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Indirect Determinant Effects of Stunting with Toddler Stunting Incident in Papua New Guinea in 2018

Pengaruh Determinan Tidak Langsung Stunting dengan Kejadian Stunting Balita di Papua New Guinea Tahun 2018

Riza Khoiriyah[1]*, Trias Mahmudiono[2], Siti Rahayu Nadhiroh[2]

[1]Program Magister Kesehatan Masyarakat, Fakultas Kesehatan Masyarakat, Universitas Airlangga, Surabaya, Indonesia
[2]Departemen Gizi, Fakultas Kesehatan Masyarakat, Universitas Airlangga, Surabaya, Indonesia

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Correspondent:
Riza Khoiriyah
riza.khoiriyah-2022@fkm.unair.ac.id

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ABSTRACT

Background: Papua New Guinea has a significant problem with stunting, with a prevalence rate of 46.5% in 2018.
Objectives: This study aimed to analyze the effect of various factors on stunting in Papua New Guinea in 2018. These factors include characteristics of the child (gender, age, and ownership of health insurance) and household environmental factors such as the mother's education level, number of toddlers in the household, drinking water sources, and availability of restrooms.
Methods: This study employed a cross-sectional research design using secondary data from "The Demographic and Health Surveys (DHS) in Papua New Guinea in 2018." The variables of interest were extracted and subjected to data cleaning procedures, resulting in a final sample size of 744 toddler data points available for analysis. The chi-square test and logistic regression were employed for statistical analysis.
Results: The study revealed that mothers of toddlers who had never received any formal education were more likely to have toddlers who experienced stunting. The statistical analysis showed a significant association between the lack of maternal education and toddler stunting (p-value=0.012; odds ratio=1.488; 95% confidence interval [1.092; 2.028]). Additionally, toddlers in the age group of 24-59 months were found to be at a higher risk of experiencing stunting. The statistical analysis indicated a strong association between this age group and toddler stunting (p-value<0.001; odds ratio=1.770; 95% confidence interval [1.301; 2.408]).
Conclusions: The approach to addressing stunting in toddlers aged 24-59 months emphasizes the implementation of targeted and responsive interventions, with particular emphasis on the significance of investing in the education of toddler mothers in Papua New Guinea. However, in terms of prevention, it is crucial to administer the intervention before the toddler reaches the age of 24-59 months, as stunting is a visible result of long-term malnutrition.

INTRODUCTION

The second objective of the Sustainable Development Goals (SDGs) is to eradicate all types of malnutrition, including stunting[1]. Children who experience stunting often exhibit compromised cognitive, physical, and metabolic growth, which can subsequently contribute to the development of cardiovascular disease in adulthood[2]. Furthermore, stunting can result in diminished cognitive capacity and academic performance and decreased economic output in adulthood[2].

Stunting is not an abrupt occurrence; however, rather a gradual manifestation of malnutrition that develops over an extended period (chronic)[3]. Stunting is a result of growth and development issues that children face owing to malnutrition, frequent illnesses, and insufficient psychosocial stimulation[4]. Children are classified as stunted if their height-for-age falls more than two standard deviations below the World Health Organization (WHO) Child Growth Standards.

As per the World Health Organization (WHO) report from 2023, the worldwide occurrence of stunting is projected to reach 22.3%[6] in 2022. While the drop has been gradual over the past five years, it has only been at a rate of 0.2% per year[6]. Over the same time frame, nations in the Oceania region, excluding Australia and New Zealand, have had a yearly rise in frequency of about 0.3%. In the year 2022, the value will be 44.0%[6]. The stunting prevalence in Papua New Guinea in 2018 was 46.5%[7].

As stated in the WHO conceptual framework, stunting is caused by proxy determinants and contextual determinants. Proxy determinants refer to immediate causes or factors at the individual and family level that

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affect children's first stages of hindered growth and development. Contextual factors refer to determinants from the community, society, or multi-sectoral institutions with policies addressing proxy causes[8]. The variables that contribute to stunting include many aspects of the family and home environment, and factors related to breastfeeding, complementary feeding, and the health state of toddlers[3].

