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CORRELATION ANALYSIS OF VARIABLES THAT AFFECT STUNTING IN EAST JAVA

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ABSTRACT

Stunting has become a widely discussed issue recently. Even the current government is actively involved in reducing the prevalence of stunting in Indonesia through various means, one of which is the recent 'free lunch and milk' program. This study aims to investigate the relationships between variables influencing stunting using Pearson, Spearman, and Kendall correlations, in order to identify necessary actions to reduce the risk of stunting. The research findings indicate a negative correlation between breastfeeding, early immunization initiation, child growth monitoring, vitamin A supplementation, maternal nutrition, early marriage prevention (before 17 years old), food expenditure, and adequate sanitation facilities with stunting prevalence. This means that increasing the number of infants receiving adequate breastfeeding, early initiation of breastfeeding, frequent child growth monitoring, more vitamin A supplementation, fewer malnourished mothers, fewer early marriages, higher food expenditures, and better sanitation facilities will decrease stunting prevalence. Through these analytical results, it is hoped that all involved parties, especially mothers, will pay attention to necessary actions to prevent stunting in children, such as exclusive breastfeeding, early immunization initiation, regular health facility visits for growth monitoring, vitamin A supplementation, improving maternal nutrition, delaying marriage until after 17 years old, increasing food expenditures, and maintaining proper sanitation conditions.

Keywords: Stunting Prevalence, Stunting Prevention, Toddlers, Nutrition, Correlation Analysis.

INTRODUCTION

Indonesia is currently facing a serious nutritional issue that could significantly impact the quality of its human resources in the future. One of the major nutritional concerns in Indonesia today is the high prevalence of stunting among toddlers (Bima, 2019). Abdila et al. (2023) state that stunting (low height-for-age) is a consequence of chronic malnutrition in children under five years old, particularly during the first 1000 days of life. Poor nutrition during this critical period can lead to impaired growth and development in children. Stunted toddlers are typically identified by unusually short stature compared to their peers of the same age. Early childhood stunting serves as an indicator of child well-being and reflects social disparities accurately.

The World Health Organization (2015) defines stunting as impaired growth and development resulting from chronic malnutrition, recurrent infections, and inadequate psychosocial stimulation. Its consequences include reduced cognitive ability and educational attainment, diminished productivity, increased risk of nutrition-related chronic diseases in adulthood, morbidity and mortality risks, non-communicable diseases, as well as compromised learning capacity and productivity. It is closely linked to child development across various domains including cognitive ability, language, and sensorimotor skills.

The prevalence of stunting in Indonesia presents a significant challenge, necessitating serious intervention from various stakeholders, especially the government and parents. Consequently, the Indonesian government has prioritized tackling stunting risks through integrated programs aimed at reducing stunting prevalence nationwide. According to the Indonesia Nutrition Status Survey (SSGI) conducted by the Ministry of Health, the prevalence of stunting in Indonesia stands at 21.6% (Ministry Secretariat of Indonesia Republic, 2023). According to the World Health Organization (WHO), a region is considered to have a low stunting prevalence if it is below 20%. This poses a considerable challenge for the government to reduce stunting prevalence rates.

High rates of stunting are generally caused by two factors: direct factors such as food and health status, and indirect factors such as toddler care practices, healthcare services, maternal factors, and living conditions (Permana and Wijaya, 2020). Stunting is also influenced by maternal nutrition during pregnancy and nutrition intake during the child's first 1000 days of life. Additionally, factors contributing to stunting include inadequate maternal knowledge regarding health and nutrition during pre-pregnancy, pregnancy, and postpartum periods, limited healthcare access, insufficient access to nutritious food, poor sanitation, and limited availability of clean water (National Population and Family Planning Board, 2023).

This study aims to explore the relationships between factors influencing stunting using Pearson, Spearman, and Kendall correlation analyses. The study categorizes these factors into three main groups: health factors, socio-economic factors, and environmental factors. Health factors include exclusive breastfeeding, early breastfeeding initiation (EBI), monitoring of child growth and development, vitamin A supplementation for toddlers, and maternal nutrition intake. Socio-economic factors comprise early marriage of mothers before the age of 17 and household expenditures on food. Meanwhile, environmental factors encompass access to adequate and safe sanitation.

