

# Factors Influencing Nutritional Status Changes in Wasting Toddlers in the Working Area of Serpong Sub-District Health Center: A Retrospective Cohort Study

Aulia Vania Andini and Ony Linda

Department of Public Health, Faculty of Health Sciences, University of Muhammadiyah Prof. Dr. Hamka, Jakarta, Indonesia

**Keywords:** Nutritional Status, Toddlers, Wasting.

**Abstract:** The main issue worldwide is wasting, which contributes to 45% of deaths in children under five years of age. In 2022, South Tangerang achieved 100% intervention for wasting toddler through a supplementary feeding program. Despite this, some toddlers still require additional supplementary feeding recovery (PMT) because their nutritional status remains unchanged. This study analyzed the factors affecting nutritional changes in wasting toddlers. The cohort study involved 46 wasting children in Serpong Districts who received PMT recovery during a three-month period. The secondary data required were anthropometric measurements of toddlers and history of infectious diseases during PMT-P consumption and can be found in the KIA Book. The primary data in this study included the characteristics of mothers and toddlers, the suitability of toddlers for consuming supplementary food recovery (PMT-P), and the history of infectious diseases in toddlers during the period of supplementary food recovery. Statistical analyses were performed using the chi-square test. The findings indicated a significant relationship between mother's education ( $p = 0.014$ ;  $RR = 13,462$ ), supplementary feeding recovery ( $p = 0.002$ ;  $RR = 11,500$ ), history of infections ( $p = 0.003$ ;  $RR = 8,143$ ), and improvement in nutritional status in the Serpong Sub-District Health Centre. Many toddlers still have poor nutrition.

## 1 INTRODUCTION

Wasting is a major nutritional concern worldwide. Data from the World Health Organization (WHO) indicate that in 2020, there will be 56.2%, or approximately 13.6 million, of children wasting in Southeast Asia, with a prevalence rate of 14.5%. Children aged 5 years with malnutrition have weakened long-term immune responses during development (World Health Organization, 2021).

Based on the findings of the Indonesian Nutritional Status Survey (SSGI) in 2022, the prevalence of wasting in 2022 is 7.7%, and the province of Banten has a prevalence of wasting above the national average of 7.9%. According to these percentages, the target of the 2024 National Medium-Term Development Plan (RPJMN) of 7% has not yet been achieved (Presidential Regulation of the Republic of Indonesia Number 18, 2020). The 2022 SSGI results for wasting among toddlers in Banten Province and 4.9% in South Tangerang City indicate that each child needs monitoring and assessment of

nutritional status to ensure optimal growth, which involves comparing a child's weight and height (Ministry of Health of Indonesia, 2020).

One of the Sustainable Development Goals (SDGs), which is the second goal, is to address hunger and all forms of malnutrition by 2030 and achieve food security. To achieve the SDG target, the government tackled stunting and wasting priority. According to Minister of Health Regulation Number 39 of 2016 in the Guidelines for the Implementation of the Healthy Indonesia Program with a Family Approach, one of the efforts being made is the implementation of the Supplementary Feeding (PMT) program for toddlers. The Supplementary Feeding Program (PMT) aims to address insufficient food intake. It also aims to prevent the occurrence of diseases that may arise owing to nutritional deficiencies. The supplementary food recovery provided to address nutritional issues was given for a duration of 90 days (Ministry of Health of Indonesia, 2017)

In Banten province, 43.5% received PMT and 74.9% benefited from the PMT program. In 2022,

South Tangerang City became one of cities that provided 100% intervention for wasting toddlers through the Supplementary Feeding Recovery Program (PMT-P).

Previous research, which was tested using Pearson's product-moment correlation with a p-value of 0.037 ( $p < 0.05$ ), showed that there was a connection between compliance consumption of PMT-P by toddlers and changes in nutritional status (Adelasanti & Rakhma, 2018). The utilization of the Supplementary Feeding Program (PMT) is influenced by the taste of the biscuits consumed. Taste is a sensory response to gustatory nerve stimulation (Setiawan 2018).

