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Incomplete Immunization and Chronic Energy Deficiency (CED) as Risk Factors for Stunting in Toddlers

Ananda Hafid Firdausi and Mohammad Shoim
Department of Medicine, Universitas Muhammadiyah, Surakarta, Indonesia
*corresponding author: ms225@ums.ac.id

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ABSTRACT

Background: Stunting is a problem caused by long-term malnutrition so that at the age of 24-59 months the physical manifestations are more visible. Completeness of immunization and nutritional status of pregnant women are aspects that are risk factors for stunting. The prevalence of stunting in 2020 in the world reached 22%, while in Indonesia it is 30.8%. The purpose of this study was to analyze the relationship between the completeness of immunization and the nutritional status of pregnant women with the incidence of stunting in children under five aged 24-59 months. **Method:** The research method with this type of observational analytic research is a case-control approach. The sample size is 178, the sample is taken by purposive sampling, using secondary data obtained at the Wilangan Health Center. **Results:** Based on the chi-square test, it was found that there was a relationship between the completeness of immunization and the incidence of stunting with a value of p<0.001 (OR=12.63) and there was a relationship between the nutritional status of pregnant women and the incidence of stunting with a value of p<0.001 (OR=13.58). The results of the logistic regression test analysis showed a p-value <0.001 on the completeness of immunization and nutritional status of pregnant women for stunting with OR values of 5.71 and 5.52 respectively. **Conclusion:** There is a significant relationship between the completeness of immunization and the nutritional status of pregnant women with the incidence of stunting.

Introduction

Growth and development are the process of changing biologically, physiologically, anatomically, psychologically, and motorically in humans [1]. At the age of a toddler growth and development usually occur very significantly so it is often called the golden period. Toddlers are children aged 1 to 5 years. Infancy is a period that determines the quality of children in the future if experiencing interference will affect self-quality. Therefore, optimizing children's growth and development is a view and thought that should grow in society [2]. Stunting is a condition that indicates a lack of intake and a long incidence of infectious diseases [3]. Stunting is assessed with a z-score of Height for Age (TB/U) showing <-2 standard deviation (SD) [4]. At the age of 24-59 months, the physical manifestations of stunting will be more visible [5].

Some factors can trigger stunting including environmental sanitation, health aspects, a malnourished diet, feeding children including breastfeeding and supplements, and poor parenting styles [6]. The problem of stunting can hinder physical development, cognitive impairment, and body

metabolism disorders that put the risk of non-communicable diseases, thus it needs special attention [3].

According to WHO, in 2020 globally the incidence of stunting has reached 22%. Based on Basic Health Research or *Riskesdas* data for 2018, the prevalence of stunting in toddlers in Indonesia is 30.8% [7]. Based on data from the Indonesian Nutrition Status Study (SSGI) the incidence of stunting in East Java Province will be 23.5% in 2021, while in Nganjuk Regency the prevalence of stunting under five will reach 44.33% and included in 100 districts or cities with very high prevalence [8].

Riskesdas data for 2018 coverage of basic immunization completeness in Indonesia reported that 9.2% did not carry out the immunization program, 57.9% carried out Complete Basic Immunization (IDL), and 32.9% carried out an incomplete immunization program [7]. There is research stating that there is a relationship between a history of basic immunization of the government program which is carried out in full against the problem of stunting with a p-value = 0.028 [9]. In line with Darmawan et al.'s research, (2022), it was concluded that there was a relationship between complete basic immunization and stunting, with a value of p = 0.005. There is another conclusion in the research conducted by Rayhana and Amalia (2020) that basic immunization for toddlers has no significant correlation with the incidence of stunting (p=0.788). Based on research conducted by Sumilat et al., in 2019 it stated otherwise that there was no correlation between basic immunization status and the incidence of stunting.

The 2018 *Riskesdas* data reported that the prevalence of the nutritional status of pregnant women, including pregnant women who experience Chronic Energy Deficiency (KEK), is 17.3%. Research by Sukmawati et al., (2018) stated that there was a suspected relationship between the nutritional status of pregnant women and stunting, the results of the statistical test were p=0.01. There are other conclusions in the research conducted by Zeffira et al., (2022) which shows that most women who do not experience CED during pregnancy have children who are stunted. This was also found in a study by Legi et al., (2022) which stated that the incidence of stunting in toddlers aged 24-60 months had no significant relationship with CED in pregnant women. It is on this basis that researchers are interested in researching the relationship between the completeness of immunization and the nutritional status of pregnant women on the incidence of stunting in children aged 24-59 months at the Wilangan Health Center.