Pham et al. (2021)[7] conducted a study in five provinces of Papua New Guinea to determine the prevalence of wasting and stunting. In addition, they analyzed various socio-economic and maternal demographic factors that contribute to the occurrence of wasting and stunting. The study utilized secondary data collected from the Comprehensive Health and Epidemiology Surveillance System (CHESS) of the Papua New Guinea Institute of Medical Research (IMR) during July-December 2018. The December 2018 report from the Comprehensive Health and Epidemiology Surveillance System (CHESS) of the Papua New Guinea Institute of Medical Research (IMR) revealed that no significant socio-economic and maternal demographic factors affect the incidence of stunting, except for the age of toddlers. Specifically, toddlers aged 36-47 months are 1.44 times more likely to experience stunting compared to toddlers aged 48-59 months in Papua New Guinea. Pham et al. (2021)[7] examined many factors influencing socio-economic and maternal demographics. These factors include rural/urban location, household welfare quintile, food insecurity, marital status of mothers under five, education level of mothers under five, age of mothers under five, and gender.

This study seeks to analyze the factors that contribute to the occurrence of stunting in Papua New Guinea. It will use various data sources from the same year to examine the influence of factors related to children (such as gender, age, and health insurance ownership) and household environmental factors (including the education level of mothers with children under five, the number of children under five in the household, and the quality of drinking water sources and latrines) on stunting incidence. The analysis will be based on the 2018 Demographic and Health Surveys (DHS) data. The selection of factors was examined by considering the theoretical correlation between variables and the comprehensiveness of the data provided by the DHS.

METHODS

This study employs a cross-sectional research methodology and does secondary data analysis using the data from the Demographic and Health Surveys Programme (DHS) conducted by the United States Agency for International Development (USAID) in Papua New Guinea in 2018.

The 2018 DHS programme yielded a total of 2,337 target data points. Extraction and cleaning were carried out during the data processing phase. The data to be analyzed must meet the inclusion requirements, which require the data to be complete and aligned with the studied variables. A total of 97 toddlers died, resulting in a lack of data. Out of the remaining 2,240 data points, only 931 had anthropometric measurements. The other data points were eliminated due to missing or inadequate information for the analyzed variables. A total of 744 toddler data were collected.

The study focused on the incidence of stunting as the dependent variable. Stunting was defined as having a height or length for age more than—two standard deviations below the WHO child growth criteria median. The variables examined were the gender and age of toddlers, their mother's education level, the number of toddlers in the family, whether they had health insurance, and the conditions of their drinking water sources and latrine sanitation.

The analysis employed univariable descriptive statistical analysis, explicitly calculating the frequency and percentage of each variable. Next, we proceeded with bivariable analysis, explicitly using cross-tabulation, and applied either the chi-square test or Fisher's Exact test to examine the relationship between each independent variable and the occurrence of stunting. We set a significance level of ($p<0.25$) to identify potential predictor factors. The candidate predictor variables will undergo multiple logistic regression tests using the backward Wald technique. Categorical covariates will be evaluated using the reference category first. The significance level will be set at ($p<0.05$ and CI=95%). The final predictors that significantly influence the incidence of stunting in Papua New Guinea in 2018 will be determined.

The category of protected water (improved) includes tap water, public taps, standpipes, tube wells, boreholes, protected dug wells, protected springs, rainwater, water delivered by tanker trucks or carts with small tanks, and bottled water. The improved sanitation category includes flush/pour toilets that flush water and waste to a sewer pipe through a piping system, septic tank, pit latrine, unknown destination, ventilated latrine, slab latrine, or composting latrine[10].

RESULTS AND DISCUSSIONS

Respondent Characteristics

Of the 744 participants, 44.4% exhibited stunting; on the other hand, 48.9% were male. Most participants (63.3%) were between the age range of 24 and 59 months, and an overwhelming majority (99.6%) possessed health insurance. The household environment associated with the toddler consisted of households with one toddler (30.9%), two toddlers (48.9%), and more than two toddlers (20.8%). Approximately 66.8% of households had moms of toddlers who have received an education. According to Table 1, just 31.2% of households had access to a reliable source of drinking water; on the other hand, only 14.8% had access to proper sanitary facilities.

