STUDY OF THE HISTORY OF MATERNAL NUTRITIONAL STATUS AND NEWBORN HEALTH ON TODDLER NUTRITION PROBLEMS

Yeri Delsia Nenogasu[1], Merlin M.M. Juwa[2]

[1,2]Lecturer of Midwifery S1 Study Program, Citra Bangsa University, Kupang - NTT – Indonesia
Email correspondence: yerinenogasu0801@gmail.com

ABSTRAK : KAJIAN RIWAYAT STATUS GIZI IBU DAN KESEHATAN BAYI BARU TERHADAP MASALAH GIZI BALITA

Latar Belakang: Masalah Gizi balita menghambat perkembangan kognitif dan mengakibatkan penyakit kronis yang dapat berdampak pada kualitas hidup dikemudian hari. Faktor intrauterine seperti gizi ibu selama hamil, yang berdampak pada berat badan janin. Faktor ektrauterin seperti ASI ekslusif, pola asuh dan sanitasi lingkungan. Prevalensi masalah gizi seperti *stunting* di Provinsi NTT adalah yang tertinggi di Indonesia.

Tujuan: Penelitian ini bertujuan untuk mengatahui dampak langsung dan tidak langsung status gizi ibu dan kesehatan bayi baru lahir terhadap masalah gizi balita.

Metode Penelitian: Penelitian ini adalah penelitian analitik korelasional dengan pendekatan metode *cross sectional.* Kebenaran konsep teori yang dirumuskan diuji menggunakan *Structural Equation Modeling* (SEM) dengan pendekatan *Partial Least Square* (PLS) dengan aplikasi smart PLS 3.0.

Hasil: Status gizi ibu signifikan memengaruhi kesehatan bayi baru lahir (*T-statistic* diatas *rule of thumb* yaitu 2,545). Kesehatan bayi baru lahir berdampak namun tidak signifikan memengaruhi masalah gizi balita (*wasting*) dengan nilai *T-statistic* diatas *rule of thumb* yaitu 1,081. Status gizi ibu berdampak namun tidak signifikan memengaruhi masalah gizi gizi balita (*wasting*) dengan nilai *T-statistic* diatas *rule of thumb* yaitu 0,131.

Kesimpulan: Interaksi antara status gizi ibu (IMT dan Lila) berdampak positif 11,9% terhadap kesehatan bayi baru lahir dan secara bersamaan (status gizi ibu dan kesehatan baru lahir) berdampak positif 3% terhadap masalah gizi balita (*wasting*). Meningkatnya status gizi ibu (IMT dan Lila) sebelum hamil adalah akan meningkatkan kesehatan bayi baru lahir terutama berat badan lahir, panjang badan lahir dan lingkar kepala. Hal ini merupakan langkah penting sebagai upaya untuk mencegah kejadian *wasting* pada balita.

Kata Kunci: Status gizi ibu, kesehatan bayi baru lahir, wasting

ABSTRACT

Introduction: Toddler nutrition problems hinder cognitive development and result in chronic diseases that can impact quality of life later in life. Intrauterine factors such as maternal nutrition during pregnancy, have an impact on fetal weight. External factors such as exclusive breastfeeding, parenting, and environmental sanitation. The prevalence of nutritional problems such as stunting in NTT Province is the highest in Indonesia.

Purpose: This study aims to determine the direct and indirect impact of maternal nutritional status and newborn health on toddler nutrition problems.

Methods: This research is a correlational analytical research with a cross-sectional method approach. The correctness of the formulated theoretical concepts was tested using Structural Equation Modeling (SEM) with a Partial Least Square (PLS) approach with the application of smart PLS 3.0.

Results: Maternal nutritional status significantly affected newborn health (T-statistic above rule of thumb of 2.545). Newborn health has an impact but does not significantly affect toddler nutrition problems (wasting) with a T-statistic value above the rule of thumb which is 1.081. Maternal nutritional status has an impact but does not significantly affect the nutritional problems of toddler nutrition (wasting) with a T-statistic value above the rule of thumb, which is 0.131.

