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## CURRENT ISSUE

**Vol 10 No 2 (2022): Jurnal Ilmu Kesehatan**

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## PUBLIC HEALTH AND ENVIROMENTAL HEALTH

**Efforts To Increase The Coverage Of The Pregnant Women's Health Program (ANC) During The COVID-19 Pandemic At The Health Office Of The Kampar Regency**

meldy meldy, Mitra Mitra, Afridayanti Afridayanti

89-101



...: UMKT JOURNALS ...

All UMKT Journals

## INSTRUCTION FOR AUTHOR

[Guide for authors](#)

[Online Submission](#)

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[Focus and Scope](#)

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[Author fees](#)

[Peer Review Process](#)

[Editorial Team](#)

[Reviewer](#)

[Open Access Statement](#)

[Privacy Statement](#)

[Journal History](#)

[Abstracting & Indexing](#)

[Archiving](#)

[Plagiarism](#)

[Copyright](#)

[Contact](#)

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**AN OVERVIEW OF ACADEMIC STRESS STUDENTS OF MEDICAL STUDENTS OF MATARAM UNIVERSITY FOR THE 2020 CLASS IN THE PANDEMIC ERA**

Fadhila Maulida Al Idrus, Agustine Mahardika, Wahyu Sulistya Affarah

102-106



**The Effect of Ginger (Zingiber OFFICINALE) on Reducing the Intensity of Hand Pain (Primry Dysmenorrhea) in Adolescent Women:**

Juwita Juwita, Nurhaeda Nurhaeda, Fadly Umar

107-113



**NURSING AND MEDICAL HEALTH**

**SKIN REACTIONS DUE TO THE USE OF PERSONAL PROTECTIVE EQUIPMENT ON HEALTHCARE WORKERS IN COVID-19 PANDEMIC**

Ratna Noor Mariyati, Vera Madonna Lumban Toruan, Yetty Hutahaean, Fransiska Sihotang, Agnes Kartini

114-121



**The Relationship between LBW History and Genetic Factors with the Incidence of Toddler Stunting at Loa Ipuh Health Center Tenggarong**

Rini Ernawati, Pipit Feriani, Nida Dzakyiah Khosyi

122-133



**PRIMARY MYELOPHYBROSIS: RECOGNIZING ONCET TO COMPLICATIONS**

Nimas Resti, Mohammad Rizki, Dita Kholida Nurlalwani

134-144



**Determinants Of Factors Affecting The Implementation Of The HPV Vaccination In Women Of Childbearing Age**

chanda paramitha bherty, Niken Grah Prihartanti, Nur Laila Faizah, Ana Dyah Aliza

145-151



**PHARMACEUTICAL SCIENCE**

**Analysis of Rhodamin B on Lipstick, Blush On and Eye Shadow in Pekalongan Regency With Uv-Vis Spectrophotometer**

Khusna Santika Rahmasari, Urmatul Waznah

152-160

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## PHARMACEUTICAL SCIENCE

---

### **Analysis of Rhodamin B on Lipstick, Blush On and Eye Shadow in Pekalongan Regency With Uv-Vis Spectrophotometer**

Khusna Santika Rahmasari, Urmatul Waznah

152-160



### **Prevalence of Death in Geriatric COVID-19 Patients with Comorbid Hypertension and/or Diabetes Mellitus in Samarinda City Hospital**

Meirin Siti Namira, Meirin Siti Namira

161-170



### **Impact of eHealth on Medication Adherence: A Review**

Noor Cahaya, Oskar Skarayadi

171-178





# The Relationship between LBW History and Genetic Factors with the Incidence of *Stunting* in Toddlers at Loa Ipuh Puskesmas, Tenggara.

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## ABSTRACT

Stunting in toddlers in Indonesia is still an important nutritional problem that needs to be the focus of attention. Toddler stunting occurs due to nutritional consumption disorders that occur over a long period of time and can occur from the womb. The problem that can occur in stunting toddlers is that it can result in growth and development disorders such as impaired thinking processes, low immunity, the long-term impact is that they can suffer from heart disease, diabetes and even stroke, this situation will result in humans becoming unproductive, and can threaten the future generation of the nation. This study aims to determine the relationship of LBW history and genetic factors with the incidence of stunting in toddlers in the working area of the loa ipuh tenggarong health center. This study used a descriptive correlational research design with a *cross sectional* approach. The total sample size was 175 respondents, the research instrument used a questionnaire, data analysis with the *chi-square* test. The results of the study on the LBW history variable obtained a p value = 0.000, meaning the p value < (0.05) so that Ho is rejected, meaning that there is a relationship between LBW history and the incidence of stunting, and the genetic factor variable obtained a p value = 0.000, meaning the p value < (0.05) Ho is rejected, so it is said that genetic factors are associated with the incidence of stunting in toddlers. The conclusion is that the history of LBW and genetic factors of maternal height have an impact on the birth of babies whose growth is disturbed, so it is necessary to monitor maternal health since adolescence and pregnancy.

