The Development of Early Detection Tool for Stunting Prediction

La Banudi[1], Bedjo Santoso[2], Purnomo Leksono[1], Matius Rantesalu[3], Sukri Palutturi[4]

[1]Lecturer, Health Polytechnic of Kendari, Southeast Sulawesi, [2]Lecturer, Health Polytechnic of Semarang, Central Sulawesi, [3]Lecturer, Midwifery Academy of Sinar Kasih Toraja, South Sulawesi, [4]Professor, Faculty of Public Health, Universitas Hasanuddin, Makassar, South Sulawesi

Abstract

Stunting is a nutritional problem in Indonesia which prevalence has experienced an increased every year. One way to overcoming nutritional problems, especially stunting, is the availability of technology, including early detection [tool] for prediction of stunting. The general objective of this research was to develop an early detection tool for predicting stunting. This research was a cross-sectional study. This research was conducted in Kendari and Semarang, from April to December 2019. The research population was children under two years-old in Kendari and Semarang. The samples of this research were children under two years-old in Kendari and Semarang. The data analysis was done using the SPSS program. The research results are: The prediction of stunting is formed when the maternal height variable is a predictive factor for stunting pv = 0.004 CI (1.573–11.438);shorter maternal height with a tendency of 4.242 times. Feeding is a predictive factor for stunting pv = 0.047 CI (1.015–14.229); feeding to baby is only breast milk with a tendency of 3.800 times. The maternal education is a predictive factor for stunting pv = 0.012 CI (1.153–3.225); lower maternal education with a tendency of 1.929 times. The use of drinking water is a predictive factor for stunting pv = 0.027 CI (1.072–3.213); the use of unfiltered drinking water with a tendency of 1.858 times. The prediction of stunting is formed when the variable of maternal height is short, feeding to baby is only breast milk and milk, Antenatal Care is lacking, maternal education is low, the drinking water used is unfiltered, the type of toilet used is other than gooseneck toilet and the birth weight is LBW, thenthe prediction of stunting would be 85%. Suggestions given in this research are that –from the models(variables) taken, namely inappropriate feeding, inadequate ANC and low maternal education can predict stunting status thus it is necessary to make improvements to these variables.

Keywords: *Stunting, baduta, early detection.*

Introduction

Stunting is one of the nutritional problems faced by all countries[1-3], particularly in poor and developing countries. Stunting is a problem with an increased risk of illness and death, slow brain development resulting in delayed motor development and stunted mental growth. Stunting is a predictor of poor quality of human resources which in turn will affect the development of a reliable nation's potential[4]. It is estimated that 40% of children under five years-old suffer a loss of developmental potential; and stunting is a major risk factor[5,6].

The nutritional status of children with short parent(s), one or both, are more at risk of growing short (having stunted growth) than children with parents of normal height[7]. If the parents are short because of the genes on the chromosomes that carry the short trait, it is likely that the short trait will be passed on to their children. But if the short trait of the parents is caused by food consumption or pathological problems, then the short trait will not be passed on to their offspring or children[8].

A study conducted in Ethiopia identify factors associated with high stunting in breast-fed babies. The results show that babies of mothers who have low zinc levels in their breast milk are more likely to be stunted[9]. One of the problems in infant feeding is the cessation of

breastfeeding and insufficient complementary feeding. WHO recommends exclusive breastfeeding for the first 6 months of life and continued with the introduction of complementary foods in addition to breast milk until the age of 2 years.

Basic Health Research data in 2013 shows that the prevalence of stunting by province and national was 37.2%, meaning there was an increase compared to 2010 with 35.6% and 2007 with 36.8%. The prevalence of stunting was 37.2%, consisting of 18.0% being very short and 19.2% being short. In 2013, the prevalence of very short (stunted) decreased, from 18.8% in 2007 to 18.5% in 2010. The prevalence of short (stunted) increased from 18.0% in 2007 to 19.2% in 2013[10]. The results of monitoring the nutritional status in 2015, the description of the national nutritional status for the very short category reached 10.1% and 18.9% for the short category. Meanwhile, the nutritional status of children aged 0 — 59 months by province in 2015 reveals that the prevalence of very short children under five y.o in Southeast Sulawesi was 9.2% and the prevalence of short cBasic Health Research in 2010 explains that the prevalence of stunting in Indonesia was 35.6%. The prevalence of stunting in Central Java is considered high, namely 33.6%, with 17% of short children and 16.9% of very short children. One of the areas in Central Java with a high prevalence of stunting is Semarang. Meanwhile, the sub-district with the highest prevalence of stunting is East Semarang sub-district which is 40.16%.

