The Effect of Exclusive Breastfeeding on Linear Growth of Stunted Birth Length Infants in Bandar Lampung

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Abstract. Exclusive breastfeeding is the only appropriate food for infant 0-6 months, an ideal nutrition for child development and growth. In Bandar Lampung city, the prevalence of stunting is still high compared to national data. This study aimed to know the effect of exclusive breasfeeding on linear growth infants which is stunting birth length in Bandar Lampung city. A quantitative study with prospective cohort design was carried out for 3 months. A number of 179 mother who has stunted birth length infants and breastfeeding practice from birth to six months were completed to follow up. Exclusive breasfeeding in Bandar Lampung city is still low (45.8%). Most of stunted infants with exclusive breasfeeding achieving normal linear growth (97.6%) up to six months of age. Linier growth of exclusively breast-fed infants is higher than those who are not exclusively breastfed either on normal growth or in infants who remain stunting at 6 months of age and girls grow better than boys. Growth faltering occurs during 4 – 5 months of age for those infants who were not breastfed exclusively and those who breastfed exclusively at 5 – 6 months of age. Growth pattern throughout 3 – 6 months of age were analyzed by logistic regression and plotted in curves compared to WHO standard. Exclusively breastfed infants had 3,58 times better in linier growth compared to formula fed infants. Thus, active role of health personnel to promote exclusive breasfeeding and growth monitoring, especially linier growth during 0-72 months to monitor growth faltering, is required.

Keywords: exclusive breastfeeding, birth length, linier growth, stunting

1 Introduction

Achievement of optimal linear growth in stunted infants from birth can be done by preventing the possibility of stunting at the next age. As explained in [1] describe that growth related to changes in terms of size, number, size, or dimension of cell, organ and individual levels, one of which can be measured in length. The baby's growth rate is the highest throughout the life cycle. This condition is characterized by high nutritional needs per kg of

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infant weight. Research result by [2] reported exclusive breastfeeding which is an ideal food for infants during the first 6 months of life may decrease the chances of stunting.

In Indonesia, stunting problem has begun to be seen in newborns with a birth length of less than 48 cm. Based on the results of Basic Health Research [3], the prevalence of under-fives year children with stunted from birth in Indonesia is 20.2%, with the largest percentage of stunted infants in the age 0 - 5 months (22.7%). In fact, Lampung Province has a stunted infants from birth prevalence greater than the national rate of 22.4% [17]. This indicates that the under-five year children suffer from malnutrition resulting in growth faltering since the womb.

Stunting occurs in the critical period of the first thousand days since the womb until the age of 2 years, if untreated it will have permanent impact or can not be corrected [4]. This situation is compounded by an inadequate catch-up growth [5] during infancy to early childhood. Stunting has a very wide impact in adulthood, including in motoric and cognitive development, mortality, and the onset of chronic disease[6] [7].

Stunted infants from birth have a tendency to be higher stunting compared to under-five children with normal length of birth [8][9]. However, some studies suggest that stunted infants from birth may not necessarily remain stunting at later growth stages, even some of them can still catch up so as to achieve optimal or normal height by age.

The Cohort Study[10] in Sweden in adolescents with a stunted birth-history (<-2SD / SGAL) showed a rapid catch-up growth pattern in the early 6 months of birth with an average increase of 1.2 SD (normal birth weight) and 1.3 SD (low birth weight) and only 27% remained stunting at the age of 2 years and 22% at age 18 years.

Based on the results of a cohort study [11] in pregnant women to 12 months of infants in the Indramayu region, it was explained that the high number of stunting infants at birth decreased at the age of 4-6 months. This is influenced by exclusive breastfeeding and exposure to infections. Infants who are not exclusively breastfed have the opportunity to falter 1.7 times compared to those who are exclusively breastfed. In addition, infants with growth faltering at an early age indicate the risk of developing growth faltering over the next life ages. Thus, growth faltering is the next predictor of faltering.

Unicef the conceptual model describes the role of nutritional intake to the incidence of malnutrition in children. Nutritional intake factors are directly related to stunting [4,9,30,31]. Stunting and its consequences should be prevented by ensuring adequate nutrition during the first 1,000 days of life [5].

Adequate nutrition intake affects the normal growth pattern so it can be catch up [28]. The ideal nutritional intake for infants is breastmilk. Breastmilk has been adapted for human life to meet nutritional needs and prevent infant infections for optimal growth, development, and survival [29]. The benefits of breastfeeding will be optimal if the giving is done exclusively without any other supplementary feeding, during the first 6 months of life [20].