Conclusion: The interaction between maternal nutritional status (BMI and upper arm circumference) had a positive impact of 11.9% on newborn health and simultaneously (maternal nutritional status and newborn health) had a positive impact of 3% on toddler nutrition problems (wasting). Increasing the nutritional status of mothers (BMI and upper arm circumference) before pregnancy will improve the health of newborns, especially birth weight, birth length, and head circumference. This is an important step in an effort to prevent wasting events in toddlers.

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Advice: Conduct regular health checks before pregnancy, including nutritional status checks to identify maternal nutritional problems.

Keywords: Maternal nutritional status, newborn health, wasting

INTRODUCTION

Maternal and child malnutrition including stunting and wasting is a global problem whose consequences are critical to survival. The high burden of disease caused by malnutrition in women of reproductive age, pregnancy, and children in the first two years of life became one of the focuses of intervention (Black et al., 2013).

In 2020, as many as 149.2 million children under the age of five suffered from stunting, and 45.4 million suffered from wasting (UNICEF et al., 2021). In Indonesia, the prevalence of stunting in 2022 reached 21.6%, while the prevalence of wasting reached 7.7%. East Nusa Tenggara (NTT), is one of the provinces with a high number of nutritional problems. NTT has the highest position of stunting (36.3%) and wasting occupies the sixth position with an incidence rate of 10.7% (Kemenkes, 2023). Based on data from the Kupang City Health Office, the electronic results of community-based nutrition recording and reporting (e-PPGBM) show that the incidence of stunting and wasting toddlers in 2022 is 21.5% and 11.2%. Furthermore, the incidence of stunting and wasting in Alak Village is 26.9% and 15.7%.

Maternal nutrition plays an important role in fetal growth, infant health and survival, and long-term child health and development. From the time of conception, the mother is the only nutrient for the growth and development of the fetus until 6 months after birth when exclusive breastfeeding. Maternal malnutrition during pregnancy is a major determinant of poor fetal growth and stunting. Mothers with a height of < 145 cm or a BMI of < 18.5 during early pregnancy are at greater risk of giving birth to small babies, further estimated to contribute around 20% to stunting cases globally (Young et al., 2018).

In Indonesia, nutritional problems in pregnant women that often occur are chronic energy deficiency and anemia. In 2022, the incidence rate of pregnant women with chronic energy deficiency is 8.41%, while the incidence rate in NTT is 17.10%. This shows that the incidence of chronic energy deficiency in NTT is relatively high when compared to the target set by the Indonesian Ministry of Health, which is 13% (Kemenkes, 2023). Intra and extrauterine factors can cause nutritional problems such as stunting. Chronic nutritional deficiency of the mother from conception to birth is an intrauterine factor. This leads to small fetal size indicated by low body weight or short birth lengt (Lada, 2019).

Based on the description above, nutritional problems such as stunting and wasting can be prevented. Finding curable risk factors early will reduce the prevalence of stunting and wasting. Therefore, researchers are interested in conducting a study on the history of maternal nutritional status and newborn health in toddlers with nutritional problems (stunting and wasting) in Alak Village.

RESEARCH METHODS

This type of research is correlational analytical research with a cross-sectional method approach. This study focused on examining the effect of maternal nutritional status during pregnancy and newborn health on toddler nutrition problems. The correctness of the formulated theoretical concepts was tested using Structural Equation Modeling (SEM) with a Partial Least Square (PLS) approach with the help of the PLS smart application version 3.0. The research will be conducted in the Alak Village area of Kupang City in August 2023.

The population in this study was mothers who had children under five with nutritional problems (stunting and wasting). The sample used was 70 mothers and children with inclusion criteria who had children aged 12-59 months and lived in the same house with children. Mothers aged < 20 years, a history of cardiovascular disorders before pregnancy, a history of diabetes and chronic hypertension, a history of multiple pregnancies, and children who have body deformities are not included.

