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Fulfilment minimum acceptable diet, exclusive breastfeeding, and infectious disease with stunting

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ABSTRAK

Latar Belakang: *Stunting adalah kondisi yang menyebabkan kegagalan pertumbuhan selama 1000 hari pertama kehidupan karena kekurangan nutrisi yang berlangsung lama. Kabupaten Brebes merupakan wilayah dengan angka stunting tertinggi di Jawa Tengah yaitu sebesar 29.1%. Stunting dipengaruhi langsung oleh status infeksi anak serta konsumsi zat gizi makro maupun mikro..*
Tujuan: *Studi ini menyelidiki bagaimana Minimum Acceptable Diet (MAD), ASI eksklusif, dan penyakit infeksi berkorelasi dengan stunting pada anak-anak berusia 6 hingga 23 bulan di Kabupaten Brebes.*
Metode: *Penelitian ini merupakan penelitian kuantitatif menggunakan data sekunder hasil dari Survei Status Gizi Indonesia (SSGI) 2022 dengan desain potong lintang (cross-sectional). Penelitian ini dilakukan pada kelompok anak berusia 6 hingga 23 bulan yang terdaftar di SSGI 2022 Kabupaten Brebes. Sampel dalam penelitian ini berjumlah 189 anak yang didapatkan dari total sampling berdasarkan kriteria inklusi dan ekslusi. Data dianalisis secara univariat dengan tabel distribusi frekuensi, bivariat dengan uji Chi-Square, dan multivariat dengan uji regresi logistik biner.*
Hasil: *Balita yang tidak mencapai MAD berisiko 1.30 kali mengalami stunting dan balita yang memiliki riwayat penyakit infeksi memiliki risiko 1.33 kali terkena stunting namun tidak signifikan secara statistik (p-value >0.05). Tidak signifikan variabel tersebut dapat disebabkan karena MAD yang dipengaruhi oleh beberapa faktor seperti pendidikan ibu dan ayah, kunjungan antenatal, dan tempat tinggal serta definisi penyakit infeksi yang terlalu luas. Hubungan yang tidak signifikan antara MAD dan stunting mungkin juga disebabkan oleh bias dalam pengukuran MAD, yang mengandalkan ingatan akan asupan makanan selama 24 jam terakhir. Sedangkan,balita tidak ASI eksklusif dapat meniurunkan risiko stunting 2.38 kali dan signifikan secara statistik (p-value 0.013).*
Kesimpulan: *Tidak terdapat korelasi antara MAD dan penyakit infeksi dengan stunting namun terdapat korelasi yang signifikan antara ASI eksklusif terhadap stunting.*

KATA KUNCI*: ASI eksklusif; minimum acceptable diet; penyakit infeksi; stunting*

ABSTRACT

Background: *Stunting is a condition resulting from long-term malnutrition, leading to growth failure within the first 1,000 days of life. Brebes Regency has the highest stunting rate in Central Java, at 29.1%. The child's level of infection and the amount of macro- and micronutrients they consume directly impact stunting.*

Objectives: *This study aims to analyze the relationship between the Minimum Acceptable Diet (MAD), exclusive breastfeeding, and infectious diseases with stunting among children aged 6-23 months in Brebes Regency.*

Methods: *This quantitative study utilized secondary data from the 2022 SSGI and employed a cross-sectional design. The study population consisted of children aged 6-23 months, as recorded in the 2022 Indonesian Nutritional Status Survey (SSGI) data for Brebes Regency. A total of 189 children were included in the study, selected through total sampling based on inclusion and exclusion criteria. Data were analyzed univariately with a frequency distribution table, bivariately with a Chi-Square test, and multivariately with a binary logistic regression test.*

Results: *Toddlers who do not reach the MAD have a 1.30 times risk of experiencing stunting, and toddlers with a history of infectious diseases have a 1.33 times risk of stunting, but this is not statistically significant (p-value >0.05). This variable is insignificant because MAD is influenced by several factors, such as the mother's and father's education, antenatal visits, and place of residence, as well as a definition of infectious disease that is too broad. The insignificant relationship between MAD and stunting may also result from biases in measuring MAD, which rely on the recall of food intake over the past 24 hours. Meanwhile, toddlers who are not exclusively breastfed can increase the risk of stunting 2.38 times, and it is statistically significant (p-value 0.013).*

