seen in Table 5.

Based on multivariate analysis results, the most dominant variable related to weight/age and weight/height was early initiation of breastfeeding. This is indicated by p value = 0.06. The result of data analysis

obtained odds ratio (OR) = 1.556. On other hand, the most dominant variable related to height/age was vitamin A supplementation (OR = 2.402)

### Discussion

Problems of malnutrition still occur in Bengkulu Province. National Basic Health Research 2013 reported that the prevalence of nutritional status of toddlers was based on weight/age, height/age, and weight/height. In Indonesia, severe and moderate stunting prevalence in-

creased from 2007 (36.8%) to 2013 (37.2%). The prevalence of poor nutrition and nutritional deficiency, moderate stunting also increased from 2007 (18.0%) to 2013 (19.2%). The prevalence of severe stunting fell by 0.8% from 18.8% in 2007 to 18.0% in 2013. The prevalence of severe and moderate underweight (6.9% and 7.9% respectively) increased in 2013 compared to the prevalence in 2010 (9.7% and 8.1% respectively).<sup>2</sup> Malnutrition has significant health and economic consequences, which includes increasing risk of death, illness and lower cognitive development among others.<sup>13</sup>

Toddler age is an internal factor that determines the nutritional needs, so age is closely related to the nutritional status of toddler years. The toddler period is a fairly important period because in the toddler age group, the children experience the process of rapid development and growth. This determines the quality of life of the children in the future in producing human resources with good quality, thus requiring adequate nutrients for every kilogram of their weight.<sup>13</sup> The selection of the right and proper food will ensure the adequacy of nutrition for their physical growth that will determine the nutritional status of toddlers.<sup>14</sup> The results of this study showed that in Bengkulu Province, toddlers suffered from underweight (11.9%), stunting (28.09%) and wasting (10.46%) and these mostly occurred at between 13-59 months of age. Stunting is the result of chronic undernutrition that retards linear growth, while wasting is the result of inadequate nutrition over a shorter period, and underweight encompasses both stunting and wasting.<sup>8</sup>

Based on the results of analysis on toddler age, there was no significant correlation between age and nutritional status of toddlers for height/age and weight/height ( $p$  value  $> 0.05$ ), but there was a significant correlation between age and weight/age indicated by  $p$  value  $< 0.05$ . This is in accordance with the theory stating that older the age of the children, the more weight gain they will have. A child whose weight/age is less than  $-2$  SD is considered underweight, and one whose weight/height is less than  $-2$  SD is deemed wasted. Growth faltering begins at about six months of age, as children transition to food are often inadequate in term of quantity and quality, and the exposure to the environment increases their vulnerability to illness.

Results of this study highlighted that sex was not associated with nutritional status of children (weight/age, height/age and weight/height). This indicates that both male and female toddlers had relatively similar chances of getting abnormal nutritional status. The birth weight reportedly did not have significant correlation with nutritional status of children. Causes of childhood growth faltering are multifactorial, but fetal growth restriction might be an important contributor to stunting and wasting in children.<sup>1</sup> The nutritional status of toddlers can be

determined based on the index of weight/age, height/age and weight/height, but the most commonly used is infant at birth, that is, to see if the baby is born with low or normal birth weight. Toddlers aged 2-5 years are vulnerable to poor nutritional status. One of the factors that may affect the poor nutritional status among toddlers is low birth weight. Infants with low birth weight ( $< 2,500$  gram) contribute to deficits in children's development and health and productivity in adulthood.<sup>1</sup> Infants with low birth weight will experience growth and development more slowly on the organs of their body. This situation becomes even worse if children with low birth weight do not get energy and nutrient intake, get a poor pattern of care, and often suffer from infectious diseases.

Moreover, the results found no significant correlation between birth length and the nutritional status of toddlers by weight/age and weight/height. However, the birth length had a significant association with height/age nutritional status. The infant's body length at birth describes the infant's linear growth in the womb. Infants are born to have normal birth weight if the infant's birth length ranges between 48-52 cm. Decrease in linear growth usually indicates a nutritional deficiency status due to energy and protein deficiencies in the past that begins with retardation of fetal growth.<sup>15</sup> Maternal intakes which are inadequate prior to pregnancy cause growth disorders in the fetus that can cause the infant born with a short linear birth length. Maternal undernutrition contributes to fetal growth restriction, which increases the risk of neonatal deaths and, for survivors, of stunting by two years of age. Undernutrition and low intake during pregnancy influence fetal growth, and the first two years of life is a major determinant of stunting of linear growth.<sup>1</sup> Infants with failure to grow at an early age indicate a risk of failure to grow over their lifespan.