Materials and Method

This research uses observational analytic research with a case-control approach. This research was conducted in the Working Area of the Wilangan Health Center in December 2022 with secondary data collection in November 2022. The study population was mothers and children under five aged 24-59 months. The sampling technique used is purposive sampling. The selected sample was adjusted to the criteria including those recorded at the Wilangan Health Center, children under five aged 24-59 months who received immunization, and mothers whose LILA examination status was recorded during pregnancy. The sample used was 178 samples with a ratio of 89 case groups and 89 control groups. The bivariate data analysis test was carried out through the Chi Square test followed by the multivariate test using the logistic regression test. The researcher already has ethical approval from the UMS FK Ethical Commission with Ethical Clearance (EC) number 4592/C.1/KEPK-FKUMS/XI/2022.

Results and Discussion

Results

The number of samples used in the study were 178 respondents with stunting and non-stunted groups, each with 89 respondents. In Table 1, the sex characteristics of the majority of respondents were male, 94 respondents, the majority of toddlers aged 24-35 months 69 respondents, the majority of immunization completeness carried out complete immunization, 110, and the nutritional status variable of pregnant women showed that the majority were not KEK. a total of 119 respondents from the total research respondents.

Table 1. Distribution of Respondent Characteristics

Variable	Frequency	Persentase (%)
Gender		
Male	94	52.8
Female	84	47.2
Toddler age		
24-35 months	69	38.8
36-47 months	63	35.4
48-59 months	46	25.8
Immunization Equipment		
Complete	110	61.8
Incomplete	68	38.2
Nutritional Status of Pregnant Women		
KEK	59	33.1
Non KEK	119	66.9
Stunting		
Stunting	89	50
Non-Stunting	89	50

Table 2 shows that those who were not fully immunized were more in the stunted group at 64% than toddlers who were not stunted. The results of the chi-square test showed that there was a significant relationship between the completeness of immunization against the incidence of stunting p<0.001 with an Odds Ratio (OR) value of 12.63. Also obtained is Phi-coefficient=0.532, which means the strength of the association between variables has a large effect size.

Table 2 shows that of all respondents who experienced stunting, 57.3% of mothers experienced CED. While the respondents were not stunted, only 9% of mothers experienced CED. The results of the chi-square test that has been carried out show a p-value <0.001. This means that there is a significant relationship between the nutritional status of pregnant women and the incidence of stunting and OR = 13.58. Also obtained is Phi-coefficient = 0.513, which means the strength of the association between variables has a large effect size.

Table 2. The Relationship Between Completeness of Immunization and Nutritional Status of Pregnant Women to Stunting

Variable	Stunting				P	OR	95% CI	Phi-coefficient
	Stunting		Non-Stunting					
	n	%	n	%				
Completeness of Immunization								
Complete	32	36	78	87.6	<0.001	12.63	1.771-3.302	0.532
Incomplete	57	64	11	12.4				
Nutritional status of pregnant women								
KEK	51	57.3	8	9	<0.001	13.58	1.770-3.448	0.513
Non KEK	38	42.7	81	91				

Based on Table 3, the variables that influence stunting include the completeness of immunization and the nutritional status of pregnant women (P<0.001). The strength of the relationship can be seen from the OR value. Strengths were obtained from the largest to the smallest, namely the completeness of immunization (OR=5.71), and the nutritional status of pregnant women (OR=5.52).

Table 3. Relationship between Immunization Completion and Nutritional Status of Pregnant Women with Stunting

Variable	Coefisient	P	Exp (B)	95% CI for Exp (B)		Nagelkerke R Square
				Minimal	Maximal	
Immunization equipment	1.743	<0.001	5.717	2.407	13.576	0.418
Nutritional status of pregnant women	1.709	<0.001	5.523	2.138	14.269	
Konstanta	-1.093	<0.001	0.335			

Discussion

Trained immunity may contribute to disease progression, resulting in a chronic hyperinflammatory state or a persistent state of immunological tolerance, a mechanism by which the inflammatory response decreases to maintain homeostasis and prevent tissue damage and organ failure, with subsequent risks. More and more evidence shows that trained immunity has an important role in humans. Live vaccines such as the BCG vaccine, measles vaccine, smallpox vaccine, and oral polio vaccine have beneficial non-specific protective effects against infections other than the target disease [16].

Completeness of linear immunization with a level of protection against diseases that can be prevented by immunization, children who get complete basic immunization will be better protected from infectious diseases, so their growth and development will be better [17]. Immunization aims to reduce mortality in children due to infectious diseases, early immunization will reduce the possibility of stunting in children [18]. Infectious diseases have a correlation with food intake when food intake is insufficient and the child's condition is not protected by an active immune system children will be more susceptible to disease and distribution of intake occurs in children resulting in a lack of energy intake which should be used for child development [3].