Conclusions: *Stunting is not correlated with either MAD or infectious disease; however, it is significantly associated with exclusive breastfeeding.*

KEYWORD*: exclusive breastfeeding; infectious diseases; minimum acceptable diet; stunting*

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INTRODUCTION

Stunting is a medical condition caused by chronic nutritional deficits that prevent growth during the critical first 1,000 days of life (HPK) (1). It is a form of chronic malnutrition characterized by a kid's height-for-age being significantly below the World Health Organization (WHO) child growth criteria (2). Stunting is an important public health issue that requires serious attention, particularly in Indonesia. More than 165 million children under the age of five are stunted worldwide, with over 8.4 million in Indonesia (3). According to the 2022 Indonesian Nutritional Status Survey (SSGI), Indonesia's stunting rate remains extremely high at 21.6%, however this is a decline from previous years, when rates were 24.4% in 2021 and 27.7% in 2019. The stunting rate in Central Java Province is the highest on the island, at 20.8%, with Brebes Regency reporting the highest rate at 29.1%. This rate remains much higher than the national stunting reduction target of 14% by 2024 (4). The Minimum Acceptable Diet (MAD) is a composite indicator of infant and young child feeding practices (PMBA) that assesses the nutritional quality and sufficiency of diets for children aged 6 to 23 months (5). MAD serves as an indicator for child feeding practices, emphasizing both the quantity and type of food offered by combining little variety in diet with minimal meal frequency. These variables represent the quality of food served to children, and good feeding practices are critical since they have a direct impact on children's growth, health, and nutritional status, eventually affecting child survival (6). Effective PMBA practices are critical for enhancing child survival and fostering healthy growth and development. However, the proportion of babies

aged 6-23 months who fulfill the MAD criteria (which include both dietary diversity and meal frequency appropriate for their age) remains below 25%. Pranita et al. (2023) found that approximately 61.8% of children meet MAD, indicating the need for additional measures to promote conformation to this dietary standard (7). Stunting is also influenced by exclusive breastfeeding. Breastfeeding is acknowledged as one of the mechanisms that protect infants against stunting (8). When exclusive breastfeeding and complementary foods (MPASI) are offered thoroughly, the risk of stunting in children under the age of two is lowered by 20% (9), and it also helps to lessen the risk of infections (10). However, the rate of exclusive breastfeeding in Indonesia remains low (11). Several factors contribute to this low coverage, including a lack of awareness, insufficient family and community support, limited involvement of local health workers (12), maternal age, early initiation of breastfeeding (IMD), maternal psychological factors, mothers' employment status, availability of lactation rooms at work, family income, cultural beliefs, and media promotion of formula milk (13). Pratama and Irwandi (2021) found a strong correlation between the frequency of stunting and exclusive breastfeeding habits (8). Another study found that children (under five years old) who do not receive exclusive breastfeeding are 61 times more likely to be stunted than those who do receive exclusive breastfeeding (11). Furthermore, exclusive nursing by moms beyond the age of 30 is likely to protect against stunting (14).

Stunting is strongly determined by a child's illness status as well as their macronutrient consumption (15). Optimal growth and development in children require sufficient nutritional intake, which is greatly influenced by maternal caregiving practices, such as the supply of various and fresh foods that match children's nutritional requirements (10). Chronic problems in macro and micronutrients during the key 1,000-day window (HPK) can have long-term repercussions (16). Chronic malnutrition might decrease cognitive ability, lower earning potential, reduce productivity (15), and increase susceptibility to adult diseases caused by metabolic disorders such as hypertension and diabetes (17). Common diseases that are infectious in children, such as diarrhea, upper respiratory tract infections (URTIs), parasite infestations, and other health problems linked to long-term repercussions, all contribute significantly to stunting (18). Frequent viral infections in children can stunt growth and development by limiting food intake, affecting vitamin absorption, and resulting in chronic nutritional deficits (19). Children with a history of illness are 4.9 times more likely to be stunted than those without a history (20).