Table 1. Univariate descriptive analysis of determinants with stunting incidence in Papua New Guinea in 2018

Characteristics	Number of children under five	%
Stunting status		
Not stunted	414	55.6

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Characteristics	Number of children under five	%
Stunting	330	44.4
Age under five		
0 - 23 months	273	36.7
24 – 59 months	471	63.3
Gender of children under five		
Male	364	48.9
Female	380	51.1
Health insurance ownership		
Available	3	0.4
Not available	741	99.6
Number of children under five in the household		
1 child under five	230	30.9
2 children under five	359	48.3
More than 2 children under five	155	20.8
Education of mother of children under five		
Ever been to school	497	66.8
Never been to school	247	33.2
Source of drinking water		
Protected water (improved)	232	31.2
Unimproved water (unimproved)	512	68.8
Sanitation latrine		
Improved sanitation (improved)	111	14.8
unimproved sanitation (unimproved)	633	85.1

Determinants of Stunting in Toddlers in Papua New Guinea

A bivariate descriptive statistical test was conducted on the incidence of stunting using either the chi-square test or Fisher's Exact test for each determinant variable, including age of toddlers, gender of toddlers, ownership of health insurance, number of toddlers in the household, education of mothers of toddlers, drinking water sources, and latrine sanitation. After conducting a bivariable descriptive analysis with a significance level of $p<0.25$, it has been determined that the variables of gender of toddlers, number of toddlers in the household, latrine sanitation (based on the chi-square test), and health insurance ownership (based on Fisher's Exact test) are not suitable predictor variables and should be excluded. The logistic regression analysis will consider the variables of age of children under five, education of mothers under five, and source of drinking water as potential predictor variables (table 2).

Table 2. Descriptive analysis of bivariate determinants with stunting incidence in Papua New Guinea in 2018

Characteristics	Stunting status		*p-value**
	Number of children not stunted (%)	Number of Stunted Children (%)	
Children under five years of age			
0 - 23 months	176 (23.7%)	97 (1.0%)	<0.001*
24 – 59 months	238 (32.0%)	233 (31.3%)	
Gender of children under five			
Male	209 (28.1%)	155 (20.8%)	0.376
Female	205 (27.6%)	175 (23.5%)	
Health insurance ownership			
Available	2 (0.3%)	1(0.1%)	1.000
Not available	412 (55.4%)	329 (44.2%)	
Number of children under five in the household			
1 children under five	130 (17.5%)	100 (13.4%)	0.907
2 children under five	200 (26.9%)	159 (21.4%)	
More than 2 children under five	84 (11.3%)	71 (9.5%)	
Education of mother of children under five			
Ever been to school	293 (39.4%)	204 (27.4%)	0.012*
Never been to school	121 (16.3%)	126 (16.9%)	
Source of drinking water			
Quality water (improved)	139 (18.7%)	93 (12.5%)	0.130
Unimproved water (unimproved)	275 (37.0%)	237 (31.9%)	
Sanitation latrine			0.756

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Characteristics	Stunting status		*p-value**
	Number of children not stunted (%)	Number of Stunted Children (%)	
Quality sanitation (improved)	60 (8.1%)	51 (6.9%)	
Sanitation with no quality (unimproved)	354 (47.6%)	279 (37.5%)	

The p-values were obtained from the Chi-Square test results, except a: The p-value is from the Fisher's Exact test results because two cells (50%) have an expected count of less than 5. The minimum expected count is 1.33.
*The p-value is significantly associated when p≤0.25

Each candidate predictor variable underwent multiple logistic regression statistical tests using the backward Wald method and categorical covariates-reference category first (p<0.05 and CI=95%) to identify predictors significantly affecting under-five stunting in Papua New Guinea in 2018. The initial phase involves analyzing the variables of age under five, education of mothers under five, and drinking water source. The variable of drinking water source is eliminated from further consideration due to its insignificance, as indicated by a p=0.187. Only the variables of age under five and mother's education under five are significant predictors of stunting incidence, as shown in Table 3.

Table 3. Logistic regression inferential analysis of the effect of drinking water source, maternal education, and age of children under five on the incidence of stunting among children under five in Papua New Guinea in 2018.

Variables	adjusted 95% CI	p-value
Education of mother under five		
Never went to school	1.488 (1.092-2.028)	0.012*
Ever been to school	Reff	
Age of children under five		
24 - 59 months	1.770 (1.301-2.408)	<0.001*
0 - 23 months	Reff	

Ref: Reference Category
*The p-value obtained from the multiple logistic regression test results is significant when p<0.05.

Papua New Guinea possesses distinctive attributes compared to other countries within the Australian region. The prevalence of stunted growth in children, frequently overlooked and accepted as expected, is pervasive and has significant negative consequences for Papua New Guinea[11]. Despite significant economic expansion, the prevalence rates of stunting tend to remain unchanged. The average Gross Domestic Product (GDP) growth rate was 6.85% from 2005 to 2010[11]. The Global Nutrition Report (2023) indicated that there has been no improvement in the frequency of stunting, and in fact, the stunting prevalence in Papua New Guinea has worsened from 43.9% in 2005 to 49.5% in 2010. There is currently insufficient data on the prevalence[12].