Keywords: LBW, Genetic, Stunting, Toddler.

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## 1. Introduction

Nutrition problems in toddlers in Indonesia are currently still quite high, including stunting. The condition of toddlers is said to be stunting if their height is less when compared to age, and is one type of chronic nutritional disorder in the body caused by various factors including maternal health, maternal nutrition before, during pregnancy and during childbirth, maternal posture (short) pregnancy distance is too close, teenage pregnancy. (Indonesian Ministry of Health, 2018) . In 1000 (HPK) or the first day of a child's life is a period of rapid growth and development, because this period is also called a large *window of opportunity* in a child's life.



During this period, if a child suffers from malnutrition, it will have a long-term impact on the child's health and well-being. The most serious impact is that it can cause irreversible stunting or a condition that cannot be reversed, brain development will not develop properly and cannot be repaired. (Hidayah & Marwan, 2020).

The highest prevalence of stunting in the world is found in Asia at around 55%, and in Africa at 39%. In Southeast Asia, Indonesia ranks third with a prevalence of 36.4%, followed by India at 38.4% and Timor Leste at 50.2%. (Ministry of Health of the Republic of Indonesia, 2020). According to the 2018 Basic Health Research survey, the prevalence of stunting in 2016 was 27.5% which increased to 29.6% in 2017 and in 2018 reached 8 million (37.2%) children experiencing growth disorders, and the prevalence of stunting. (Ministry of Health of the Republic of Indonesia, 2018).

Research (Apriluana, 2018) stated that there are several risk factors for stunting, namely LBW, maternal education, household income, sanitation and a history of low birth weight (LBW) are the risk factors that contribute most to the incidence of stunting in children. Stunted toddlers caused by LBW will be seen over time, due to insufficient nutrition, frequent infections, and inadequate health care. This is supported by previous research which shows that LBW is associated with the incidence of stunted children. (Fitri, 2018). Data from the World Health Organization shows that the prevalence of LBW babies in the world is 15.5% or around 20 million babies born each year, with around 96.5% occurring in developing countries. Indonesia's LBW data reached the 70th rank of 10.69%. (Minister of Health of the Republic of Indonesia, 2017).

Another factor that can affect the occurrence of stunting in toddlers is the genetic factor of maternal height, however, if the mother's shortness is caused by nutrition or pathological, this will not occur and will not affect the health of the child. Mothers with stunting are more likely to give birth to stunted children, known as the intergenerational cycle of malnutrition. (Fitriahadi, 2018). Genetic control of growth and development correlates with kinship and within a family there will be more similarities, so individuals who come from the same kinship lineage have similarities. (Candra, 2020). Research shows that the genetic factor of maternal height is associated with stunting. (Latif & Istiqomah, 2017). A child who suffers from stunting as an adult is at risk of reproductive disorders, pregnancy complications, and even death during pregnancy.

East Kalimantan Province is one of the provinces that has a high prevalence of *stunting*, namely in 2017 (30.6%), and in 2018 the prevalence of East Kalimantan became (21.84) although there has been a decrease but still below the WHO standard of 20%. (Indonesian Ministry of Health, 2017)

Based on the survey results that the Loa Ipuh Health Center is one of the health centers in the Kutai Kertanegara district, and the case of stunting toddlers is quite high, based on data from March to December 2021, Tenggarong obtained data that there were 48 toddlers suffering from stunting (very short). The purpose of this study was to analyze the relationship between LBW

and genetic maternal height with the incidence of stunting in the Loa Ipuh Puskesmas Working Area in Tenggara.