The Indonesian Nutritional Status Survey (SSGI) is a national survey aiming to assess toddlers' nutritional status. The Ministry of Health surveyed with the assistance of professional enumerators, which included 486 districts/cities throughout 34 provinces in Indonesia and provided representative data. SSGI uses a two-stage stratified sampling method cross-sectionally. SSGI 2022 will be implemented effectively from April to October 2022, including preparation activities, coordination meetings, training, data collection, and results delivery. SSGI data is taken by enumerators who have been trusted by the Indonesian Ministry of Health and is the latest data on the nutritional status of toddlers in Indonesia so that it can be analyzed further for research purposes and accounted for. The results of the SSGI survey are useful for undertaking additional analysis linked with specific research aims. The use of secondary data is critical to ensuring that obtained data stays useful and may be further analyzed to produce new insights. This study is notable for its investigation of the continuous association between the MAD, exclusive breastfeeding, and infectious illnesses about stunting in children aged 6-23 months. Unlike earlier research, this study incorporates these variables and makes use of secondary data from the SSGI, which has not been widely used in similar studies. The purpose of this study is to investigate the links between MAD, exclusive breastfeeding, and a infectious infections with stunting in children aged 6-23 months in the Brebes Regency.

MATERIALS AND METHODS

This quantitative analysis utilizes secondary data from the 2022 SSGI, with a cross-sectional

design. Conducted in Surakarta City from February to August 2024. The independent variables in this study include MAD, exclusive breastfeeding, and infectious diseases, while the dependent variable is stunting. This study included all toddlers recorded in the 2022 SSGI data from the current census block area in Brebes Regency. The study's source population consisted of children aged 6 to 23 months who were recorded in the Brebes Regency's 2022 SSGI database. The sample for this study comprised all children aged 6-23 months recorded in the 2022 SSGI data collection in Brebes Regency, totaling 189 children who were selected based on specific inclusion and exclusion criteria. The inclusion criteria were children aged 6-23 months who were registered at the time of the SSGI 2022 data collection. The exclusion criteria included children who lacked a 24-hour recall record (covering dietary diversity and meal frequency) and those without records related to the study variables. There was missing data in this study because 6 children did not have variables regarding exclusive breastfeeding, so they were immediately excluded. The SSGI 2022 secondary data was acquired by formal data requests sent to the Head of the Center for Data and Information Technology (Pusdatin) of the Ministry of Health of the Republic of Indonesia. Appended were the request form, a letter soliciting data usage, a cover letter from the university, and an approved research proposal obtained from the Pusdatin website. The occurrence of stunting is assessed by calculating the body height index according to age (BH/A) less than -2 standard deviation (SD) are called stunting using WHO Anthro software (21).

The Minimum Acceptable Diet (MAD) is a key indicator for evaluating infant and young child feeding practices by integrating both the Minimum Dietary Diversity (MDD) and the Minimum Meal Frequency (MMF) provided that children who are not breastfed must receive milk at least twice in the previous day (22). Exclusive breastfeeding refers to the practice of giving only breast milk to babies for six months with unlimited breastfeeding frequency given to the baby (11). Infectious disease refers to a child who is diagnosed as having a history of contagious disease. Data from this study will be analyzed further using SPSS. In this study, a univariate analysis was conducted to describe the characteristics of the respondents including age, gender and place of residence. The analysis also described the independent variables namely, the Minimum Acceptable Diet (MAD), exclusive breastfeeding, and infectious diseases as well as the dependent variable, stunting (nutritional status). These variables were grouped, tabulated into a frequency distribution table, and then described accordingly. A bivariate analysis was performed to examine the relationship between the independent and dependent variables using the Chi-Square test. Following this, a multivariate analysis was conducted using binary logistic regression After that, multivariate analysis was carried out using binary logistic regression because the independent variables in this study were dichotomous or categorical. This study has received ethical approval from the ethics commission of Dr. Moewardi Hospital with number 427/II/HREC/2024.