Harahap's research results on the Disorders of Growth and Development in Children Aged 0.5– 1.9 Years Associated with Poor Food Intake and Parenting explain that protein intake, socio-economic status and child care are risk factors for growth and developmental barriers in children[11]. Other researches explain that The factor most influencing the occurrence of stunting in children under five years-old in rural and urban areas is the level of zinc adequacy[12].

Indicators of the program success can be seen between the suitability of the process and the planned program, the conformity with objectives, the use and utilization of resources effectively and efficiently, and the ability to guarantee the conformity of processes and achievement of goals – through a harmonious control mechanism in one measuring instrument. One system to monitor early detection of stunting assessment activities is in the form of a screening module[13,14].

Stunting early detection information system is a tool to track stunting prediction, procedures and policies used to manage early detection of stunting to support the implementation of monitoring of nutritional status (stunting) in an integrated and comprehensive manner within the framework of early detection of stunting. This program will describe the early detection of stunting and intervene when there are indications of stunting[15,16].

Materials and Method

This research was a cross-sectional study. This research was conducted in Kendari and Semarang from April to November 2019. The population of this research was children under two years-old with a large sample size; 245 people (Kendari with 125 people and Semarang with 125 people). The sampling technique in this research was purporsive sampling. The data analysis was done using the SPSS program. The data that has been analyzed are presented in tables and narratives to discuss the results of the research.

Results

This research was conducted at two locations, namely Kendari and Semarang. The sample characteristics are shown in Table 1.

Table 1: The characteristics of the research sample

No.	Variable	N	%
1.	**Nutritional Status H/A**		
	Stunting	105	57.1
	Normal	140	42.9
2.	**Gender**		
	Male	131	53.5
	Women	114	46.5

No.	Variable	N	%
3.	**Age group** 6–12 months 12–24 months	 125 120	 51.0 49.0
4.	**Mother's Age Category** <20 y.o 20-35 y.o > 35 y.o	 5 208 32	 2.0 84.9 13.1
5.	**Maternal (mother's) Education** Low Moderate High	 30 161 54	 12.2 65.7 22.0
6.	**Paternal (father's) education** Low Moderate High	 28 162 55	 11.4 66.2 22.4

The determination of nutritional status according to the H/A index reveals that those who experience stunting are 42.9% while those who are normal are 57.1%. The gender of the sample is almost equal between male and female, wherein for the male is 53.5% while the female is 46.5%. The percentage of sample age group of 6-12 months is 51.0% and 12-24 months is 49%. Meanwhile, for the categorization of maternal age of<20 y.ois only 2%, 20-35 y.o is 84.9% and >35 y.o is only 13.1%. Most of the maternal education is in the moderate category at 65.7%, while those in the low category are 12.2% and those in the high category are 22.0%. Most of the paternal education is in the moderate category at 66.2%, while those in the low category are 11.4% and those in the high category are 22.4%.

After the multiple logistic regression test was carried out in 5 steps with variables consisting of the maternal height, feeding, pregnancy desire, Antenatal Care (ANC), maternal education, death of siblings, use of drinking water, type of toilet and birth weight, the models for the formation of stunting in this research are presented in Table 2.