## 2. Research Methods

This study is a descriptive study using quantitative methods with a cross sectional approach. The population in this study were mothers who had toddlers aged < 59 months with a total research sample of 175 respondents. The sampling technique used was accidental sampling. Data were collected using a questionnaire, which contained closed questions, so that respondents could choose the answers available according to the conditions of each respondent, data collection was also carried out by means of observation to see and assess toddler height. This study was conducted from March to April 2022 Data analysis using the Chi-Square test. Place of research in Loa Ipuh Village Tenggara Kutai Kertanegara Regency East Kalimantan

## 3. Results and Discussion

### 3.1 Respondent Characteristics

Table 1 Frequency distribution of respondent characteristics based on age, education, occupation, gender of toddlers

No.	Characteristics	Category	F	%
1	Mother's age	17-25	35	20,0
		26-35	104	61,4
		36-45	36	100
2	Mother's occupation	Not working	160	91,4
		Civil servants	6	3,4
		Private employee	4	2,3
		Self-employed	4	2,3
		Farmers	1	0,6
3	Mother's education	SD	31	17,7
		SMP	16	9,1
		HIGH SCHOOL	105	60,0
		PT	23	13,1
4	Gender of children under five	Male	81	46,3
		Female	94	53,7
5	Age of toddler	0-24 months	116	66,3
		25-36 months	22	12,6
		37-60 months	37	21,1

Source: Primary Data 2022

Table 1 above shows that the age of the most mothers is 26-35 years as many as 104 people (59.4%), the majority of mothers' work is not working as many as 160 people (91.4%), the most maternal education is high school as many as 105 people (60.0%), the gender of female toddlers is 94 toddlers (53.7%) male toddlers 81 (46.3%) while the age of the most toddlers is 0-24 months as many as 116 toddlers (66.3%).

### 3.2 Univariate Analysis

Table 2 Frequency Distribution of LBW History

Body Weight	Frequency	Percentage
Weight < 2500grams (LBW)	81	46.3
Weight ≥ 2500grams (Normal)	94	53.7
Total	175	100.0

Source: Primary Data 2022

Table 2 shows that the frequency distribution of the number of toddlers who have a history of LBW in the Loa Ipuh Tenggara Health Center Area the most is with Weight ≥ 2500 grams (Normal) as many as 94 respondents (53.7%), Weight < 2500 grams (LBW) toddlers as many as 81 respondents (46.3%).

Table 3 Frequency distribution of genetic factors

Genetic Factors	Frequency	Percentage
Maternal Tb < 150cm (short)	84	48.0
Maternal Tb ≥ 150cm (normal)	91	52.0
Total	175	100.0

Source: Primary Data 2022

From Table 3, it is obtained information that the frequency distribution of genetic factors of maternal height in the Loa Ipuh Tenggara Health Center Area, the most of which are maternal height ≥ 150cm (Normal) as many as 91 respondents (52.0%). Mother's height < 150cm (Short) number 84 people (48.0%)

Table 4 Frequency distribution of *stunting*.

Incidence of <i>Stunting</i>	Frequency	Percentage
Very short (<-3 SD)	19	10.9
Short (TB/U) -3 SD to <-2 SD	67	38.3

Normal (TB/U) -2 SD to +3 SD	76	43.4
High (TB/U) +3 SD	13	7.4
Total	175	100.0

Source: Primary Data 2022

Table 4 shows that the frequency of *stunting* in toddlers in the Loa Ipuh Tenggara Health Center Working Area is very short 19 people (10.9%), short category as many as 67 people (38.3%), normal category as many as 76 people (43.4%), and high category as many as 13 people (7.4%).

### 3.3 Bivariate Analysis

Table 5 Relationship between LBW history and the incidence of *stunting* in toddlers in the Loa Ipuh Puskesmas work area in Tenggara.

LBW history	Incidence of Stunting								P value		
	Very short		Short		Normal		High			Total	
	n	%	n	%	n	%	N	%		n	%
LBW	13	16.0	40	49.4	26	32.1	2	2.5	81	100	0.000
Normal	6	6.4	27	28.7	50	53.2	11	11.7	94	100	
Total	19	10.9	67	38.3	76	43.4	13	7.4	175	100	

Source: Primary Data 2022

Based on table 5 shows that of the total toddlers 175 respondents obtained toddlers with a history of LBW (weight < 2500 grams and experienced a very short body 13 respondents (16%), short toddlers 40 respondents (49.4), while toddlers with a history of normal weight experiencing a very short body 6 respondents (5.4), short toddlers 27 respondents (28.7%). The results showed  $p$  Value = 0.000 < 0.05, then  $H_0$  is rejected. This shows a significant relationship between the history of LBW and the incidence of *stunting* in toddlers in the Loa Ipuh Tenggara Puskesmas work area.