RESULT AND DISCUSSION

In this study, univariate, bivariate, and multivariate analyses were conducted. The frequency distribution results revealed that the majority of subjects were aged 12-23 months (65.1%), with males comprising 51.9% of the sample, and 77.2% of subjects residing in urban areas. Based on the data presented in the table, it can be concluded that approximately one-third of the subjects in this study had a z-score of ≥ -2 SD, indicating that 75.1% of them did not experience stunting. However, despite this, the stunting rate in Brebes Regency remains relatively high at 24.9% among children aged 6-23 months, which is above the government's target of reducing the prevalence of stunting to below 20%. **Table 1** shows that 51.3% of children aged 6-23 months in Brebes Regency did not achieved MAD. Furthermore, the table show that the fraction of children who did not obtain exclusive breastfeeding remained high, with 54% being exclusively cared for**. Table 1** also demonstrates that 30.7% of children have a history of infectious infections, whereas 69.3% have none. A bivariate analysis was conducted to examine the relationship between the variables MAD, exclusive breastfeeding, and infectious diseases with stunting. The results of the analysis can be seen in **Table 2**.

Table 1. Distribution of respondents (n=189)

Category	n	%
Age		
6-11 month	66	34.9
12-23 month	123	65.1
Sex		
Male	98	51.9
Female	91	48.1
Residence		
Urban	146	77.2
Rural	43	22.8
Nutritional Status		
Not Stunting	142	75.1
Stunting	47	24.9
Minimum Acceptable Diet		
Not Achieved	97	51.3
Achieved	92	48.7
Exclusive Breastfeeding		
Not Exclusive Breastfeeding	102	54.0
Exclusive Breastfeeding	87	46.0
Infectious Disease		
History of Infectious Diseases	58	30.7
No History of Infectious Diseases	131	69.3

Source: SSGI Secondary Data, 2022

The bivariate analysis of the MAD variable in relation to stunting yielded an odds ratio (OR) of 1.1, indicating that not achieving the MAD 1.1 times higher risk of stunting. However, this result was not statistically significant (p-value 0.899). The bivariate analysis of the exclusive breastfeeding variable on stunting revealed that children aged 6-23 months had a OR 0.429, specifically, children aged 6-23 months who not receive exclusive breastfeeding had a 2.33 times lower of stunting. This finding was statistically significant (p-value 0.020). Moreover, the bivariate analysis of infectious diseases and stunting revealed an OR of 1.39, indicating that the have a history of infectious diseases were 1.39 times greater to experience stunting although this result was not statistically significant (p-value 0.449).

Table 2. Analysis of variable with the incidence of stunting among children aged 6-23 months in Brebes Regency

Category	Stunting	Not Stunting	OR 95% CI (Lower-Upper)	*p-value*
MAD				
Not Achieved	25 (53.2%)	70 (49.3%)	1.105 (0.571-2.139)	0.899
Achieved	22 (46.8%)	72 (50.7%)		
Exclusive Breastfeeding				
Not Exclusive Breastfeeding	18 (38.3%)	84 (59.2%)	0.429 (0.218-0.843)	0.020*
Exclusive Breastfeeding	29 (61.7%)	58 (40.8%)		
Infectious Disease				
History of Infectious Diseases	17 (36.2%)	41(28.9%)	1.396 (0.695-2.803)	0.449
No History of Infectious Diseases	30 (63.8%)	101(71.1%)		

*significant, p-value <0.05
Chi-Square Statistical Test; OR = Odds Ratio; CI = Confident Interval