Studies in India found a trend of decreased stunting in exclusively breastfed children [21]. In addition, early breastfeeding can lead to stunting [30]. Exclusive breastfeeding during growth spurt is expected to prevent sustained growth faltering in stunted infants from birth through adequate catch-up growth in the first 1,000 days of life (730 days postnatal) period.

However, in Indonesia, the concept of exclusive breastfeeding today is becoming increasingly difficult to implement. The coverage of exclusive breastfeeding is still far from the Indonesia national target of 50% [18] that is respectively 15.3% and 30.2% in 2010 and 2013 [15,17].

WHO through WHA targets a 20% reduction in global stunting prevalence by 40%, meaning that Indonesia's prevalence is 15% by 2025 with a target of 3% per year. Stunting

problems are in line with the low exclusive breastfeeding in Indonesia. Thus, this study aims to analyze the effect of exclusive breastfeeding on stunted infants from birth in achieving optimal linear growth in Bandar Lampung City.

2 Methods

A quantitative study with prospective cohort design was carried out in Bandar Lampung city for 3 months since the infants were 3 months of age. A number of 179 mother who has stunted birth length baby (less than 48 cm) and exclusive breastfed from birth to six months of age were completed to follow up.

Infants's linear growth was measured by the length of the infant by age compared to the WHO anthropometric standard Z-score of Height for Age (HAZ) of children. The length of the infants body at birth was obtained from a birth certificate with a different measuring instrument during the study. Infants's body length is measured every month using a digital infantometer until the baby is 6 months old.

Infant feeding includes breastmilk, formula, food and other beverages (early complementary food) given to infants began to be questioned and observed the 3 month-old infants. This observation begins by asking a feeding history from birth to 3 months of age and followed every month until the infants is 6 months old.

3 Results

3.1 Characteristics of Infant and Mother

The general characteristics of mothers and infants can be seen in Table 1. The majority of mothers are high school and college education background (64.3%). The average age of mother is 29 years and the average height of mother is 151.9 cm.

Table 1. Characteristics of Mother in Bandar Lampung City

Characteristics of mother			**Amount (n)**	**Percentage (%)**
Maternal Education	< Senior High School		64	36.7
	Senior High School and College		115	64.3
	Total		**179**	**100.0**
Family economiy	Low		74	41.3
	High		105	58.7
	Total		**179**	**100.0**
Age of mother (years old)	**Mean**	**SD**	**Min-Mak**	**95% CI**
	29.3	5.8	16 – 46	28 – 30
Nutritional Status (kg/m^2)	Wasting		15	8.4
	Normal		102	57.0
	Overweight		62	34.6
	Total		**179**	**100.0**
	Mean	**SD**	**Min-Mak**	**95% CI**
	23.9	4.4	16 – 41	23 – 25
Height of mother (cm)	Stunted		70	39.1
	Normal		109	60.9

	Total		**179**	**100.0**
	Mean	**SD**	**Min-Mak**	**95% CI**
	151.9	5.2	136 – 165	151 – 153

The average length of the infants's birth was 46.3 cm. Stunted infants from birth is more boy (52%) than girls (48%). The majority of infants born with normal birth weight (92.2%) are weighing more than or equal to 2500 grams (Table 2).

Table 2. Characteristics of Infant in Bandar Lampung City

Characteristics of Infant			**Amount (n)**	**Percentage (%)**
Birth length	**Mean**	**SD**	**Min-Mak**	**95% CI**
(cm)	46.3	1.4	40 – 47	46 – 46.5
Sex	Laki-laki		93	52.0
	Perempuan		86	48.0
	Total		**179**	**100.0**
Birth weight	Low birth weight		14	7.8
	Normal		165	92.2
	Total		**179**	**100.0**

3.2 Exckusive Breastfeeding

Table 3 shows that Exclusive Breastfeeding in Bandar Lampung City is still lower (45.8%) than non-exclusive breastfeeding (54.2%). Non exclusive breastfeeding is divided into 3 categories that are part of seven categories of infant feeding according to Indonesia Ministry of Health [34], are predominant breastfeeding, partial breastfeeding and formula feeding.

Table 3. Distribution of Exclusive Breastfeeding in Bandar Lampung

Exclusive Breastfeeding	**Amount (n)**	**Percentage (%)**
Non-exclusive breastfeeding		
Predominant breastfeeding	8	4.5
Partial breastfeeding	64	35.8
Formula feeding	25	14.0
Exclusive breastfeeding	82	45.8
Total	179	100.0

Partial breastfeeding is the most non-exclusive breastfeeding method performed by mothers to infants in Bandar Lampung City (35.4%) compared to predominant breast feeding (4.5%) and formula feeding (14%).