This study investigated the association between early initiation of breastfeeding and weight status. There was no significant effect between early initiation of breastfeeding and weight/age status. This can be because the function of the implementation of early initiation of breastfeeding is to optimize breastfeeding since the infant was born. The World Health Organization recommends initiation of breastfeeding within the first hour after childbirth.<sup>6</sup> Breastfeeding for one hour after delivery will give the infant an opportunity to get food as well as antibodies needed by infants that are widely contained in colostrum. However, the increase in the average weight in infants who got breast milk early (1642.86) was higher than those who did not get breast milk early (1462.96, that is, 200.10 gram). This suggests that giving breast milk early improves the quality of infant health and growth. Early initiation of breastfeeding increases chances of breastfeeding success.<sup>13</sup> The average infant growth is common to all infants, because at that time, the

infant enters a period of gold growth.<sup>14</sup> In fact, not infrequently, infants without breast milk consumption have a heavier weight than infants with breast milk consumption because of the high fat in cow's milk. A birth cohort study on Chinese infants showed that exclusive breastfeeding reduced the risk of overweight and obesity by 47% at the age two.<sup>14</sup>

Benefits of early initiation of breastfeeding could affect neonatal mortality risk by four mechanisms. The lower rate of mortality in early initiators may have occurred because mothers who breastfeed their infants shortly after birth have a greater chance of successfully breastfeeding, prelacteal feeding with non-human milk antigens may disrupt normal physiologic gut priming. Third, early human milk is rich in a variety of immune and non-immune components that may accelerate intestinal maturation, resistance against infection, and epithelial recovery from infection. Total protein and immunoglobulin levels also decrease markedly over the first days of life. Finally, promotion of warmth and protection may reduce the risk of death from hypothermia during day 1, especially in preterm infants.<sup>7,8</sup>

Growth of infants with body length indicator have a significant influence in increasing the infant's length and early breastfeeding initiation. This is in line with the assertion that the implementation of early initiation breastfeeding is one way to optimize the growth and health of the infant. In addition, the fact that there was also an increase in the mean body length in infants with early breastfeeding initiation (10.29) which was higher compared to those with no breastfeeding initiation (8.15) also provided a clear picture that infant growth was strongly influenced by breastfeeding and early initiation of breastfeeding.

Previous studies have demonstrated a significant influence of weight gain and increase of body length in infants with the frequency of incidence of illness. The smaller the increase of infant's body length/ weight is, the higher the frequency of the illness is. Growth in children, which is often described using weight gain, is better portrayed as the integration of two processes, namely increased height and increments in height-adjusted weight.<sup>16</sup> A child or infant can be categorized as healthy when his/her physical growth and development fit with the optimal growth stage. Being healthy can also mean the condition in which the infant does not experience physical disability, disruption of body function, also not affected by any diseases.

Vitamin A supplementation was associated with significantly height/age nutritional status. Vitamin A in breast milk is exclusively found almost in fat, thus factors that can affect breast milk fat concentration may affect the vitamin A concentration as well.<sup>7</sup> Deficiency of vitamin A affects protein synthesis, so it also affects cell

growth. Therefore, children with vitamin A deficiency will experience growth failure. In addition, vitamin A also affects the immune function of the human body. As a result, the deficiency of vitamin A causes decreased immunity, making it susceptible to infection, for example, if it occurs on the surface of the intestinal wall, it will cause diarrhea.<sup>4</sup> Non-breastfeeding during the neonatal period and early infancy may increase the incidence of severe malnutrition, cough, and duration of hypoxemia in young infants presenting with pneumonia and diarrhea.<sup>17</sup>

Vitamin A is important in many other tissues and metabolic processes, and the considerable effects of vitamin A deficiency on morbidity and mortality have become clearer. It is important to note that in populations with only marginal vitamin A deficiency, effects on metabolism and immune function already exist.<sup>4</sup> Vitamin A supplementation decreases the severity of diarrhea and complications from measles, but in some trials, supplementation has been associated with increased respiratory infections.<sup>11</sup> Also, vitamin A deficiency contributes to the development of anemia and stunting.<sup>10</sup> People in developing countries like Indonesia derive most of their vitamin A from provitamin A carotenoids, of which  $\beta$ -carotene is the most important. Vitamin A is fat soluble vitamin that can help the absorption and metabolism of iron for the formation of erythrocytes. Low vitamin A status will make iron deposits unable to be utilized for the process of erythropoiesis. In addition, vitamin A and  $\beta$ -carotene will form a complex with iron to make the iron remain soluble in the intestinal lumen, so that iron absorption can be helped.<sup>11</sup>

## Conclusion

There is a significant association of early initiation of breastfeeding, birth length, and vitamin A supplementation with height/age nutritional status. There is a significant association of early initiation breastfeeding and vitamin A supplementation with weight/height nutritional status. The most dominant variables associated with nutritional status are early initiation of breastfeeding and vitamin A supplementation.