The results of the chi-square analysis in this study concluded that there was a significant relationship between the completeness of immunization variables and the incidence of stunting. This research is in line with research conducted in Central Buton District showing that there is a relationship between immunization status and the incidence of stunting (p=0.005) and shows a risk level rate of 4.3 times (OR=4.3) [19]. In line with the research of Beal et al. (2018), one of the factors for stunting in children under five is immunization. Other research also shows that there is a significant relationship between the completeness of basic immunization and the incidence of stunting in children aged 24-59 months with a risk of 3.5 times more at risk for children who do not get complete basic immunization compared to children under five with complete basic immunization status (p=0.028 OR=3.5) [9]. Other findings statistically obtained p=0.001 and OR value = 3.03, which means that there is a significant relationship between the completeness of immunization against stunting events with a risk of 3.03 times more risk for children who do not get complete immunization against stunting events compared to children who are given immunizations completely [21]. Some of the studies above used a cross-sectional approach, while this study used a case-control research approach.

Stunting syndrome can be described as a cycle, starting when in the womb associated with maternal nutritional intake, short maternal stature, the occurrence of intrauterine infections, and systemic infections. This situation can result in neonates being born with low birth weight, small gestational age, shortness, and small head circumference [22].

Mothers who have good nutrition before pregnancy will affect their nutritional status during pregnancy when the nutritional state before and during pregnancy will help the growth and development of the fetus so that the fetus can grow optimally and that the quality of the baby born will be good [23]. During pregnancy, mothers need additional energy intake of around 10-15% compared to their pre-pregnancy state. KEK and iron anemia are determinants of a person's nutritional status during pregnancy, thereby affecting the state of stunting later. Manifestations of the condition of the mother experiencing insufficient nutrition or KEK can be seen through the upper arm circumference (LILA) and can be seen in the appearance that she looks thin, small, and tired easily. KEK can cause disturbances in the process of fetal growth and development [3]. KEK in pregnant women is influenced by several conditions including mother's knowledge, food diversity, energy intake, and protein intake [24]. Therefore, the incidence of CED that begins before conception causes inadequate weight gain during pregnancy, which can cause barriers to fetal growth and development which can lead to underweight at birth and stunting.

This research is in line with the research of Ismawati et al., (2021) using a cross-sectional research approach with a sample of 30 stunting children who found a significant relationship (p=0.004). Other findings in a study conducted using a case-control approach, bivariate chi-square test, concluded that there was a correlation between gestational age mothers with CED and the incidence of stunting (p=0.000) and obtained OR=4.85 [26]. Line with the research conducted by

Karjono and Erna, (2021) showed a significant relationship between SEZ and the incidence of stunting with the magnitude of the risk that pregnant women who experience CED have a 2.22 times chance that their children will experience stunting compared to pregnant women whose nutritional status normal or not KEK with a case-control research approach. Another result of a case-control study conducted in 2019 with a sample size of 62 respondents obtained a significant correlation between CED status during pregnancy and stunting (p=0.01) [28].

The incidence of stunting can be caused by many factors that can affect the completeness of immunization which can cause recurrent infectious diseases as well as the nutritional status of pregnant women related to fetal growth and development. These two factors mutually influence the state of stunting in which nutritional status affects during pregnancy and the completeness of immunization affects after birth [3].

Based on the findings of the study using the cross-sectional approach, multivariate statistical test with the logistic regression method, it was concluded that immunization status has a significant relationship (p=0.014) with a risk of 2.03 times the incidence of stunting in toddlers [17]. Based on case-control research with a sample of 46 case groups and 46 control groups conducted at the Senaru Health Center, the results of multivariate logistic regression analysis obtained p=0.017 with OR = 9.69 [27].

Conclusion

Based on the research conducted, it can be concluded that the completeness of immunization and the nutritional status of pregnant women have a relationship with stunting. The researcher suggests that future researchers can add and examine sources and references related to stunting and other factors.

Declaration

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Conflicts of Interest: Declare conflicts of interest or state “The authors declare no conflict of interest" Authors must identify and declare any personal circumstances or interest that may be perceived as inappropriately influencing the representation or interpretation of reported research results. Any role of the funding sponsors in the design of the study; in the collection, analysis, or interpretation of data; in the writing of the manuscript, or in the decision to publish the results must be declared in this section. If there is no role, please state “The founding sponsors had no role in the design of the study; in the collection, analyses, or interpretation of data; in the writing of the manuscript, and in the decision to publish the results”.

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