Pham et al. (2021) researched the prevalence of stunting in Papua New Guinea in 2018. However, it is essential to note that their study had limitations since it did not use a nationally representative sample and only focused on 5 out of 22 provinces. The research findings indicated that stunting prevalence in Papua New Guinea in 2018 was 46.5%[7]. Pham et al. (2021) found that apart from the age of children under five in Papua New Guinea[7], factors such as rural-urban socio-economic and maternal demographic determinants, household welfare quintile conditions, food insecurity, the married status of mothers of children under five, education of mothers of children under five, age of children under five, and gender does not affect the incidence of stunting. This study discovered no correlation between the factors influencing the gender of children under five, such as ownership of health insurance, number of children under five in the household, and latrine sanitation. Additionally, the study found no significant effect of drinking water sources on stunting, except for the age of children under five and the education level of mothers under five[7].

Other studies, such as the research conducted by Toma et al. (2023)[13] and Danso et al. (2023)[14], have found similar results, indicating that gender does not significantly affect the occurrence of stunting. The graph depicting the relationship between age, gender, and increase in length or height reveals several key findings. Firstly, in infants aged 0-5 months, boys exhibit more rapid growth in body length than girls. Secondly, between the ages of 6 and 11 months, both genders experience similar growth rates in body length. Lastly, girls demonstrate a faster body length growth rate from 12-23 months than boys. Therefore, gender is a significant factor to consider when evaluating growth charts[15]. The study conducted by Tafesse et al. (2021)[16] in Bensa, Southern Ethiopia, found that males are 2.37 times more likely to experience stunting than females (p-value=0.003). Similarly, the study by Odey-Obeng et al. (2021)[17] in Karamoja, Uganda, revealed that males are at a higher risk (p-value≤0.001; adjusted odds ratio = 1.79; 95% confidence interval [1.6; 2.00]).

This study's findings indicated no correlation between the number of children under five living in a family and the occurrence of stunting. According to Fauziyah et al., more children under five can affect how food is distributed among families with limited money[18]. As a result, there is an increased risk of inadequate nutritional intake. Furthermore, the presence of young children in the household can affect parenting practices that may not be ideal[18]. The findings of this study contradict the findings of Tafesse et al. (2021)[16] and

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Danso et al. (2023)[14], who found that the number of toddlers aged 2-3 (Tafesse) and the number of toddlers aged 2 (Danso) in a household affect the occurrence of stunting. Tafesse's study reported a p-value of 0.032, an adjusted odds ratio (aOR) of 2.18, and a 95% confidence interval (CI) of [1.03; 4.64]. Danso's study reported a p-value of 0.011, an aOR of 3.368, and a 95% CI of [1.315; 8.626]. These results were compared to households with only one toddler.

Poorly constructed latrines can spread infectious diseases[19], making environmental sanitation and hygiene practices crucial for determining stunted growth[20]. A study conducted by Cameron et al. (2021) using data from over 6,000 children in the Indonesia Family Life Survey (IFLS) found that the implementation of WASH (Water, Sanitation, and Hygiene) practices, notably improved sanitation can significantly decrease the likelihood of stunting in children and enhance their cognitive development. Effective sanitation practices help safeguard the body against illness or infection[21]. The findings of this study indicate that there is no correlation between latrine sanitation and the occurrence of stunting[22]. This conclusion is further supported by the data, which shows that 47.6% of respondents who use improper latrine sanitation do not experience stunting, compared to 37.5% who do experience stunting (as shown in Table 2). The findings of this study align with the research carried out by Danso et al. (2023)[14], today-obeng research (2021)[17], Kombih research (2023)[23], and Sahiledengle research (2023)[24].

Inadequate nutrient absorption, which various conditions can cause, is one of the potential factors leading to growth retardation or malnutrition[3]. The association between disease and malnutrition is both reciprocal and causal. Disease can exacerbate malnutrition; on the other hand, starvation can increase susceptibility to illness. Having health insurance reduces the likelihood of development retardation by providing necessary healthcare and interventions for disease[26,27]. This study's health insurance ownership data falls within the extreme category because only 0.4% of the respondents had health insurance. As a result; on the other hand, conducting the cross-tabulation test, 50% of the cells have an expected count of less than 5. Thus, the chi-square test value does not reveal significance; however, the findings of Fisher's exact test do. According to the Fisher's Exact test findings, the p-value is > 0.25, indicating no statistically significant link between health insurance ownership and the frequency of stunting among children under five in Papua New Guinea in 2018. The findings of this study are consistent with the research conducted by Yuliawati (2019)[28], which indicates no correlation between health insurance and stunting in the Mentawai Islands of Indonesia.