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## References

1. Black RE, Victora CG, Walker SP, Bhutta ZA, Christian P, Onis M De, et al. Maternal and child nutrition 1 maternal and child undernutrition and overweight in low-income and middle-income countries. In: Maternal and child nutrition [Internet]. Lancet. 2013; 382(9890): 427-51. Available from:<http://dx.doi.org/10.1016/>
2. Kementerian Kesehatan Republik Indonesia. Riset kesehatan dasar.

- Jakarta: Kementerian Kesehatan Republik Indonesia; 2012. p 1-200.
3. Bose K, Mandal GC. Proposed new anthropometric indices of childhood undernutrition. *Malaysia Journal of Nutrition*. 2010; 16(1): 151–6.
  4. Khanal V, Scott JA, Lee AH, Karkee R, Binns CW. Factors associated with early initiation of breastfeeding in Western Nepal. *International Journal of Environmental Research and Public Health* [Internet]. 2015; 12: 9562–74. Available from: [www.mdpi.com/journal/ijerph](http://www.mdpi.com/journal/ijerph)
  5. Food Security and Analysis Unit. *Food Security and Nutrition Analysis. Technical Series Report No. VII (64)*. Somalia: Food Security and Analysis Unit; 2015.
  6. Hailemariam TW, Adeba E, Sufa A. Predictors of early breastfeeding initiation among mothers of children under 24 months of age in rural part of West Ethiopia. *BMC Public Health*. 2015; 15 (1076). 1-7
  7. Liyanage C, Hettiarachchi M, Mangalajeewa P, Malawipathirana S. Adequacy of vitamin A and fat in the breast milk of lactating women in south Sri Lanka. *Public Health Nutrition*, 2008; 11(7): 747–50.
  8. Edmond KM, Zandoh C, Quigley MA, Amenga-Etego S, Owusu-Agyei S, Kirkwood BR. Delayed breastfeeding initiation increase risk of neonatal mortality. *Pediatrics*. 2006; 117(5): 580–6.
  9. Dijkhuizen MA, Wieringa FT, West CE. Concurrent micronutrient deficiencies in lactating mothers and their infants in Indonesia. *The American Journal of Clinical Nutrition*. 2001; 73: 786–91.
  10. Örün E, Yalç SS, Madenda Y, Üstünyurt-eras Z. Factors associated with breastfeeding initiation time in a Baby-Friendly Hospital - ProQuest. *The Turkish Journal Pediatrics*. 2010;52:10–6.
  11. Caulfield LE, Richard SA, Rivera JA, Musgrove P, Black RE. Stunting, wasting, and micronutrient deficiency disorders. In: Jamison DT, Breman JG, Maesham AR, et al editors. *Disease Control Priorities in Developing Countries*. 2nd edition. Washington (DC): The International Bank for Reconstruction and Development/The World Bank; 2006. Chapter 28. 551-67.
  12. Adhi KT. Perbedaan pertumbuhan linear (TB/U), kadar seng dan kadar c-reactive protein (CRP) pada balita dengan kadar serum retinol normal dan tidak normal [Thesis]. Surabaya: Universitas Airlangga; 2008.
  13. Muchina EN, Waithaka PM. Relationship between breastfeeding practices and Nutritional status of children aged 0-24 months in Nairobi, Kenya. *African Journal of Food, Agriculture, Nutrition and Development*. 2010; 10(4): 2358–78.
  14. Zhang J, Himes JH, Guo Y, Jiang J, Yang L, Lu Q, et al. Birth weight, growth and feeding pattern in early infancy predict overweight /obesity status at two years of age?: A birth cohort study of chinese infants. *PLoS One*. 2013; 8(6): 4–11.
  15. Brown A, Lee M. Breastfeeding is associated with a maternal feeding style low in control from Birth. *PLoS One* [Internet]. 2013; 8(1): 1–7. Available from: [www.plosone.org](http://www.plosone.org)
  16. Gregory CO, Martorell R, Stein AD. Size at birth, infant, early and later childhood growth and adult body composition?: a prospective study in a stunted population. *International Journal of Epidemiology*. 2007; 36(March): 550-7
  17. Chisti MJ, Salam MA, Smith JH, Ahmed T, Bardhan PK, Pietroni MAC. Impact of lack of breast feeding during neonatal age on the development of clinical signs of pneumonia and hypoxemia in young infants with diarrhea. *PLoS One*. 2015; 6(10): 6–10.