This study is in accordance with research (Beal et al., 2018) which shows that low-weight babies are a determining factor for stunting in Indonesia. (Budiastutik & Rahfiludin, 2019) (Aryastami et al., 2017) This study is in accordance with research showing that low

birth weight is a determining factor for stunting in Indonesia. Other studies state that there is an association between LBW and the incidence of stunting as evidenced by the results of the *chi-square statistical test* obtained a p value of 0.000 ( $p \leq 0.005$ ) with an *odds ratio* value of 6.16 indicating that respondents who have low birth weight are very at risk for stunting, the study found that about 32 toddlers (57.2%) with a history of low birth weight, and as many as 24 toddlers (42.8%) with a history of normal birth weight. (Widyaningsih et al., 2021). One of the most prominent risk factors for *stunting* is low birth weight (LBW). LBW is defined as birth weight  $\leq 2500$ grams. LBW is an indicator of birth prematurity or Intrauterine Growth Retardation (IUGR). (Aryastami et al., 2017).

Infants with LBW experience digestive system disorders where there is slow gastric emptying due to the growth of the digestive system during the womb being disturbed. Slow gastric emptying will affect the level of tolerance to nutrition. The maturity of gastrointestinal function determines the type and method of infant nutrition. The digestive enzymes sucrase and lactase in LBW are also low, the function of sucking reflexes and swallowing reflexes are still weak. Infants also do not have good coordination between the swallowing reflex and the breathing reflex, this greatly affects the intake of nutrients in infants, because infants are unable to drink effectively, if this lasts until the first thousand days of life, it will have an impact on future growth, this can result in nutritional disorders in toddlers, one of which is stunting.(Murti et al., 2020) This is supported by research (Windra et al., 2021) that there is a relationship between LBW and the incidence of stunting where the value is obtained ( $p=0.044$ ).

Other studies suggest that LBW has a significant relationship with the incidence of stunting ( $p$  value = 0.000) with an OR value of 6.15 in other words that children born with LBW have a 6.16 times greater chance of experiencing stunting than children born with normal weight.(Yanti; et al., 2020) This is supported by research (Atikah Rahayu, Fahrul Yulidasari, Andini Octaviana Putri, 2015) that the history of LBW status has a significant relationship to the occurrence of stunting in toddlers under two years old. The  $p$  value = 0.015, and the odds ratio value which states that LBW has a risk of 5.87 times for stunting to occur.

The incidence of stunting during toddlerhood in East Kalimantan Province which is still above the WHO standard of 30.6%, this will have an impact on the next generation,

namely a decrease in productivity and intelligence levels of the younger generation. Efforts to improve nutrition are needed until children reach adolescence. In Indonesia, 27.7% of school-age children and adolescents are classified as short. (Indonesian Ministry of Health, 2017) . Children who are born with LBW when at school age do not receive adequate nutrition and good health services then in the long term cause the child's body short until adolescence, as well as causing growth and development disorders. A study found that of 65 adolescents who were stunted, 46.2% experienced low resilience in dealing with various problems, putting them at risk of suffering from depression and withdrawal. (Sari et al., 2017). Mothers who experience nutritional struggles during pregnancy, usually occur in pregnant women in adolescence, where adolescence requires nutrients for growth and the fetus in the womb also requires nutrients, resulting in the fetus experiencing growth restriction, this situation will pose a risk of fetal birth with LBW or stunting. (Fiolentina & Ernawati, 2021)

Based on the above interpretation, the researcher assumes that babies born with LBW will experience various organ disorders including the digestive system, this is closely related to the baby's nutritional intake. Babies experience problems in swallowing food to digest food, this situation greatly affects the nutritional needs of the baby's body, and also the baby's health care factor is also very influential, if this situation lasts a long time, especially in the first thousand lives of babies, it will greatly impact the growth and development of babies, where the fastest baby growth is in infancy up to the age of two years. The short-term impact is that the child becomes slow in growth, namely the child becomes short (stunting).

Table 6 The relationship between genetic factors of maternal TB and the incidence of *stunting* in toddlers in the Loa Ipuh Puskesmas Working Area, Tenggara.

Genetic factors (maternal TB)	Incidence of Stunting										P value
	Very short		Short		Normal		High		Total		
	N	%	n	%	n	%	n	%	n	%	
< 150 cm	17	20.2	42	50.0	24	28.6	1	1.2	84	100	0.000
≥ 150 cm	2	2.2	25	27.5	52	57.1	12	13.2	91	100	

Total	19	10.9	67	38.3	76	43.4	13	7.4	175	100
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Source: Primary Data 2022

Based on the data in Table 6, that of the 84 respondents, the data obtained that mothers with TB < 150 cm have very short children 17 respondents (20.2%), and short children 42 respondents (50%), while mothers with TB more than 150 cm have very short children 2 people (10.9%) and toddlers who are declining 25 respondents (27.%) Statistical results show a significance value of  $p Value = 0.000, < 0.05$ , then  $H_0$  is rejected, meaning that there is a relationship between Genetic Factors and the incidence of *Stunting in* toddlers in the Loa Ipuh Tenggara Health Center Working Area.