According to the United Nations Children's Fund (UNICEF), inadequate food intake and infectious diseases are direct causes of malnutrition, while socio-economic factors are indirect causes. Food intake and infection significantly affect the nutritional status. Imbalanced diets weaken the immune system, causing symptoms such as nausea, vomiting, and reduced appetite, thereby affecting nutrition (Linda and Huriah, 2018). Weak immunity leads to illness and appetite loss, resulting in poor nutrition (Rosha et al., 2020). Other studies have also shown that the majority of undernourished toddlers are females (Sekar et al., 2020).

Mothers play crucial roles in the growth and development of their children. Age, education, and occupation are factors that influence a mother's ability to effectively fulfill her role in optimal child growth. As seen in previous research by Wubante (2017) in Ethiopia, mothers above 34 years of age had a lower risk of having undernourished children (0.29 times), whereas those aged 20–34 years had a slightly higher risk (0.59 times). Older mothers generally have a lower risk, likely because of their better child-rearing experience.

Another study reported that 73.3% of mothers had completed high school education, implying that higher parental education leads to better health knowledge and proper supplementary feeding practices (Solo et al., 2017). A mother's occupation also affects child growth; those who do not work have more time at home to monitor and control their child's intake (Fauzia et al., 2019).

In a preliminary study conducted in the working area of the Lengkong Karya Community Health Center, Serpong Sub-District, two out of four toddlers who completed the Supplementary Feeding Recovery Program (PMT-P) did not experience improved nutritional status. Therefore, this study aimed to analyze factors that may contribute to changes in the nutritional status of toddlers.

## 2 METHODS

This study is an observational study using a retrospective cohort design (looked at backwards events) to see the factors associated with changes in the nutritional status of toddlers within the past 3 months, namely in January–March 2023.

Measurement of independent variables and characteristics of toddlers and mothers, namely history of disease and suitability in the implementation of supplementary food recovery, using a questionnaire as a research instrument. The dependent variable was the change in the nutritional status of toddlers according to the anthropometric index weight for height (WHZ).

The sampling technique used in this study was total sampling or saturated sampling of 46 toddlers. This study was conducted in the working area of the Serpong Sub-District Community Health Center in South Tangerang City, which consists of seven health centers: Ciater Health Center, Lengkong Wetan Health Center, Serpong 1 Health Center, Serpong 2 Health Center, Rawa Buntu Health Center, and Rawa Mekar Jaya Health Center.

Data collection uses secondary and primary data. The secondary data required were anthropometric measurements of toddlers and history of infectious diseases during PMT-P consumption. The secondary data in this study can be found in the Kesehatan Ibu dan Anak (KIA) book. The primary data in this study included the characteristics of mothers and toddlers, the suitability of toddlers in consuming Supplementary Food Recovery (PMT-P), and the history of infectious diseases of toddlers during the period of supplementary food recovery using a questionnaire as a research instrument. Data were analyzed using the chi-squared test with statistical software.

Consuming Supplementary Food Recovery (PMT-P) is categorized as "appropriate" and "not appropriate." It is considered "appropriate" when the respondent's score is 4, while it is considered "not appropriate" if the respondent's score is  $< 4$ . After conducting validity and reliability tests for the supplementary food recovery variable, a Cronbach's alpha value of 0.720 was obtained. The variable "History of Infection" is categorized into "Ever" and "Never." It was categorized as "ever" when the respondent's score was  $\geq 1$ . On the other hand, it fell under the category of 'never' when the respondent's score was 0. After conducting validity and reliability tests for the History of Infection variable, Cronbach's alpha value of 0.762 was obtained.