3.3 Infant Linier Growth

Table 3 shows more than 90% of stunted infants from birth may achieve normal height at 6 months of age. There are only 4.5% of infants who remain stunting at 6 months of age.

Table 3. Nutritional Status (HAZ Index) of Infant 6 Months old in Bandar Lampung City

Nutritional Status (Z-score of Height for Age)	Amount (n)	Percentage (%)
Very Stunted	2	1.1
Stunted	6	3.4
Normal	169	94.4
High	2	1.1
Total	**179**	**100.0**

3.4 Baby Linear Growth According to Exclusive Breastfeeding

Figure 1 which A and B shows a linear growth chart of stunted infant from birth to 6 months based on the sex of the infant. The infant's linear growth chart according to exclusive breastfeeding was compared to WHO anthropometric standard 2005 and Indonesia Ministry of Health [16].

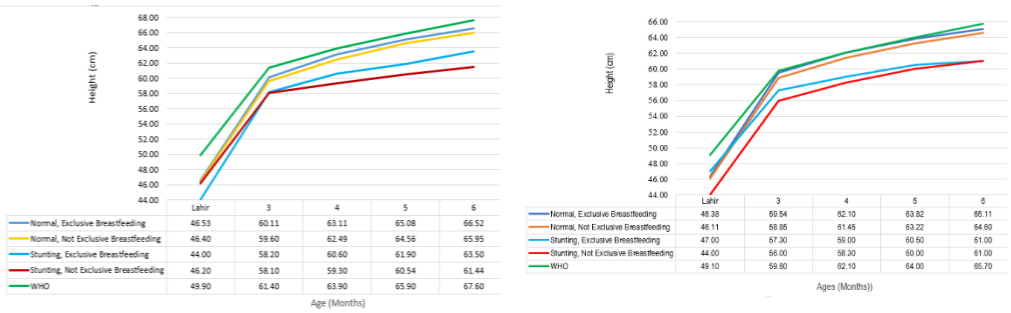
The linear growth line in the normal 6-month-old boy infants exclusively breast-fed is closer to the WHO standard median line. Whereas in infants stunted-birth, boys infants who remain stunting at 6 months of age, it appears that exclusively breast-fed male infants still have a better linear growth line than non-exclusively breast-fed infants.

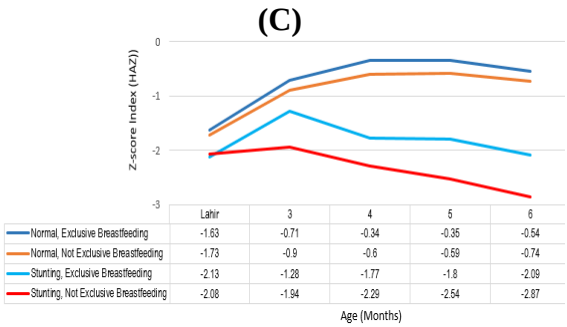
Compared to boy infants, a better linear growth chart can be achieved by girls infants with a stunted infants from bitrh. Figure 1-B shows that the average linear growth rate of all normal stunted infants at birth, girls infants at 6 months is almost close to the WHO standard median line. In fact, girls who had normal linear growth at 6 months of age and exclusively breastfed were able to reach the median WHO line at 4 months.

Thus, all exclusively breast-fed boy and clear infants have a better average linear growth rate than non-exclusively breast-fed infants. However, all female and male infants exclusively breastfed exclusively breastfed have a linear growth line that begins to move away from the WHO standard median at 5 months of age.

Figure 1-C explains that the average of short-term infants successfully catch up growth since the beginning of observation that is the age of 3 months. Furthermore, the linear growth of normal short-term infants at 6 months of age and exclusive breastfeeding has a higher z-score score than non-exclusively breast-fed infants.

(A) **(B)**





	Lahir	3	4	5	6
Normal, Exclusive Breastfeeding	-1.63	-0.71	-0.34	-0.35	-0.54
Normal, Not Exclusive Breastfeeding	-1.73	-0.9	-0.6	-0.59	-0.74
Stunting, Exclusive Breastfeeding	-2.13	-1.28	-1.77	-1.8	-2.09
Stunting, Not Exclusive Breastfeeding	-2.08	-1.94	-2.29	-2.54	-2.87

Fig.1. Graph of Linear Growth Infant Boys (A) and girls (B) and also Infants Linear Growth (Z-score of Height for age index) (C) according to Exclusive Breastfeeding

While in stunted infants from birth who remain stunting at 6 months of age, the linear growth line in exclusively breast-fed infants remains better than those who are not exclusively breastfed. The lowest z-score was achieved by infants who remained stunting at 6 months of age and not exclusive breastfeeding was -2.87 (Fig. 1-C).

