



The Relationship Between Nutritional Status and History of LBW on Child Development

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Abstract

Optimal child development reflects the future of a nation. Malnutrition and low birth weight (LBW) history are significant determinants impacting children's development, especially in low-income settings. This study examines the relationship between nutritional status and LBW history with the development of 4-year-old children using the Developmental Pre-Screening Questionnaire (KPSP). The aim is to identify the relationship between nutritional status and LBW history with the developmental outcomes of children aged 4 years. An observational analytic study with a cross-sectional design was conducted in the working area of Jongaya Health Center, Makassar. The study included 56 children, divided into groups based on their nutritional status and LBW history. Data were collected using anthropometric measurements and KPSP. Statistical analysis was performed to determine significant relationships. The results showed a significant relationship between nutritional status and child development ($p < 0.05$). Additionally, children with LBW history showed delayed development compared to those without LBW history ($p < 0.05$). It concludes that nutritional status and LBW history significantly influence the developmental outcomes of 4-year-old children. Early interventions addressing malnutrition and LBW are crucial to ensure optimal development.

Introduction

Success in achieving optimal development in children is a reflection of the future of the nation and state (Masten & Coatsworth, 1998). Children are the next generation who need serious attention. Every child has the right to achieve optimal development in various aspects, such as cognitive, social, and emotional. Providing the right stimulation can stimulate the development of the child's brain, including motor skills, speech, language, socialization, and independence according to their age. (Hati & Lestari, 2016).

Development is the process of increasing the complexity of body structure and function which includes gross motor skills, fine motor skills, speech and language, as well as socialization and independence skills. According to Diana (2010) assessment of child development can be done through measuring motor skills, speech and language, socialization, and independence in toddlers. The pattern of development of children's basic abilities tends to be regular and occurs gradually. Parents or family members can provide stimulation that is appropriate to the child's age to encourage their growth and development (Fitriani, 2015).

Growth and development disorders are a serious problem for both developed and developing countries in the world, Growth Approximately 95% of children with developmental disorders

live in low and middle income countries. Nationally in Indonesia the prevalence of toddler nutritional status consists of 3.9% malnutrition, 13.8% undernutrition, 79.2% good nutrition, and 3.1% overnutrition (Hartono et al., 2017). The prevalence of developmental deviations in children under 5 years of age in Indonesia reported by WHO in 2016 was 7,512.6 per 100,000 population (7.51%) (Nudesti & Wulan, 2024).

More than 43% of children under the age of 5 (over 200 million children) are estimated to fail to reach age-appropriate developmental milestones due to malnutrition, inadequate stimulation, and other risk factors associated with poverty (Hanifah et al., 2023). Childhood developmental delay occurs when a child does not reach developmental milestones by the expected age for each functional dimension (Handayani & Dewi, 2023). According to data from the United Nations Children's Fund (UNICEF), 21.3% of children under the age of five in the world were undernourished in 2019, representing 144 million people, research shows that malnutrition has a positive effect on child development .

According to findings from the Basic Health Research, there are 12.4% of children in Indonesia who experience gross motor development disorders, and 9.8% experience fine motor development disorders (Rosmiyati et al., 2017). Although there has been a decrease in this figure when compared to the results of the 2018 Riskesdas, where gross motor development disorders reached 8.8% and fine motor development 6.2%, the data shows that the problem of motor development disorders in children is still a major health problem in society (Amalia et al., 2022).

According to Uce (2018) Nutrition is an important determinant of child development, but nutrition alone is not enough. Stimulation is also needed to facilitate the maturation of body functions (Mueller et al., 2021). Children can only receive effective food and stimulation if the mother or caregiver has the appropriate knowledge, attitude, and motivation regarding the provision of food and stimulation (Javani et al., 2024). Education about nutrition and stimulation through counseling is an effective combination of efforts in changing the behavior of mothers or caregivers.(Amirullah et al., 2020).