Data collection begins by collecting data on toddlers who are stunted and wasting with documentation methods, namely checking and recording the necessary data, namely maternal age, maternal weight, maternal height, hemoglobin level status, upper arm circumference, child's birth weight, gestational age at delivery, birth length, and head circumference obtained from maternal child health books and integrated healthcare center registers. The primary data is to take direct measurements using micro toise or line boards and scales to determine the child's weight and height.

Data from research that has gone through various stages of processing is then analyzed. Data

analysis using SPSS software and Smart PLS application. The types of data are as follows: Univariate analysis, conducted to get an idea of the distribution of respondents on each variable or latent construct based on the research objectives. Furthermore, multivariate analysis, performed for testing measurement models (outer models) is intended to test construct validity and reliability. Structural model testing, to test direct and indirect relationship prediction models using Structural Equation Modeling (SEM) with a Partial Least Square (PLS) approach using the help of the Smart PLS application version 3.0. The latent variable in question is the history of the mother's nutritional status, the health of the newborn and the toddler nutrition problems. Each latent construct has several measures or indicators which are described as follows:

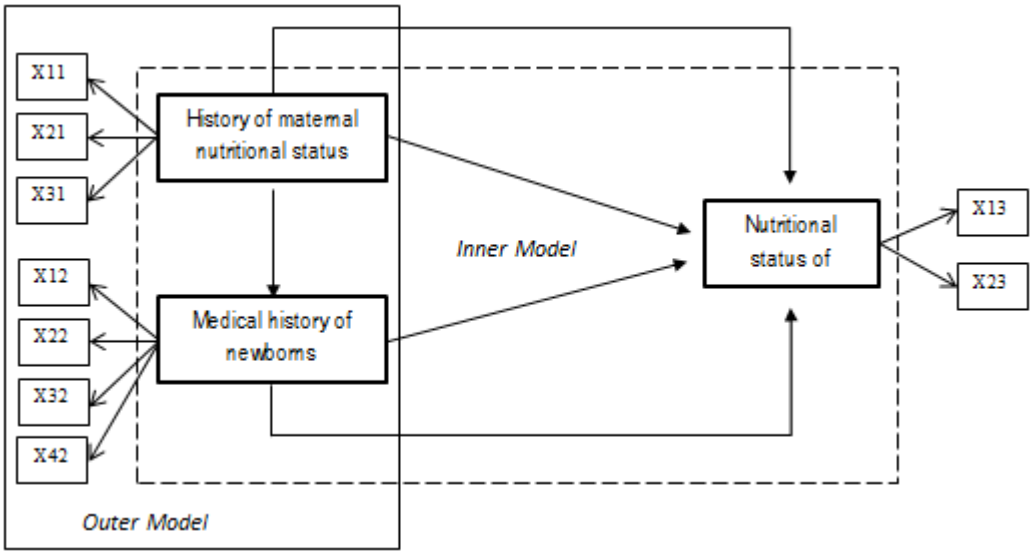

Figure 1. Model of factors that influence child growth

Description:
X11: Body mass index

X21: Hemoglobin level
X31: Upper arm circumference

X12: Birth weight
X22: Birth length
X32: Head circumference
X42: Age at birth
X13: TB/U
X23: BB/TB

RESULTS

Evaluate the outer model

Outer model testing specializes in how latent constructs are measured through observed indicators. Outer model testing uses two main parameters, namely construct validity (convergent validity and discriminant validity) and reliability. In this study before running data was carried out, the X21 indicator (Hemoglobin levels during pregnancy) had the same value in all respondents (Hemoglobin >10 g / dL or not anemia) so it must be eliminated before running data is carried out.

The convergent validity test of the outer model using reflective indicators is assessed based on the loading factor. In this study, the loading factor value used was >0.7 (Ghozali & Latan, 2015). An indicator should be eliminated if the loading factor value <0.7 (Jaya & Sumertajaya, 2008). Here are the results of the loading factor value.