### 3 RESULT

Respondents' characteristic show in Table 1. the majority of wasting toddlers in the Serpong Sub-district Primary Health Care Work Area were aged between 12 and 59 months, totaling 38 toddlers (approximately 82.6 %). Female respondents accounted for approximately 52.2% of the total respondents.

Table 1: Respondent Characteristic.

Variable	n	%
<b>Children Characteristics</b>		
<b>Children Age</b>		
6-11 Months	8	17,4
12-59 Months	38	82,6
<b>Children Gender</b>		
Female	24	52,2
Male	22	47,8
<b>Mother's Characteristics</b>		
<b>Mother age</b>		
>34 years	25	54,3
≥ 19 – 34 years	21	45,7
<b>Mother's Education</b>		
Not finished elementary school	8	17,4
Elementary – Junior high school	15	32,6
Senior High School	14	30,4
Graduated (D3, S1, S2.)	9	19,6
<b>Mother's Occupation</b>		
Housewife	36	78,3
Private Employee	5	10,9
Entrepreneur	5	10,9

In terms of mothers' ages among wasting toddlers, most were >34 years (54.3%) and ≥ 19–34 years (45.7%). In terms of education, 20 mothers completed high school (32%), while 8 had higher education (17.4%). Most mothers (78.3%) who took care of wasting toddlers in the Serpong Sub-district Primary Health Care Work Area were housewives.

Distribution of Respondents Based on The Criteria of Supplementary Recovery Feeding (PMT-P) show in Table 2. For those questions, a score of 1 was assigned if the answers met the criteria. That receives a score of 1 if the answers are "Toddler Biscuits," "60 or 90 Packets," "3 Months," "8 or 12 Pieces," "Child Only," and "Yes."

Table 2: Distribution of Respondents Based on the Criteria of Supplementary Recovery Feeding (PMT-P).

Question	Answers	
	n	%

Supplementary Food Recovery (PMT-P)		
What types of supplementary foods does the toddler receive?		
Toddler Biscuits	46	100
Milk	0	0
Other	0	0
How many biscuits does the toddler receive in one month?		
60 or 90	34	73,9
Less than 60 or less than 90	12	26,1
More than 60 or more than 90	0	0
How long has the child been receiving supplementary feeding (PMT-P)?		
3 months	29	63,0
More than 3 months	17	37,0
Less than 3 months	0	0
How many pieces of biscuit are consumed in one meal?		
8 or 12	23	50
Less than 8 or less than 12	19	41,3
More than 8 or more than 12	4	8,7
Who consumes the supplementary feeding?		
Child only	25	54,3
Family / Friends	11	23,9
Other	10	21,7
Is the provided supplementary feeding (PMT-P) completely consumed by the child?		
Yes	17	37,0
No	29	63,0

Then, the scores are composite and categorized as "appropriate" and "not appropriate." PMT-P is considered "appropriate" if the respondent has a total score of 6. It is considered "not appropriate" if the respondent has a total score of <6. The data processing results based on the PMT-P categories are as follows:

Table 3: Category of Supplementary Recovery Feeding (PMT-P).

Category Variable	n	%
<b>Supplementary Food Recovery</b>		
Appropriate	15	32,6
Not Appropriate	31	67,4

The majority of toddlers still do not meet the proper consumption of supplementary feeding recovery (PMT-P), totaling 31 toddlers, or about 67.4%, while the toddlers who meet the proper consumption of PMT-P are 15 toddlers, or about 32.6%.

Table 4: Distribution of Respondents Based On The Criteria of Infectious Diseases.