History of Low Birth Weight (LBW) is one of the factors that can affect the incidence of stunting (Sholihah, 2023). Low birth weight (LBW) babies experience fetal growth disorders that begin in the womb and continue after the baby is born. This condition can cause delays in the baby's growth and development process, as well as failure to achieve growth that should occur in the postnatal period (Khayati & Wahyuningsih, 2023).

Children aged 4 years have a close relationship to the development process (Isna, 2019). These early age children, namely children who experience development in the exploration stage, imagination, and direct interaction with their surroundings, have a tendency to be happy with new things obtained through creative activities and play.(Syukur et al., 2023)

The incidence of LBW in South Sulawesi Province is ranked seventh out of 34 provinces, with a percentage of 4.2%. Reported from the health profile of South Sulawesi Province in 2020, 167,083 live births were found, with 151,314 babies weighed, and the number of LBW cases reached 6,353 (4.2%) (Zulfikar et al., 2023). Meanwhile, data from the 2023 Indonesian Health Survey (SKI) in South Sulawesi showed that out of 5,823 babies weighed, around 7% had LBW.

Children's fine motor coordination is very developed, even almost perfect, at the age of four (Damayanti & Aini, 2020). However, children of this age still have difficulty arranging blocks into buildings. This is because they want to put all the blocks correctly so that sometimes the building collapses itself. At the age of four, children really like challenging physical activities, such as jumping from high places or hanging with their heads hanging down (Syukur et al., 2023).

Differences in several previous studies conducted regarding This study focuses on analyzing the relationship between nutritional status and history of low birth weight (LBW) with the development of 4-year-old children using the Pre-Screening Development Questionnaire (KPSP) in the Jongaya Health Center work area. This study integrates two main variables, namely history of LBW and nutritional status, which have not been studied specifically at the age of 4 years. In addition, the KPSP-based approach provides a practical contribution in identifying potential developmental delays in early childhood in the context of primary health care. This study is important because nutritional status and history of LBW are factors that can affect child development, especially in early childhood which is a critical period of growth and development. The results of this study are expected to provide relevant data to support early detection and intervention efforts for the risk of developmental delays, so that health services in the Jongaya Health Center work area can be more optimal in supporting child growth and development holistically.

Methods

Types of research used in studies This is design analytic observational with cross sectional approach aimed at For see connection between nutritional status and history of LBW development child 4 years old use questionnaire pre screening development. Research This done from October to November 2024 in the work area Health Center Research This has through ethical tests conducted at the Commission Ethics Health Research (KEPK) and stated has fulfil principle ethics as well as can implemented with number ethics No. E. 70/KEPK/FKIK/X/2024. Sample in study This is a 4 year old child living in the work area Health Center Jongaya, Makassar City, and fulfills criteria inclusion. Samples were obtained with use purposive sampling technique and calculated based on objective For see connection between independent variables and variables dependent. Total number of respondents in the study This were 56 children aged 4 years with use formula slovin:

$$n = n = \frac{N}{1 + Ne^2}$$

$$n = \frac{128}{1 + 162 (0,1)^2}$$

$$n = \frac{128}{1 + 128.0,01}$$

$$n = \frac{128}{1 + 1,28}$$

$$n = \frac{128}{2,28}$$

n = 56,14 rounded up to 56 samples

Information:

n : number sample

e : margin of error

N : number population

Types of data obtained is primary data, which includes measurement anthropometry, questionnaire pre screening development, and KIA books. In the research this, nutritional status measured use index weight according to height (BW/TB) based on anthropometric data. Second, a history of LBW was obtained from documentation in the Maternal and Child Health Book (KIA). Development child rated use Questionnaire Pre Screening Development (KPSP)

for child age 48 months, with category development appropriate, doubtful, or deviate based on score questionnaire. The data obtained analyzed use analysis univariate and bivariate. Univariate analysis was performed For know distribution and frequency every Variables. Analysis Bivariate done using the chi square test For to know connection between variable independent and variable dependent, namely The relationship between nutritional status and history of LBW development child age 4 years. For validity test and reliability test No Again done Because questionnaire pre screening development is questionnaire that has been through strict validity and reliability tests at the stage development beginning.