The results of the multivariate analysis revealed no significant relationship between the MAD, exclusive breastfeeding, and infectious diseases with stunting in children aged 6-23 months in Brebes Regency when considered simultaneously and finding was statistically insignificant. The multivariate analysis, indicated that children aged 6-23 months who not achieving the MAD criteria have a 1.3 greater risk of stunting though this was not statistically significant. Additionally, the exclusive breastfeeding variable on stunting revealed that children aged 6-23 months who were not exclusively breastfed 2.38 (1/0.42) times lower of stunting. Regarding the infectious disease variable thus children aged 6-23 months with a history of infectious diseases have a 1.33 times greater risk of stunting, although this was not statistically significant. This variable MAD and infectious disease is insignificant because MAD is influenced by several factors, such as the mother's and father's education, antenatal visits, and place of residence, as well as a definition of infectious disease that is too broad. The binary logistic regression analysis revealed a Nagelkerke R Square signifying that the combined influence of the MAD variable, exclusive breastfeeding, and history of infectious diseases accounts for 5.6% of the variation in stunting, while the remaining 94.4% is attributed to other unexamined factors. The MAD is a key indicator for evaluating infant and young child feeding practices by integrating both the diversity of foods consumed and the frequency of feeding. The quality and quantity of complementary feeding provided to children are reflected in the achievement of MAD, which can be further assessed based on the breastfeeding status of the child. The results of the multivariate analysis indicated that the MAD variable had an OR of 1.3, indicated children aged 6-23 months who did not met the MAD criteria were 1.3 times greater to experience stunting compared to those who meet the MAD criteria, although this finding was not statistically significant. Altare et al. (2016) also stated no significant correlation exists between stunting in children and achieving MAD. The MAD achievement factor is a calculation of the MDD and MMF achievements, which must achieve inseparable achievements to be considered to have achieved MAD (23).

Table 3. Analysis of variable with the incidence of stunting among children aged 6-23 months in Brebes Regency

Variable	OR	CI 95%		p-value
		Lower	Upper	
MAD	1.30	0.656	2.576	0.453
Exclusive Breastfeeding	0.42	0.210	0.834	0.013*
Infectious Disease	1.33	0.653	2.720	0.430
Omnibus Test 0.064 **Nagelkerke R Square 0.056**				

*significant, p-value <0.05
Binary Logistic Regression Statistical Test; OR = Odds Ratio ; CI = Confident Interval

According to Molla et al. (2021), the MAD is a variable influenced by several factors, including maternal education, paternal education, antenatal care visits, and place of residence (24). Julianti and Elni (2022) suggest that certain factors may diminish the indirect impact of MAD, particularly exclusive breastfeeding up to 6 months of age. Exclusive breastfeeding during this period, and continued breastfeeding up to 2 years, can provide sufficient nutrition to help prevent stunting in children. However, the lack of a significant effect of MAD on stunting can also be attributed to health conditions in children that increase their nutritional needs beyond those of healthy children, leading to continued stunting despite adequate dietary practices (25). The insignificant relationship between MAD and stunting may also result from biases in measuring the Minimum Dietary Diversity (MDD) and Minimum Meal Frequency (MMF), which rely on the recall of food intake over the past 24 hours. This reliance on respondents' memory may lead to incomplete or inaccurate reporting of dietary diversity, rendering these measures less sensitive and specific for

determining children's long-term eating patterns. However, because the 24-hour recall method is very important for determining MAD, it is necessary to coordinate with respondents to record food intake for 24 hours to avoid bias. The MAD achievement factor is calculated by combining MDD and MMF achievements. Low MDD and MMF achievements influence low MAD achievements, which can cause no significant relationship between the MAD variables and stunting. In this study, children who were not stunted had a more diverse food intake and achieved MMF.

However, this study contrast with the findings of Halim et al. (2020), reported that children aged 6-35 months who do not meet MAD criteria are 4.22 times more likely to be stunted than those who do meet MAD, and there was an association between MAD with stunting. Beside that, proper feeding practices are among the most effective strategies for combating stunting in children. Adequate feeding, which includes meeting MAD standards, enables children to achieve better linear growth and development. Children who receive an adequate MAD are more likely to be offered a diverse diet by their parents, leading to improved nutrition (26).