Table 2: The Multiple Logistic Regression Analysis for the Development of Early Detection Tool to Predict Stunting

Variable	B	PV	OR	CI
Maternal height - Less (short) - Normal	1.445	0.004	4.242	1.573 – 11.438
Feeding - Solid food - Breast milk/milk	1.335	0.047	3.800	1.015 – 14.229
Maternal education - Low - Moderate - High	0.657	0.012	1.929	1.153 – 3.225
The use of drinking water - Unfiltered - Filtered	0.618	0.027	1.856	1.072 – 3.213

Variable	B	PV	OR	CI
Birth weight - LBW - Normal	1.003	0.029	2.727	1.108 – 6.712
Constanta	-3.047	-	-	-

The emerging models inform that maternal height is a predictive factor for stunting pv = 0.004, CI (1.573 – 11.438). Children of mothers whose height is less (short) are likely to experience stunting as much as 4.242 times greater compared to children of mothers with normal height.

Feeding is a predictive factor for stunting pv = 0.047, CI (1.015 – 14.229). Babies who arefed with only breast milk or milk have a tendency to experience stunting as much as 3.800 times greater compared to those who are fed with solid food in addition to breast milk/milk.

Maternal education is a predictive factor for stunting pv = 0.012 CI (1.153 – 3.225). Children of mothers with low education have a tendency to experience stunting as much as 1.929 times compared to children of mothers with high education.

The use of drinking water is a predictive factor for stunting pv = 0.027, CI (1.072 – 3.213). Babies who use unfiltered (unsafe) drinking water have a tendency to experience stunting as much as1.858 times greater compared to those who use filtered water.

After the calculation of the models, so as to see the prediction of stunting from all variables then the following equation (Eq) is used:

y = constanta + B (BH) + B (Feeding), B (maternal education) + B (the use of water) + B (birth weight)

y = -3.047 +1.443 +1.375 + 0.657 + 0.618 +1.003

y = 0.133855

$p = 1/1 + e^{-y}$

p = 1/1 + (0.133855)

p = 85%

From this calculation, it shows that if the variable of maternal height is short, feeding to baby is only breast milk and milk, Antenatal Care is lacking, maternal education is low, the drinking water used is unfiltered, the type of toilet used is other than gooseneck toilet and the birth weight is LBW, thenthe prediction of stunting would be 85%.

Discussion

The determinants of health, including stunting, are very complex, ranging from health, sanitation, parenting patterns to political issues [17-26]. The emerging models inform that maternal height is a predictive factor for stunting pv = 0.004, CI (1.573 - 11.438). Children of mothers whose height is less (short) are likely to experience stunting as much as 4.242 times greater compared to children of mothers with normal height.

The height of the parents is closely related to the physical growth of the child. A short mother is one of the factors associated with and predicts the occurrence of stunting[27]. The results of this study are in line with Rahayu (2011), which states that children born to short mothers or fathers are at risk of becoming stunted. One or both parents who are short due to a pathological condition (such as growth hormone deficiency) have a gene on the chromosome that carries a short trait, increasing the chances of the child inheriting the gene and growing stunted. However, if the parent is short due to nutritional deficiencies or disease, the child may grow to a normal height as long as the child is not exposed to other risk factors. As many as 40% of children have stunted growth (loss of developmental potential) due to stunting[6].

Another research also concludes that a short mother, short father, low education level and low income are risk factors associated with the occurrence of stunting in children[28]. Other studies also state that genetic factors in mothers, namely height, have a strong correlation and can predict the occurrence of stunting in children under five.[5,29]

Feeding is a predictive factor for stunting pv = 0.047, CI (1.015 - 14.229). Babies who are fed with only breast

milk or milk have a tendency to experience stunting as much as 3.800 times greater compared to those who are fed with solid food in addition to breast milk/milk.

This the test results are in accordance with other studies that reveal the level of food consumption, for example lack of vitamin C, is a risk factor for the occurrence of stunting with an OR value of 2.97, meaning that the respondents with lack of vitamin C consumption have a risk of stunting 2.97 times greater compared to those with sufficient level of vitamin C consumption[30,31].

Food consumption that must be well cared for in children is the consumption of calcium nutrients (the most abundant mineral in the body –about 99%). The total calcium in the body is found in hard tissues, namely bones and teeth. Lack of calcium during growth period can cause growth disorders. Calcium plays a role in phosphate metabolism by forming solubility in the form of bone mineralization[30,32].