Water serves as an appropriate environment for the proliferation of bacteria. When hygiene and sanitation are neglected, contamination can rapidly arise[29]. Consequently, unsanitary water sources can heighten the likelihood of contracting diarrhoea and other water and soil-borne infectious diseases, such as helminthiasis. Infectious illnesses can affect nutritional status by hastening the occurrence of malnutrition[21]. Illness can lead to a decrease in appetite, hinder the absorption of nutrients in the digestive tract, or increase the body's need for nutrients due to the disease[30], resulting in inadequate nutritional intake[21]. Tafesse et al. (2021)[16] conducted research that found a significant association between the source of drinking water and the occurrence of stunting. The study reported a p-value of 0.038, an adjusted odds ratio (aOR) of 1.446, and a 95% confidence interval (CI) of [0.738; 2.833]. The chi-square test in this study revealed a p-value of < 0.25, indicating a statistically significant link between drinking water sources and the occurrence of stunting among children under the age of five in Papua New Guinea in 2018. Nevertheless, the logistic regression analysis yielded data indicating that under-five stunting in Papua New Guinea did not affect significantly different drinking water sources in 2018. The findings of this study align with the findings of previous research conducted by Toma et al. (2023)[13], Danso et al. (2023)[14], only-obeng research (2021)[17], Kombih research (2023)[23], and Sahiledengle research (2023)[24].

The education level of mothers with children under five is linked to their willingness to adopt health education knowledge, maintain clean and healthy behaviours, and ensure a nutritious diet[31]. Additionally, their educational background influences their attitudes and daily ability to apply this knowledge[32]. Children who are under the supervision of mothers with a lack of education are at a higher risk of experiencing growth disorders[32]. This study discovered a strong correlation between a mother's lack of formal education and the occurrence of stunting in children under the age of five. The statistical analysis using the chi-square and logistic regression tests yielded a p-value of 0.000, indicating a significant association and influence between mothers' education level and stunting among children under five in Papua New Guinea in 2018. Specifically, the p-value was found to be 0.012, with an adjusted odds ratio (aOR) of 1.488 and a 95% confidence interval (CI) of [1.092; 2.028]. This means that mothers of children under five who have never received any formal education are 1.488 times more likely to have stunted children compared to mothers of children under five who have attended school in Papua New Guinea.

The Global Nutrition Report reports insufficient data to assess child health programmes in Papua New Guinea[12]. Stunting prevalence data is only available for 2005 at 43.9% and increased in 2010 to 49.5%; there is no low-birth-weight data and no recent exclusive breastfeeding coverage data, except for anemia coverage, which also stagnated at 34% from 2000 to 202012. The Hou Report (2015) for the World Bank informs us that infants are introduced to solid foods much earlier in Papua New Guinea, and exclusive breastfeeding rates are low. About 80% at one month, 36% at 4-5 months, 20.1% at 6-7 months and 11.5% at 8-9 months, and nearly 10% of neonates and 27% of infants were given semi-solid or solid foods before four months. Suboptimal infant and young child feeding practices also risk the incidence of child morbidity and mortality[11]. There are many reasons for suboptimal feeding in Papua New Guinea, some due to lack of quality supplementary foods, some cultural, some due to lack of understanding of the consequences of suboptimal feeding, especially in

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remote rural communities with high illiteracy rates resulting in lack of access to information and education on proper nutrition so it is recommended that increased maternal education can significantly reduce child undernutrition in Papua New Guinea[11]. It was also reported that there is a gap in the analysis of nutritionist numbers and capacity at all Papua New Guinea health system levels. Health workers are unaware of the latest information related to proper infant-child feeding[11]. Therefore, leadership commitment is recommended to build human resource capacity in the country to combat malnutrition in Papua New Guinea[11].