Question	Answer			
	Yes		No	
	n	%	n	%
Has the child been diagnosed with Pulmonary Tuberculosis (TB) by a doctor in the past 3 months?	5	10,9	41	89,1
Has the child ever been diagnosed with lung inflammation (Pneumonia), with or without a chest X-ray, by a healthcare professional (Doctor/Nurse/Midwife)?	5	10,9	41	89,1
Has the child experienced symptoms of high fever, cough, and difficulty breathing?	5	10,9	41	89,1
Has the child been diagnosed with Acute Respiratory Infection (ARI) by a healthcare professional (Doctor/Nurse/Midwife) in the past 3 months?	7	15,2	39	84,8
Has the child experienced fever, cough for less than 2 weeks, runny/stuffy nose, and sore throat? (By fever, we mean an increase in the child's body temperature)	7	15,2	39	84,8
Has the child been diagnosed with diarrhea by a healthcare professional (Doctor/Nurse/Midwife) in the past 3 months?	29	63,0	17	37,0
Has the child experienced passing stool with a watery or loose consistency, having bowel movements more than 3 times a day? (Symptoms like having 3-6 bowel movements a day, loose or watery stool)	29	63,0	17	37,0

The results indicated that most respondents answered "yes" when asked about their history of illness. This was most prominent in questions related to diarrhea, where 29 toddlers (approximately 63.0 %) responded affirmatively. On the other hand, the fewest "no" responses regarding illness history were for questions about TB and pneumonia, with 41 toddlers (approximately 81.9 %) responding negatively.

Then, the respondents' answers were composite-scored and grouped into "ever" and "never." A history of infectious diseases is considered "ever" if the respondent's score is >0 and "never" if the score is >0. The data processing results based on the categories of infectious disease history are as follows:

Table 5: Category of Infectious Diseases.

Category Variabel	n	%
<b>History Of Infectious Diseases</b>		
Never	22	47,8
Ever	24	52,2

In this study, the majority of toddlers experienced infections, totaling 24 toddlers (52.2 %) who had never had a history of infection.

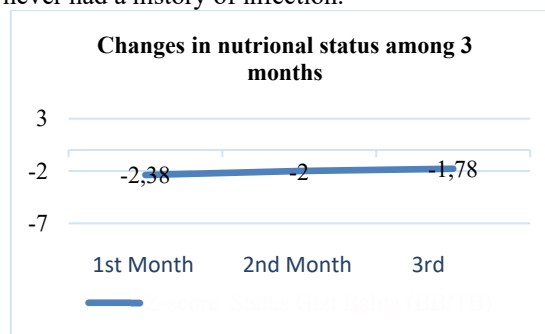


Figure 1. Change in Z-Score Based On WHZ Among 3 Months.

Based on Figure 1, the z-score change graph indicates that there was an improvement in the toddlers z-score over the three month period. In the first month, it decreased from -2.38 SD to -2 SD in the second month. Then, it increased again to -1.78 SD in the third month.

Table 6: Category of Toddlers Changes in Nutritional Status.

Variable	n	%
<b>Changes in Nutritional Status</b>		
Good	20	43,5
Not Good	26	56,5

In this study, a change in nutritional status is considered "good" when the final nutritional status shows an improvement to normal nutritional status, whereas it is considered "not good" if the final nutritional status still wasting or indicates a decline to severe malnutrition

As shown in Table 6, the majority of toddlers experienced a deterioration in their nutritional status, with 26 respondents (56.5 %) showing a decline. Meanwhile, 20 toddlers (approximately 43.5%) showed improvement in their nutritional status.

Table 7: Distribution of Respondents Based on Toddler Gender with Changes in Toddler Nutritional Status.

Gender	Change in Nutritional Status				RR (95% CI)	P value
	Good		Not Good			
	n	%	n	%		
Female	12	50,0	12	50,0	1,750 (0,537-5,701)	0,526
Male	8	36,4	14	63,6		

The bivariate results of the child's gender with changes in nutritional status show that more improvements were observed in nutritional status among female toddlers (50.0%) compared to male toddlers (36.4%). However, this study indicated that there was no relationship between sex and changes in nutritional status (p = 0.526). These findings align with those of a previous study that also found no significant association between sex and changes in nutritional status (Hasyim and Saputri, 2022).