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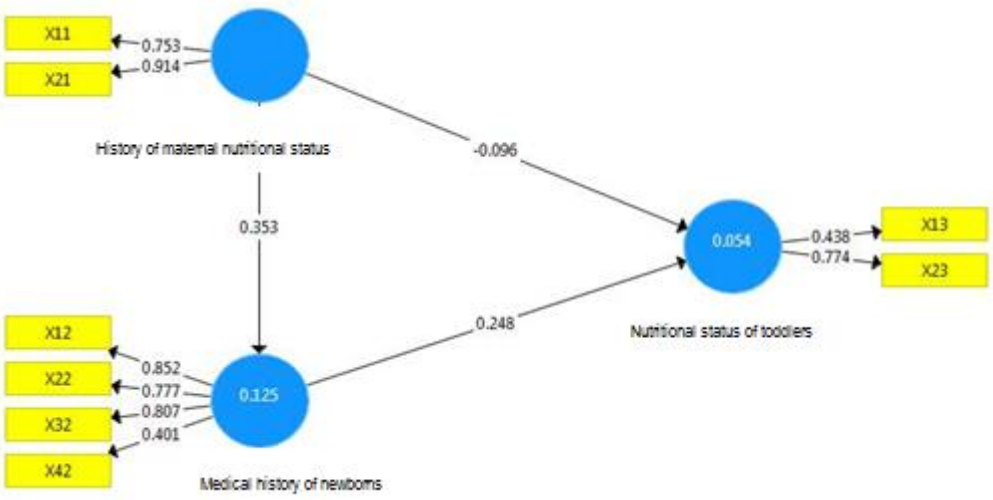

Figure 2. Path chart with loading factor values

Based on figure 2 by eliminating the smallest value and running data, a new diagram is produced as follows:

Based on Figure 3, the indicators X42 and X13 have been eliminated because they do not meet the loading factor value. Furthermore, based on the loading factor value, the resulting AVE value is presented in the following table:

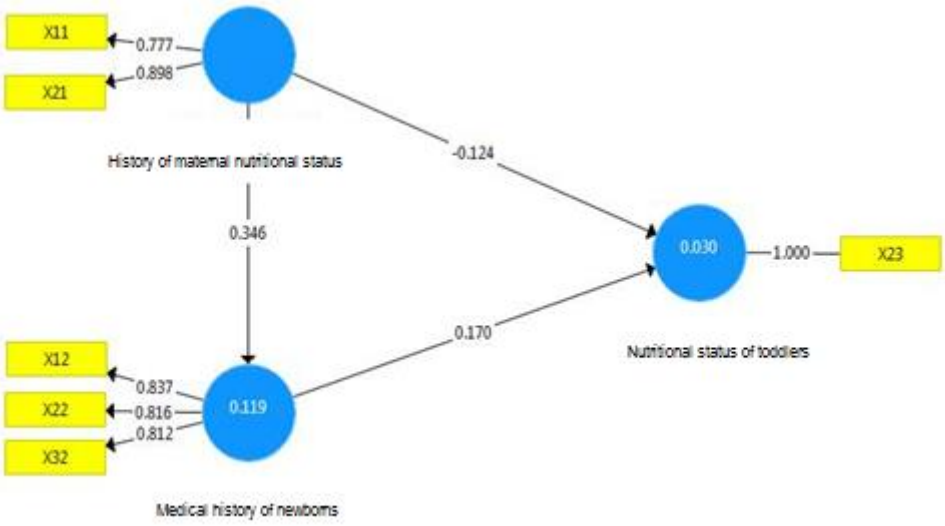

Figure 3. The path chart includes the loading factor value after the elimination of the indicator.