Results and Discussion

Observation This implemented in October 2024 in the region Health Center Jongaya , Makassar City, with involving 56 respondents child age 4 years. Respondent consists of from 35 children men and 21 children women, all of whom chosen in a way purposive in accordance criteria research. Data collection includes nutritional status measurement and examination development using KPSP 48 months. Information Details about results observation served in form structured tables and explanations For make it easier analysis. Based on results observation and data analysis, obtained findings significant that can give description connection between history birth weight low birth weight (LBW) and nutritional status to development child. Findings This will explained more carry on.

Table 1. Characteristics Respondents

Variable	Frequency	Percent
Development Status		
In accordance	25	44.6%
Doubtful	16	28.6%
Deviate	15	26.8%
Nutritional status		
Not enough	21	37.5%
Good	26	46.4%
More	9	16.1%
History of LBW		
No	35	62.5%
Yes	21	37.5%
Total	56	100%

Source: Primary Data, 2024

Based on the data in Table 1, the distribution sample child 4 years old show that as many as 44.6% of children own appropriate development with his age , while 28.6% are classified as in development doubtful , and 26.8% experienced development deviate . Based on nutritional status, the majority children (46.4%) have nutritional status good , followed by children with nutritional status not enough as many as 37.5%, and 16.1% children have nutritional status more. In terms of history of LBW, some big children (62.5%) did not own history of LBW, while 37.5% of children other recorded own history of LBW. Total respondents in every category is 56 people, which shows balanced data distribution However with trend condition appropriate development and good nutritional status. Total respondents in every category is 56 people, which shows balanced data distribution However with proportion the biggest in condition appropriate development and good nutritional status.

Analysis results univariate The variable of developmental status of 4-year-old children shows that overall, most children have appropriate development. However, there are some children who fall into the category of doubtful and deviant development. This can be caused by factors such as limited stimulation provided by parents, environmental conditions that do not support

child development, or delays due to certain medical factors. In addition, the nutritional status of 4-year-old children is mostly in the good category, but there are still children with undernutrition and overnutrition. Undernutrition is most likely related to insufficient nutrient intake or an unbalanced diet, while overnutrition can be caused by a diet high in calories but low in micronutrients (Ersado, 2022).

A history of low birth weight (LBW) was also found in several children in this study (Drillien et al., 1980). A history of LBW has the potential to affect a child's development, especially if it is not followed by adequate fulfillment of nutritional needs and developmental stimulation. Based on the results of the analysis, it can be concluded that developmental factors, nutritional status, and history of LBW are interrelated in determining the developmental conditions of 4-year-old children. To test the relationship between these variables, a bivariate analysis was conducted using the Chi-square statistical test to determine the significance of the relationship between nutritional status, history of LBW, and child development.

Table 2. Statistical Test Analysis Results Connection between Nutritional Status and Development of 4 Year Old Children in the Work Area Health Center Jongaya City of Makassar in 2024

Nutritional status	In accordance	Doubtful	Deviante	Total	P-Value
	n(%)	n(%)	n(%)	n(%)	
Not enough	0 (0%)	6 (37.5%)	15 (100%)	21 (37.5%)	0.000 *
Good	18 (72%)	8 (50%)	0 (0%)	26 (46.4%)	
More	7 (28%)	2 (12.5%)	0c(0%)	9 (16.1%)	
Total	25 (100%)	16 (100%)	15 (100%)	56 (100%)	

Source : SPSS, 2024

Based on results analysis bivariate in Table 2, there are significant relationship between nutritional status with development child 4 years old ($p\text{-value} = 0.000$). In the group child with development according to the majority have nutritional status good (72%), followed by nutritional status more (28%). On the other hand, in the group child with development deviate, entirely have nutritional status less (100%). While that, in the group child with development doubtful, some big have nutritional status less (37.5%), followed by nutritional status good (50%), and some small have nutritional status more (12.5%). This result show that good nutritional status tend related with appropriate development, while nutritional status not enough dominant in children with development deviate. The results of the analysis This support hypothesis in study This so that hypothesis alternative (H_a) is accepted, and the hypothesis zero (H_0) is rejected (Greenwald, 1975).