There is a distinct proportion of nutritional status, where more females experience a change in wasting than males (Anita, 2018). This study deviates from this theory, as female sex does not always correlate with poor nutritional status, as changes in nutritional status are influenced by multiple factors, such as the child's history of infectious diseases.

Table 8: Mothers Characteristics with Changes in Toddler Nutritional Status.

Variable	Change in Nutritional Status				RR (95% CI)	P value
	Good		Not Good			
	n	%	n	%		
<b>Mother Age</b>						
At Risk	13	65,0	12	46,2	2,167 (0,653-7,190)	0,330
Not At Risk	7	35,0	14	53,8		
<b>Mother Education</b>						
High	7	87,5	1	12,5	13,462 (1,429-121,47)	0,014
Low	13	34,3	25	65,8		
<b>Mother Occupation</b>						
Not Working	16	44,4	20	55,6	1,200 (0,288-4,993)	1,000

Bivariate results showed no relationship between maternal age and changes in children's nutritional status (p = 0.330). This is consistent with a study by Martiana (2018) that found no significant association between maternal age and changes in children's nutritional status (P-value = 0.362) (Martiana, 2018).

Older or more mature mothers have better childcare experiences than younger mothers do (Wubante, 2017). The results of this study contradict this theory. Maternal age is an indirect factor influencing children's nutritional status; however, in this study, the majority of mothers were relatively young (22 years), which means that they might not have sufficient information and knowledge about nutrition during pregnancy and after childbirth.

Furthermore, in this study, mothers with a higher education background have children with a significantly better rate of improvement in the nutritional status (87.5%) was observed. The calculation of Relative Risk (RR) values showed that respondents with higher education were 13 times more likely to experience positive changes in nutritional status. The research findings indicated a relationship between maternal education and changes in children's nutritional status (P = 0.014). These results are consistent with those of a study by Zaqiah (2019), who also found a significant connection between maternal education history and changes in nutritional status (P-value = 0.014). However, this study contradicts the findings of Amanda (2020), which indicated no relationship between education and changes in nutritional status (P = 2.000).

This study showed that mothers with higher education are better equipped to understand the health and nutrition of their children. This helps them make good choices about adding extra food that can make their children healthier (Solo et al., 2017). Moms with more education are also aware of balanced nutrition and can pick the right food for their families (Martina 2018). However, in this study, most mothers had less education, and more of them saw their children's nutrition as deteriorating. Moms with more education often learn good nutrition in seminars, so they know how to better feed their children. Moms that study more are usually better for their children at picking the right food.

Table 8 shows that there was no relationship between employment and undernutrition status changes in toddlers (p = 1.000). These findings align with those of a previous study that found no significant association between employment and changes in nutritional status (0.279) (Yunis, 2018). However, this contradicts the findings of Fauzia (2019), who suggested a significant relationship between maternal employment and changes in nutritional status (p = 0.001).

Moms who do not work have more time to take care of their children and watch them grow so that they can control what they eat (Fauzia et al., 2019). However, this study obtained a different result. In this



study, most mothers who did not work did not study much. Even though they have more free time with their children, many use phones and tablets more and do not know much about feeding their children correctly. This lack of knowledge means that they did not pay sufficient attention to what their children needed to eat.

Table 9: Distribution of Respondents Based on Supplementary Feeding Recovery (PMT-P) with Changes in Toddler Nutritional Status.

PMT-P	Change in Nutritional Status				RR (95% CI)	P value
	Good		Not Good			
	n	%	n	%		
Appropriate	12	80,0	3	20,0	11,500	0,002
Not Appropriate	8	25,8	23	74,2	(2,568-51,502)	

This study showed a relationship between providing recovery supplementary feeding and changes in the nutritional status of toddlers ( $P = 0.002$ ). The Relative Risk (RR) calculation results indicated that compliance with PMT-P increased the likelihood of toddlers experiencing positive changes in nutritional status by 11 times. These findings align with those of a study that reported a significant association between PMT-P and changes in nutritional status ( $p = 0.037$ ) (Adelasanti, 2018).