4 Discussion

Exclusive breastfeeding is part of the global strategy of infant and child feeding [25,32]. In fact, the Governor of Lampung has issued Regional Regulation No. 7 of 2014 on Exclusive Breastfeeding. The high commitment of regional heads is expected to improve exclusive breastfeeding in Indonesia.

Indonesia Government Regulation [25] describes Exclusive Breastfeeding is breastmilk given to infants since birth for 6 months, without adding and /or replacing and complementary feeding with other foods or beverages. Based on these definitions, the results showed that Exclusive Breastfeeding in Bandar Lampung City is still lower, ie decreased from 58.1% of infants that are only given breastmilk at birth to be 45.8% of infants who success exclusive breastfeeding up to 6 months. This result is still below the target of national achievement in the Strategic Plan of the Indonesia Ministry of Health 2020 - 2024 of 50% [18] as well as the world target until 2025 when Global Nutrition Report 2016 [14, 33].

As the infants age from 3 to 6 months of age, starting with the same average length of birth (46 cm), exclusively breastfed infants have a longer body length than non-exclusively breast-fed infants. This result is proven statistically according to age 3, 4, 5, 6 that is p value 0.032, 0.014, 0.024, 0.033. More exclusively breastfed infants achieve normal linear growth with longer body length because breastfeeding is the best food for infants.

Breastmilk has been adapted throughout human life to meet nutritional needs and prevent infant infections for optimal growth, development, and survival [29]. Breastmilk is the ideal food for infants to meet the physical and psychological needs of growing and developing infants. Breastmilk is easily digested by the infant's digestive system, complete with its nutritional content [3].

Based on sex, better linear growth can be achieved by girls infants than boys. The linear growth chart of all normal girls infants at 6 months is almost close to the WHO standard median line. In fact, girls who achieved normal linear growth at 6 months of age and

exclusively breastfed were able to reach the median WHO median at 4 months of age (Figs. 1-A and 1-B). These results are thought to be due to a lack of appropriate intake based on the needs of the infant boy, either the lack of breastmilk volume in exclusive breastfed infants or the presence of breastmilk substitutes and complementary feeding before 6 months and nutritional value.

According to [2] explained that boy and girl have different body composition. Boy have more muscle tissue and higher basal metabolic rate (> 5%) than girl so require more energy. High metabolic rates occur at birth and increase until the age of two years.

This result is similar to the results of a recent study of 97 normal infants born and exclusively breastfed at the North Jakarta Maternity Clinic [24] that most of the infant boys have lower linear growth than girl infants. This result is explained because boys need greater energy for faster growth than girls, but infants are given insufficient breast milk based on infants' needs.

Another study [13] in a group of non-vegetarian and non-vegetarian breastfeeding mothers in 5 cities in Indonesia reported that girl infants had higher body-length growth than did boys. This is also explained [6] which states that infant girls experience more rapid growth because it is more resistant to the environment that affects growth.

Based on the z-score of height for age index (HAZ), it is known that the average of stunted infants from birth has successfully performed catch up growth since the beginning of observation, namely 3 months of infant age (Figure 1-B). Significant differences are showed in mean z-score of infants at 4, 5, and 6 months. Infants given exclusive breastfeeding have better linear growth than non-exclusive breastfed infants. While in stunted infants from birth who remain stunting at 6 months of age, the linear growth line in exclusively breast-fed infants remains better than those who are not exclusively breastfed. The lowest z-score score was achieved by infants who remained stunting at 6 months of age and non-exclusively breastfed (-2.87). As explained in [28] that adequate nutrition intake affects the normal growth pattern so it can be catch up.

Breastfeeding contains balanced nutrients for the infant's needs, in easy-to-digest form, and with high biological availability. Breastfeeding affects both infant status and brain development, prevents infection, prevents obesity, and prevents allergies and lowers morbidity risk [2].

5 Conclusion

More than 90% of stunted infants from birth can achieve normal height at 6 months of age. Exclusive Breastfeeding in Bandar Lampung City is still lower (45.8%). The proportion of stunted infants from birth are given exclusive breastfeeding and achieved normal linear growth (97.6%) at 6 months was greater than non-exclusive breastfeeding (93.8%). The linear growth of exclusively breast-fed infants is better than non-exclusive breastfed infants in both normal and stunting infants at 6 months of age. Infants girl have better linear growth than boys.

Thus, the active role of health personnel to promote exclusive breastfeeding and growth monitoring by measuring the length or height of the child in the age of 0 - 72 months per three months in accordance with the Regulation of the health ministry of Indonesia, Permenkes number 66 year 2014 to achieve optimal linear growth.

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