Furthermore, this study identified a correlation between stunting and exclusive breastfeeding. The multivariate analysis revealed that the exclusive breastfeeding suggesting children aged 6-23 months who not receive exclusive breastfeeding had a 2.38 times lower of stunting, a finding that was statistically significant. The research conducted by Muldiasman et al. (2018), reported that the absence of exclusive breastfeeding increased the likelihood of stunting by 54.1 (27). The differences in the results of this study could be triggered by other factors such as the condition of the mother, the condition of the baby, and the socioeconomic status of the family. According to Umiyah and Hamidiyah (2020), the presence of poor quality breast milk given by mothers to babies can influence the relationship between exclusive breastfeeding and stunting (17). This is supported by the results of the analysis in Table 2 which reports that stunting often occurs in toddlers who receive exclusive breast milk. Diversity in food intake also contributes to the risk of stunting, children with good food diversity can reduce stunting by 10% (3). In this study, the majority of children received adequate food diversity, dominated by consumption of staple foods, protein, and fruit and vegetables high in vitamin A. A systematic review by Sianti et al. (2024) also found that exclusive breastfeeding for up to six months can prevent stunting in poor and low-income communities (28). However, this research does not explore these variables which could support differences in results in this research and makes this one of the limitations of the research. Islamiyati et al. (2022) identified several factors influencing the provision of exclusive breastfeeding to children aged 6-23 months, including maternal knowledge, lactation challenges, economic status, employment, and parenting practices. At six months, children are in a period of rapid growth, and breast milk, rich in macro and micronutrients, is crucial for their optimal development. Unlike artificial milk, breast milk cannot be substituted, as it contains essential macronutrients, micronutrients, vitamins, microbiomes, and mRNA necessary for early growth and development. One significant benefit of exclusive breastfeeding is its role in promoting infant growth, particularly height, as the calcium in breast milk is more efficiently absorbed, thereby maximizing growth and reducing the risk of stunting (29).

This study indicates that although 29.3% of children aged 6-23 months in Brebes Regency have a history of infectious diseases, there is no significant correlation between the incidence of stunting and infectious diseases. The multivariate analysis reveals that the infectious disease variable has an OR of 1.33, suggesting that children aged 6-23 months with a history of infectious diseases have a 1.33 times greater risk of stunting compared to those without a history. However, this difference is not statistically significant. These findings are consistent with the research conducted by Kragel et al. (2020), which also found no significant relationship between the incidence of infectious diseases and stunting in children of the same age group. This may be attributed to the prompt and appropriate treatment of infectious diseases, ensuring that children's nutritional needs are still met, coupled with adequate exclusive breastfeeding, which helps maintain their nutritional status. This explains why

a history of infectious diseases does not have a significant impact on stunting (30).

The lack of a significant relationship between infectious diseases and stunting could be due to the broad definition of infectious diseases, which may include mild infections. Mild infections that do not lead to a loss of appetite or affect metabolism in children may not cause stunting, as these children do not suffer from nutritional deficiencies (31). This study aligns with the findings of Abeway et al. (2018), which also reported no significant relationship between infectious diseases and stunting. This could be due to the nutritional interventions and advice provided to mothers during pregnancy regarding the prevention and management of infections in children, enabling mothers to support their children's growth and development more effectively (32). The MAD evaluation is based on a 24-hour recall, which is dependent on respondents' memories of the previous 24 hours and may be influenced by bias and other factors. This technique is also restricted in its ability to identify correlations with stunting, as stunting is often caused by persistent malnutrition that is not immediately obvious.

CONCLUSIONS AND RECOMMENDATIONS

The conclusion drawn from this study is that the MAD and infectious diseases do not have a significant relationship with the incidence of stunting among children aged 6-23 months in Brebes Regency, as indicated by a p-value greater than 0.05. However, exclusive breastfeeding has a significant relationship with the incidence of stunting in this age group and emerges as the most dominant variable. Health institutions are recommended to maximize or develop programs aimed at supporting the achievement of MAD, preventing infectious diseases, and especially ensuring exclusive breastfeeding in children aged 6-23 months by promoting activities through counseling and education so that the public is more alert. Cross-sector coordination also needs to be carried out to make the program more optimal.

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