Toddler growth and development will be greatly influenced by nutrition. Nutritional status will greatly affect the growth and development of children both physically, cognitively and psychologically. Children with good nutrition will experience good and ideal growth and development. Children who experience malnutrition will cause various limitations including flat growth, weight and height deviating from normal growth and will experience delays in motor development (Gannika, 2023). Based on the theory that states that the most frequently observed factor in growth and development is the nutritional status of the baby at birth. If a child is malnourished after birth, it will certainly slow down their growth. Nutritional status is a picture of a person's intake in the long term. Thus, nutrients in toddlers affect the nutritional status of toddlers lower, optimal, or high. Food for toddlers is used for body development. Thus, the nutritional status and growth of toddlers are used as a measure in monitoring the adequacy of toddler nutrition, because it is closely related to adequate food intake (Engle et al., 1999). Adequate growth and development of toddlers requires proper nutrition for child development (Utami & Azizah, 2023).

Based on the results of research that has been conducted on the relationship between nutritional status and the development of 4-year-old children using the pre-screening development questionnaire (KPSP) in the Jongaya Health Center Working Area of Makassar City, it shows that out of 56 4-year-old children, 21 children have poor nutritional status and 16 children have questionable development status and 15 children are in deviant development status. The results of this study indicate that the research that has been conducted by researchers based on the theory and results of the analysis, then this study is in line with the theory above, where 4-year-old children who have poor nutritional status experience developmental disorders compared to good nutritional status and more nutritional status. Therefore, it can be concluded that when a child has poor nutritional status, they will be more susceptible to developmental disorders (Hairunis et al., 2018).

Based on several previous studies, the results of this study are in line with the research conducted (Qaniah et al., 2023) at the Maradekaya Health Center with a sample of 41 people, which obtained research results with a *p-value* <0.05, which means that there is a significant relationship between nutritional status and child development with the KPSP study at the Maradekaya Health Center. Another study conducted by Adani et al., 2023) PAUD RW 08 Kedoya Village, West Jakarta also showed results that were in line with a total sample of 55 samples obtained research results with a *p-value* of 0.03 <0.05 which means there is a significant relationship between the nutritional status of children aged 48-60 months and child development using the pre-screening development questionnaire (KPSP). From the results of this study, when a child's nutritional status is lacking or poor, they are at high risk of experiencing developmental disorders.

There are several previous studies that highlight the importance of balanced nutrition in the growth and development of early childhood (Abbas & Karim, 2023). Balanced nutrition must be applied since early childhood because this group is an important and critical period in human growth and development, which will determine their quality of life in the future. Balanced nutrition is very necessary for children aged 1 to 6 years to increase their immune system so that children are protected from infectious diseases or other infectious diseases, child growth and development, and in the long term will improve their quality of life. (Ilhami, 2024). This is also supported by the results of the study (Triyana et al., 2023), where the results found that there was a relationship between nutritional status and development in children aged 4 years in Serdang Wetan Village in 2022, with a total of 90 respondents aged 4 years with the results of the Chi-square test with a *p-value* (0.001) which shows that there is a significant relationship between nutritional status and child development.

Table 3 Statistical Test Analysis Results Connection between the history of LBW and Development of 4 Year Old Children in the Work Area Health Center Jongaya City of Makassar in 2024

LBW	In accordance	Doubtful	Deviate	Total	<i>P-Value</i>
	n(%)	n(%)	n(%)	n(%)	
No	25 (100%)	10 (62.5%)	0 (0%)	35 (62.5%)	0.000*
Yes	0 (0%)	6 (37.5%)	15 (100%)	21 (37.5%)	
Total	25 (100%)	16 (100%)	15 (100%)	56 (100%)	

Source : SPSS, 2024

Based on results analysis in Table 4.3, there is significant relationship between history of LBW with development child 4 years old (*p-value* = 0.000) . In the group child with development according to , all (100%) no own history of LBW. On the other hand , in the group child with development deviated , all (100%) have history of LBW. While that , in the group child with development doubtful , the majority (62.5%) did not own history of LBW, while the rest (37.5%) have history of LBW. This result show that child without history of LBW tends to

own appropriate development, while history of LBW more often found in children with deviant development. Results of the analysis This support hypothesis in study This so that hypothesis alternative (H_a) is accepted, and the hypothesis zero (H_0) is rejected.