The results of this study are in line with research (Fitriahadi, 2018) that *stunting* in toddlers is related to maternal height. Genetic factors of maternal height can be passed down to the child, and in toddlerhood the child will look short (*stunting*), but if the mother's short body is caused by nutritional or pathological problems, it will not have an impact on the child's height. Stunted mothers are likely to give birth to stunted children, commonly known as the intergenerational cycle of malnutrition. As they grow, stunted children in the future will experience various health problems such as pregnancy complications, reproductive disorders and perinatal mortality. (Andari et al., 2020).

Maternal height can affect the linear growth of children, maternal height also indicates the mother's history of growth disorders early in their lives. Socioeconomic factors can end the effect of intergenerational growth from the non-genetic side such as nutrition, stress, disease, parenting. The same combination of genetic factors, environment and epigenetic changes between parents can also affect the growth of parents and offspring. (Andari et al., 2020) Genetic factors, namely short chromosome carrier genes, are likely to pass on short traits to their children, this is due to the pathological condition of growth hormone deficiency possessed by the chromosome carrier gene, if not supported by adequate nutritional intake, it will have an impact on the next generation of growth failure or *stunting*. (Apriningtyas & Kristini, 2019). This is supported by research (Nasution et al., 2014) that a short mother's height will have a 2.14 times chance of giving birth to a short child as well. Another study also stated that maternal height is associated with the incidence of *stunting* in toddlers with the result of  $p = 0.001$ . (Wahdah et al., 2016).



Based on this study, it was found that LBW and genetic Maternal height < 150 cm are factors associated with stunting in children under five. From the LBW factor, the p value is obtained <0.000, this is supported by research (Meikawati et al., 2021) in the Genuk Puskesmas area of Semarang city on toddlers aged 12-24 months that a history of LBW is a risk factor for stunting with a value of  $p = 0.004$ , this is supported by the research that LBW affects the incidence of stunting in children under five years old. (Pibriyanti et al., 2019) that LBW affects the incidence of stunting in toddlers in the Slogohimo Puskesmas work area of Wonogiri Regency with a p value = 0.000 and an OR value of 15.3, meaning that babies born LBW have a 15.3 times risk of stunting compared to babies born normally. Genetic factors of maternal height in this study obtained a value of  $p = 0.000$ , this is in line with research in Gorontalo Regency that the genetic factor of mother's height in this study was found to be stunted. (Nurdin & Dwi Nur Octaviani Katili, 2020) in Gorontalo Regency that the genetic factor of maternal height < 150 cm has an effect on the incidence of stunting with a value of  $p = 0.04$ , supported by a study conducted in 5 locations of the post office. (Ramadhan et al., 2020) that research conducted at 5 posyandu locations in Puskesmas Kopelma Darussalam found a strong relationship between maternal height and stunting with a value of  $p = 0.000$  and a value of  $r = 0.529$ .

Health during childhood is a very important thing to pay attention to, especially related to nutritional needs, mothers who have short talent will be at risk of giving birth to short babies coupled with malnutrition during pregnancy, so this situation will have an impact on themselves and future generations. Mothers with malnutrition will experience growth disorders, mothers will give birth to children who are malnourished, including stunted children.

#### **4. Conclusion**

According to researchers from the research conducted, it was found that the incidence of stunting that occurred in toddlers was related to a history of LBW, this occurred because the mother was malnourished during pregnancy, and this condition lasted long enough, and gave birth to a baby who had a low birth weight, so that the baby had problems related to his digestive system which would interfere with the fulfillment of baby nutrition. This situation if it occurs for a long time can interfere with the growth and development of the child. The child cannot grow optimally, due to chronic nutritional disorders, and eventually the child becomes short

(stunting). Genetic factors of maternal height are related to the incidence of stunting, this is because genetic control is related to kinship lines in one family, so there will be many similarities including height, so if the parents are short, the child tends to have a short body.

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### **Conflict of Interest**

All authors declare no conflict of interest and agree with the content of the manuscript.

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