Table 1
Average Variance Extracted (AVE) Value)

Construct	AVE	Description
History of maternal nutritional status	0,675	Qualify
Medical history of newborns	0,705	Qualify
Nutritional status of toddlers	1.000	Qualify

The AVE value shown in the table above has met the minimum standard criterion of >0.5. This indicates that the convergent validity criteria have been met. Test discriminant validity. The discriminant validity measurement is assessed based on the cross-loading measurement with its construct. Cross-loading values are presented in the following table:

Table 2
Cross loading value

Indicators	History of maternal nutritional status	Medical history of newborns	Nutritional status of toddlers
X11	**0,777**	0,211	-0,164
X21	**0,898**	0,350	0,021
X12	0,236	**0,837**	0,271
X22	0,286	**0,816**	0,011
X32	0,330	**0,812**	0,019
X23	-0,065	0,127	**1,000**

Table 2 shows that the correlation of each construct with its indicator is higher than the correlation of the indicator with other constructs. So it can be concluded that the measurement model built in this study has met the discriminant validity test. In addition to looking at the cross-loading value, discriminant validity measurements from the measurement model can be assessed by comparing the AVE root for each construct with the correlation between constructs with other constructs in the model. The model has good discriminant validity if the AVE root for each construct is greater than the correlation between constructs and other constructs in the model.

Table 3
AVE root value

Construct	Medical history of newborns	History of maternal nutritional status	Nutritional status of toddlers
Medical history of newborns	0,822		
History of maternal nutritional status	0,346	0,840	
Nutritional status of toddlers	0,127	-0,065	1.000

The table above shows that diagonal is the root value of AVE and the value below is the correlation between constructs. So it can be seen that the AVE root is higher than the correlation value between constructs, it can be concluded that the model in this study has been valid because it has met discriminant validity.

Construct reliability

The reliability measurement in this study used is to look at the value of composite reliability (>0.7). Composite reliability values are presented in the following table:

Table 4
Construct Reliability

Construct	Composite reliability	Description
History of maternal nutritional status	0,826	Qualify
Medical history of newborns	0,862	Qualify
Nutritional status of toddlers	1,000	Qualify

The table above shows that the Composite reliability value of each latent construct is more than >0.7 so it is concluded that the measurements used in this study are reliable.

Inner Model Testing

The inner model in PLS uses the value of R^2 for the dependent construct, the value of path coefficients, or the t-value of each path for a significant test between constructs in the structural model. The value of R^2 is used to measure the degree of variation of change of the independent variable to the dependent variable. The higher the value of R2 the better the predictive model of the proposed research model. The value of R^2 is presented in the following table:

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Table 5
R-Square value (R^2)

Latent Construct	R-Square (R^2)
Medical history of newborns	0,119
Nutritional status of toddlers	0.030

From the table above, it can be seen that the R-squared value produced by each variable is in the weak category. Furthermore, the path coefficients and T-statistic values of each path are presented in the following table:

Table 6
Path coeffisients on inner model testing

Construct	Original Sample	Sample Mean	Standard Deviation	T-statistic	Description
Medical history of newborns -> Nutritional status of toddlers	0,170	0,183	0,157	1,081	Not significant
History of maternal nutritional status -> Medical history of newborns	0,346	0,382	0,136	2,545	Significant
History of maternal nutritional status -> Nutritional status of toddlers	-0,124	-0,118	0,131	0,131	Not significant

The table above provides an overview of the magnitude and direction of influence between variables or latent constructs in the model. From the results of the path coefficient, it can be seen that all variables are positive values seen from the results of the T-statistic with a significance value of. This shows that the hypothesis in this study is accepted. Where there is 1 relationship of variables that have a positive and significant effect (T-statistic > 1.96) and 2 variable relationships that have a positive but not significant effect (T-statistic < 1.96). Furthermore, the complete model structure and weight value of influence between latent variables, both directly and indirectly, are presented in the following figure:

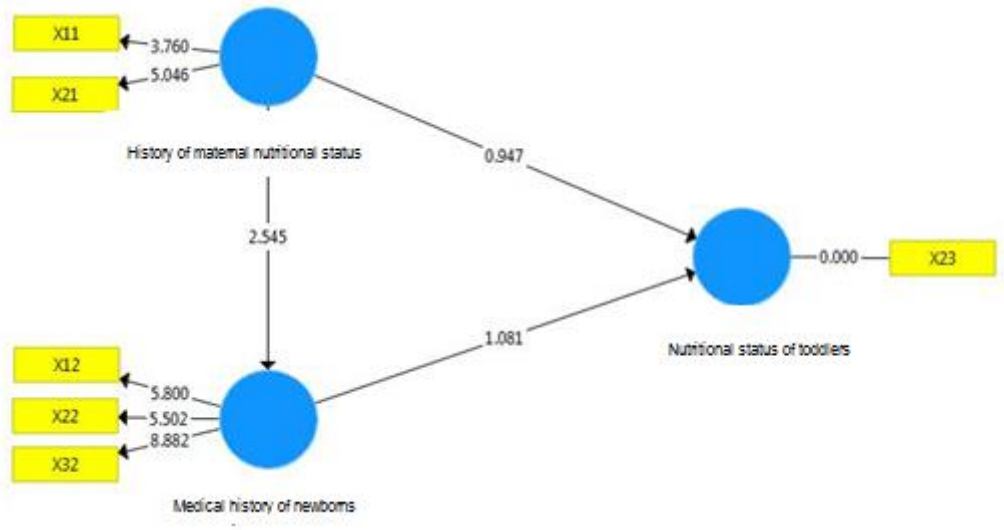

Figure 4. Structural model (Inner model)

DISCUSSION

The results of the path coefficient test found that the maternal nutritional status history variable had a significant direct effect on the health of the newborn based on the T-statistic value above the rule of thumb (>1.96), namely 2.545. In Indonesia, the most common nutritional problems among pregnant women are chronic energy deficiency (CED) and anemia (Werdani, 2023). In 2022, the incidence rate of pregnant women with CED will be 8.41%, while the incidence rate in NTT will be 17.10%. This shows that the incidence of chronic nutritional deficiency in NTT is relatively high when compared to the target set by the Indonesian Ministry of Health, namely 13% (Young et al., 2018). The upper arm circumference threshold for CED risk is 23.5 cm. This means that pregnant women at risk of CED are expected to give birth to LBW babies.

Pregnant women who experience CED have a 2.8 times chance of giving birth to a low birth weight baby (Hartiningrum & Fitriyah, 2016). The history of the mother's nutritional status is an important factor in fetal growth and development. If there is a lack of nutritional status at the beginning of life, it will have an impact on the next life such as Intrauterine growth restriction (IUGR), low birth weight (LBW), small, short and thin, low endurance and the risk of death (D. Nenogasu et al., 2020).

Anemia in pregnancy is higher in developing countries with a prevalence of 43% and in developed countries, it is 9%. Hemoglobin levels greatly influence the weight of the baby to be born. Anemia has negative impacts on mothers such as infections and postpartum hemorrhage, IUGR, low birth weight, prematurity, and abortion (Utami, 2022). Apart from that, the impact of anemia on pregnant women includes shortness of breath, fatigue, palpitations, hypertension, sleep disorders, preeclampsia, and even maternal death (Sululinggi et al., 2021).

Pregnant women with anemia not only endanger the life of the mother but also disrupt growth and development and endanger the life of the fetus. This is caused by a lack of nutrient and oxygen supply to the placenta which will affect the function of the placenta for the fetus (T. Wahyuni & Diansabila, 2021). Poor maternal nutritional status in mothers with a thin BMI causes a decrease in blood vessel expansion, causing an inadequate increase in cardiac output and causing a decrease in blood flow to the placenta, and a decrease in nutrient transfer, causing fetal growth retardation (Cunningham et al., 2014).