Based on results study This show Of the 56 4-year-old children who had low birth weight, 21 children experienced developmental disorders with deviant and doubtful status (Duncan et al., 1994). This means that if you have a low birth weight, you are at risk of experiencing developmental disorders, whereas if you have a normal birth weight, a child is not susceptible to experiencing developmental disorders. The results of the study showed a significant relationship between the history of LBW and the development of 4-year-old children with a *p-value* of 0.000. The results of this study provide an overview that 4-year-old children who have a history of LBW are likely to experience developmental disorders.

Another theory that suggests that low birth weight is a baby born <2500 grams. Babies with LBW have a greater risk of experiencing growth and development disorders in childhood. Children with a history of LBW have a risk of experiencing growth disorders up to the age of 2 years and are at risk of experiencing developmental disorders in the first 5 years of life, especially if not balanced with the provision of more stimulation (Rosyidah & Mahmudion., 2018). The results of the research conducted by researchers after being analyzed based on the theory, show that the results of this study are in line with the theory above, where when babies are born with a history of low birth weight they will be more susceptible to experiencing developmental disorders compared to toddlers with normal birth weight because children who have low birth weight have a greater risk of experiencing growth and development disorders.

Based on several previous studies, the results of this study are in line with the research conducted by Qaniah et al. at the Maradekaya Health Center with a sample of 41 with a *p-value* of 0.001, which means that there is a significant relationship between the history of LBW and child development. The KPSP study at the Maradekaya Health Center Qaniah also agrees with the research and supports this research. Another study conducted by Novi Triyana et al. in Serdang Wetan Village in 2022 with a sample of 90 children under 4 years of age obtained research results with a *p-value* of 0.000, which means that there is a significant relationship between the history of LBW and the development of 4-year-old children in Serdang Wetan Village in 2022.(Triyana et al., 2023).

Children with history of LBW will grow more slow compared to with child with normal birth weight, thing the can in progress until age of five years (Badjuka, 2020). Further growth slow the possible related with decline ability cognitive. Similar things were also found in research previously stated that baby with LBW since inside content experience retardation between growth uterus and can to be continued until age next that is after born so that experience more growth and development slow compared to baby born with normal body weight, and has an impact on failure grow and develop in accordance age (Wibiyani & Gustina, 2021). This is also supported by the results of the study (Purnani & Afifi., 2023) where the results found that there was a relationship between the history of LBW and the development of toddlers at the Sukorame Health Center, with a total of 186 respondents with the results of the Chi square test showing that there was a significant relationship between the history of LBW and child development (*p-value* = 0.001).

Conclusion

This study shows a significant relationship between nutritional status and history of Low Birth Weight (LBW) with the development of 4-year-old children in the Jongaya Health Center, Makassar City. Children with good nutritional status and no history of LBW tend to have appropriate development, while children with poor nutritional status and a history of LBW are more susceptible to experiencing questionable or deviant development. These results emphasize the importance of monitoring nutrition and birth history to support optimal child

development. Based on these findings, it is recommended that parents pay more attention to fulfilling children's nutritional needs from pregnancy to early childhood, and routinely monitor children's development through periodic check-ups. Health centers can improve community education programs regarding the importance of good nutritional status and prevention of LBW, and carry out child development screening using the Pre-Screening Development Questionnaire (KPSP). Further researchers are expected to conduct research with a wider population and use longitudinal methods to understand the long-term impact of nutritional status and history of LBW on child development. In addition, the government needs to strengthen early intervention programs such as providing additional food (PMT) and child development stimulation training to prevent growth and development disorders.

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