This study contradicts the findings of Nurfatimah and Rakhma (2017), who found no correlation between PMT and changes in nutritional status among undernourished toddlers in the Sukoharjo Regency ( $p = 0.340$ ). They suggested that when mothers become tired of PMT, they may not attempt to modify it into other foods, as taught during counseling (Nurfatimah et al., 2017). This study aligns with the theory that supplementary foods serve as nutritious additions to the main diet of the target group, thereby fulfilling their nutritional needs. If implemented according to recommendations aimed at meeting the energy and protein requirements of malnourished toddlers, PMT programs can improve children's nutritional status (Kementerian Kesehatan RI, 2017).

In this study, many mothers mentioned that their children did not like the taste of biscuits and became bored with them, so they did not eat enough food daily. In addition, some mothers did not know that the PMT-P should only be given to their children and should not be shared with family or friends. Others did not try to change PMT-P to avoid boredom. A few months later, even though the PMT-P could replace one main meal, skipping the meal was skipped. Moms that do not meet the PMT-P criteria may not

understand how they help their children with nutrition (Adelasanti & Rakhma, 2018).

Toddlers who do not fully follow PMT-P still improve their nutrition if they eat other foods such as sweet bread. Despite not fully adhering to PMT-P, their weight increased because they preferred snacks and formula milk. Moms provide other foods because they can afford them. On the other hand, toddlers who strictly follow PMT-P but have worsening nutrition might have other issues like past illnesses. Some are still recovering from TB and lost weight due to recent diarrhea.

Table 10: Distribution of Respondents Based on History of Infectious Diseases with Changes in Toddler Nutritional Status.

History Of Infectious Diseases	Change in Nutritional Status				RR (95% CI)	P value
	Good		Not Good			
	n	%	n	%		
Never	15	68,2	7	31,8	8,143	0,003
Ever	5	20,8	19	79,2	(2,148-30,863)	

As shown in Table 10, there was a relationship between a history of infectious disease and changes in nutritional status ( $p = 0.003$ ;  $RR = 8,143$ ). This is consistent with previous research findings that more toddlers who have never been infected with infectious diseases experience a better nutritional status than those who have been infected (Sri, 2018). This is further supported by earlier studies, such as that of Nengsi (2017), who reported a connection between infectious diseases and changes in nutritional status ( $p = 0.046$ ).

This study aligns with Carolin's research (2020), suggesting that infectious diseases can increase the likelihood of toddlers experiencing undernutrition. Some toddlers in this study were still undergoing treatment for infectious diseases including tuberculosis (TB). The most common infectious disease experienced by the children in this study was diarrhea. This can be attributed to some mothers' lack of awareness of their children's hygiene, such as allowing their children to handle food with dirty hands. Some caregivers who assisted during the study also mentioned that there were mothers who let their children's clothes and bodies remain dirty and did not bathe them for several days. The impact of infectious diseases on child growth includes weight loss due to reduced appetite, leading to reluctance to consume food.

## 4 CONCLUSIONS

After performing the study around 46 toddlers in the Serpong Sub-district Community Health Center area, it can be concluded that the mother's education ( $p = 0.014$ ;  $RR = 13,462$ ), supplementary feeding recovery ( $p = 0.002$ ;  $RR = 11,500$ ), history of infections ( $p = 0.003$ ;  $RR = 8,143$ ) are related to changes in wasting among the toddlers in the same area of South Tangerang city. However, the study did not find a significant link between the child's gender ( $p = 0.413$ ), mother's age ( $p = 0.330$ ), and mother's job ( $p = 1.000$ ) and changes in wasting. This suggests that mothers need a way to learn more about balanced child nutrition and that they should be eager to learn and apply better eating habits to help their children grow healthy.

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