The results of other studies show that a BMI <18.5 kg/m2 significantly influences low birth weight. Pregnant women with a BMI <18.5 kg/m2 are twice as likely to give birth to babies with low birth weight. BMI <18.5 kg/m2 indicates chronic malnutrition (Demelash et al., 2015). In addition, chronic nutritional deficiency in the mother since conception is an intrauterine factor that causes small fetal size as indicated by low birth weight or short birth length (Lada, 2019). Arm circumference indicates a chronic lack of protein energy. Chronic nutritional deficiency is a condition caused by unbalanced nutritional intake between protein and energy so that the nutrients needed by the body are not met (Zulfikar et al., 2023)

Globally, in 2016 the presentation of chronic nutritional deficiency in pregnant women was 73.2%. The percentage of pregnant women with chronic nutritional deficiency in Indonesia is 8.41%. This is very important to pay attention to (Kusumastuti et al., 2023). Chronic nutritional deficiency pregnant women are at risk of giving birth to babies with LBW, short birth length, as well as stunting in children (Simbolon & Rahmadi, 2022). The nutritional status of the mother plays an important role in the growth of the fetus, the health and survival of the baby as well as the long-term health and development of the child and is one indicator in measuring the nutritional status of the community (Kulsum & Wulandari, 2022). Since conception, the mother is the only nutrition for the growth and development of the fetus until 6 months after birth when exclusively breastfed. Maternal nutritional deficiencies during pregnancy are the main determinant of poor fetal growth and stunting. Mothers with a height < 145 cm or a BMI < 18.5 during early pregnancy are at greater risk of giving birth to small babies, which is estimated to contribute around 20% to stunting cases globally (Young et al., 2018). The results of the inner model evaluation using R2 (Table 5) show that the history of maternal nutritional status influences the health of newborn babies by 11.9% (R2: 0.119), while the rest is explained by other factors not included in this research model.

The relationship between newborn health has a positive but not significant effect on under-five nutritional problems (wasting) based on a T-statistic value of 1.081 (Rule of thumb <1.96). The health of newborn babies, which is reflected through birth weight, body length, and birth head circumference, is an important indicator that can influence toddler nutrition problems, this is proven by the positive influence it produces. Low birth weight has a strong correlation with body length and malnutrition in childhood. The incidence of LBW in NTT province is 4.5%. This shows that the incidence of LBW is still high when compared with the national incidence rate of 2.5% (Kementerian Kesehatan RI, 2022). The baby's weight at birth is an important determinant of the chances of survival, growth, and development. Mothers with good nutrition will give birth to healthy babies. On the other hand, mothers who experience nutritional deficiencies have a risk of giving birth to LBW babies (Hartiningrum & Fitriyah, 2016).

This is supported by other research where the condition of newborns with LBW significantly influences the incidence of wasting and will be exacerbated if the mother experiences CED. If a baby is born with LBW there is a risk of death, malnutrition, growth disorders, and developmental disorders during childhood. Babies with LBW are one of the determining factors for short-term problems. This indicator is an outcome indicator of the mother's nutritional condition during pregnancy (S. Wahyuni et al., n.d.). Intra- and extrauterine factors can cause nutritional problems such as stunting. Chronic

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maternal nutritional deficiency from conception to birth is an intrauterine factor. This causes small fetal size which is indicated by low birth weight or short birth length. Extra-uterine factors that influence include exclusive breastfeeding and complementary foods (Lada, 2019). The results of the inner model evaluation using R2 (Table 5) show that together the nutritional status of the mother and the health of the newborn influence the nutritional status of the child by 3% (R2: 0.030), while the remainder is explained by other factors not included in this research model.

CONCLUSION

Based on a review of theories, the results of other researchers, and current research, it was found that there is a positive influence on the health of newborns directly on the incidence of wasting, so it becomes very important to optimize growth during pregnancy. Efforts that must be made are to prepare the nutritional status of the mother before pregnancy so that the resulting pregnancy output is a baby with normal weight, body length, and head circumference.

SUGGESTION

It is necessary to conduct a holistic study on toddlers with nutritional problems which include intra and extrauterine factors to provide an overview of the factors that affect nutritional problems. This helps in formulating a priority plan of interventions that can be done for the prevention and treatment of infant nutrition problems.

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