The research conducted in Guatemalan explain that children with insufficient consumption will experience stunting (F = 7.069, p = 0.013),for example children who do not consumea sufficient amount of protein source, will likely to experience stunting. Likewise, for not consuming sufficient amount of milk.[33]. Whereas, a reserach in Uganda on millet porridge as the main food for children reveals that they could only meet <60% of the recommended daily nutritional intake[34].

The research on the Predictors of stunting for children aged 6 – 59 months in the Sodo Zuria District,Southern Ethiopia illustrates that children who receive pre-lacteal feeding are predictors of stunting (AOR = 3.8; 95% CI: 1.2 – 12.2). This happens because children are introduced to complementary foods that are not suitable for the age of feeding[35]. Meanwhile, the nutritional status of children living in institutionalized care is revealed to have half of the study results on dietary information with inappropriate intake or dietary diversity. Likewise, younger children will experience higher stunting than older children[36].

Maternal education is a predictive factor for stunting pv = 0.012, CI (1.153 – 3.225). Children of mothers with low education have a tendency to experience stunting as much as 1.929 times compared to children of mothers with high education. Maternal education level is determined by formal education that has been completed. The level of maternal education is the basis for achieving good nutrition for children because theoretically, the low level of maternal education is a risk factor and can predict the children's growth. The provision (feeding) of appropriate ingredients and food menus for children in an effort to improve their nutritional status will be realized if the mothers have a good level of education and knowledge. Maternal education and knowledge level influence attitudes and behaviors in choosing quality food ingredients which will affect the nutrition of their family.[37]

The research on Children Malnutrition in the Metropolitan City of Southeast Nigeria explains that the risk factor for malnutrition is maternal education. Where it is explained that mothers with sufficient level of education will easily seek daily information (about appropriate nutrition for their family) compared to those with low level of education[38].

The level of education is related to how mothers can easily get and receive access to information about nutrition and health from outside. Mothers with higher level of education are more likely to receive information from others, compared to mothers with low level of education. The level of education in families of children under five years-old who experience stunting is mostly in the low category, this is due to the economic limitations, including eating which sometimes is just what it is.[39]

The use of drinking water is a predictive factor for stunting pv = 0.027, CI (1.072 – 3.213). Babies who use unfiltered (unsafe) drinking water have a tendency to experience stunting as much as1.858 times greater compared to those who use filtered water. Clean drinking water sources are important factor for body health in order to reduce the risk of various diseases such as diarrhea, cholera, and typhus. Children are susceptible to infectious diseases because naturally their immune system is classified as low. The deaths and morbidity of children are generally associated with contaminated drinking water sources and inadequate sanitation.[40].

Filtered drinking water sources are healthy environmental sanitation that indirectly affecting the health of children under five years-old, which in turn can affect their nutritional status, in this case – the occurrence of stunting. Nutritional problems, apart from being caused by a lack of nutrient intake, can also occur due to poor environmental sanitation. In this case, unfiltered sources of drinking water and bad personal hygiene make it easier for infectious diseases to occur. This is in line

with other studies which state that there is a relationship between environmental hygiene and sanitation with the occurrence of stunting as these condition can predict the occurrence of stunting in children[33].

Based on the results of the calculation that if the variable of maternal height is short, feeding to baby is only breast milk and milk, Antenatal Care is lacking, maternal education is low, the drinking water used is unfiltered, the type of toilet used is other than gooseneck toilet and the birth weight is LBW, thenthe prediction of stunting would be 85%.

Conclusion

Based on the results and discussion, the conclusion of this study is that the prediction of stunting is formed when the variable of maternal height is short, feeding to baby is only breast milk and milk, Antenatal Care is lacking, maternal education is low, the drinking water used is unfiltered, the type of toilet used is other than gooseneck toilet and the birth weight is LBW, thenthe prediction of stunting would be 85%. The suggestions given in this study are that from the models (variables) taken, namely inappropriate feeding, inadequate ANC and low maternal education are proven to be able to predict stunting status, thus it is necessary to make improvements to these variables.

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