Similar research results that the education of mothers of toddlers has an influence on the incidence of stunting of toddlers are the results of research by Brou et al (2023)[32] in urban areas in Côte d'Ivoire West Africa with a significance of <0.001 stating that there is an association between the education of mothers of toddlers who are not formal with the incidence of stunting of toddlers, the results of research by Tafesse et al (2021)[16] state that the educational status of mothers of toddlers who do not have formal education is at risk of having stunted toddlers 3.28 times more than the educational status of mothers of toddlers who have formal education (p-value=0.001); aOR=3.28; 95% CI [1.56; 6.924], the results of research by Odey-obeng et all (2021)[17] reported that the educational status of mothers of toddlers with no formal education is 2.08 times more at risk of having stunted toddlers compared to the educational status of mothers of toddlers who have formal education ≥ 8 years (p-value=0.003; aOR=2.08; 95% CI [1.28; 3.38]; on the other hand, the results of studies stating that the education of mothers of toddlers does not significantly affect the incidence of stunting of toddlers are Madinar's research (2021)[33] in Central Jakarta Indonesia and research by Danso, et al (2023)[14].

The study revealed a significant association between the age of toddlers (24-59 months) and the occurrence of stunting among toddlers in Papua New Guinea in 2018. The statistical analysis showed a p-value of 0.000, an adjusted odds ratio (aOR) of 1.770, and a 95% confidence interval (CI) of [1.301; 2.408]. This indicates that toddlers aged 24-59 months are 1.770 times more likely to experience stunting than toddlers aged 0-23 months in Papua New Guinea. Pham's (2021) research in Papua New Guinea found that toddlers aged 36-47 months have a 1.44 times higher risk of stunting than toddlers aged 48-59 months in the same country. This association was not observed in other age groups of toddlers[7].

Stunting does not manifest abruptly. However, toddlers between the ages of 24 and 59 months are at a greater risk of stunting than those < 24 months[25]. This can be attributed to insufficient nutritional intake during <24 months[3] and the lack of proper recovery from growth and developmental disorders. The period from conception to 23 months of age, known as the first 1000 days of human life, is a crucial stage of significant growth and development[34]. The rapid growth during infancy encompasses brain growth, tissue and organ maturation, and brain development, which reaches 80% of its adult size[35]. During the first three months of life, infants utilize 35% of their energy needs for growth, decreasing to 3% by 12 months. Inadequate intake during this crucial period can negatively affect the manifestation of slow growth. The nutrient intake requirements of children aged 24-59 months increase in proportion to their body size, age, and development[35,36]. During this period, children experience an acceleration in their development and excretory function, yet their growth rate starts to decelerate[37]. The growth rate during the first three months of age is 3.5 cm per month. This rate reduces to 2.0 cm per month between 3 and 6 months, 1.5 cm per month between 6 and 9 months, 1.2 cm per month between 10 and 12 months, 1 cm per month between 1 and 3 years, and 3 cm per year between 4 and 6 years[37].

The findings of this study align with the results of previous research conducted by Toma et al. (2023)13 in the Ari District of Southern Ethiopia. Their research indicates that the age of toddlers between 24 and 59 months significantly affects the occurrence of stunting, with a p-value of ≤ 0.001, an adjusted odds ratio (aOR) of 2.24, and a 95% confidence interval (CI) of [1.58; 3.16]. Similarly, Danso et al. (2023)[14] conducted a study in the Nkwanta area of Ghana, which found that the age of toddlers also influences the incidence of stunting, with a p-value of 0.039, an aOR of 2.358, and a 95% CI of [1.046; 5.314]. On the other hand, Fufa (2022)[38] conducted research in Dhibate, Ethiopia, and concluded that age does not significantly affect stunting. This study is limited in scope as it focuses on just a few variables, specifically those related to children and the household environment. To facilitate additional study, expanding the range of variables examined is necessary to gather data on more intricate factors.

CONCLUSIONS

The factors contributing to stunting might differ across different locations and can alter with time, place, and season, depending on the specific determinants in each region's development. This study gathered empirical data demonstrating the factors influencing stunting in toddlers aged 24-59 months, namely the age group of the toddlers themselves and their mother's education level.

Our recommendations involve addressing stunting in children aged 24-59 months and prioritizing targeted and responsive interventions, particularly by investing in the education of mothers with children under five in Papua New Guinea. However, in terms of prevention, the intervention must be administered before the toddler reaches 24-59 months of age, as stunting is a visible result of long-term malnutrition.

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CONFLICT OF INTEREST AND FUNDING DISCLOSURE

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AUTHOR CONTRIBUTIONS

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