RESEARCH METHOD

This research utilized data sourced from the book "Jawa Timur dalam Angka 2023" published by the Central Statistics Agency in 2023, which contains data on the health, economic, and environmental sectors across 38 regencies/cities in East Java in 2022. Additionally, the research also employed data from the book "Profil Kesehatan Provinsi Jawa Timur Tahun 2022" published by the East Java Health Office in 2022, which includes data on stunting and other health indicators. The study employed a saturation sampling technique where all members of the population were used as samples (38 regencies/cities in East Java). The variables used are presented in Table 1.

Table 1. The Relationship between Health Factors and the Prevalence of Stunting

Variable	Definition	Unit	Data Source
STUN	Prevalence of stunting (stunted toddlers)	%	Profil Kesehatan Jatim
EXB	Toddlers who receive exclusive breast milk	%	Profil Kesehatan Jatim
EBI	Toddlers who receive breast milk as soon as possible after birth	%	Profil Kesehatan Jatim
TGD	Toddlers are monitored for growth and development	%	Profil Kesehatan Jatim
VITA	Toddlers given vitamin A	%	Profil Kesehatan Jatim
MMN	Mother is malnourished	%	Profil Kesehatan Jatim
MAR	Married mothers under 17 years of age	%	Jawa Timur dalam angka
EXP	Household expenses for foodstuffs such as rice and side dishes	Thousand Rupiah	Jawa Timur dalam angka
SAN	Access to adequate and safe sanitation facilities	%	Profil Kesehatan Jatim

RESEARCH RESULT

Stunting Prevalence in East Java

The distribution of stunting in East Java in 2022 is presented in Figure 1.

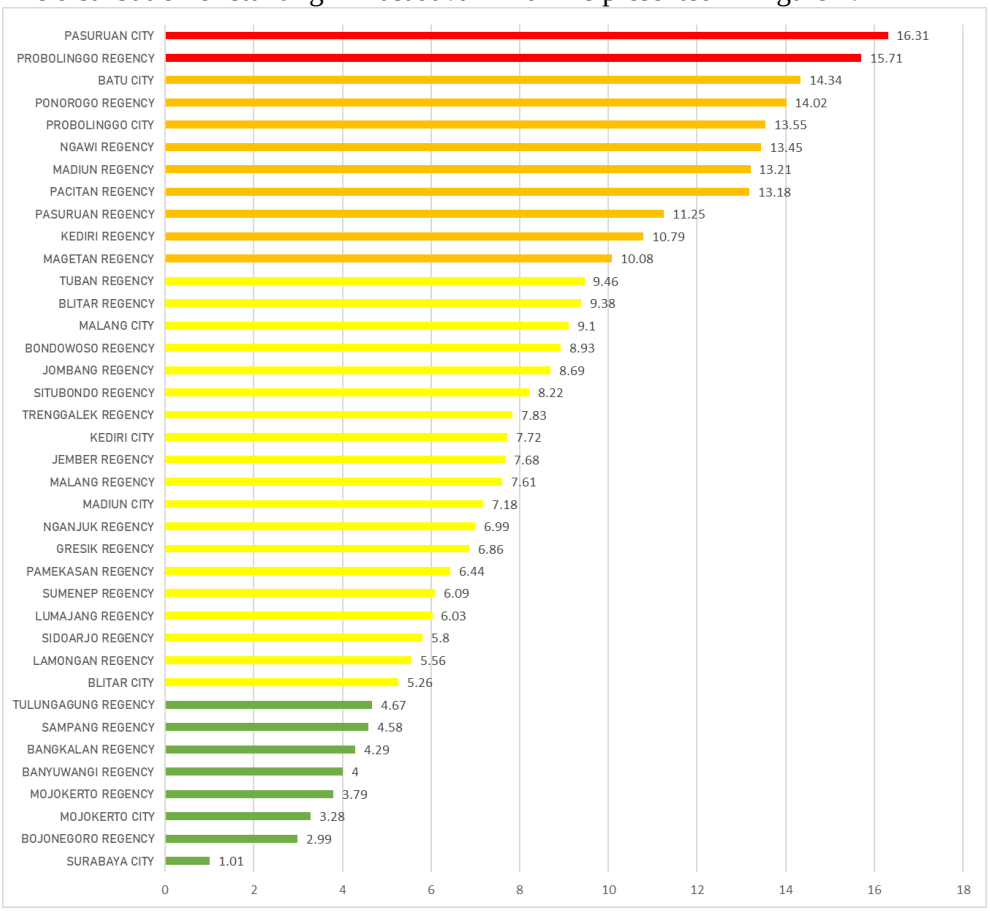

Figure 1. The distribution of stunting prevalence in 38 regencies/cities in East Java in 2022 (in percentage).

Through Figure 1, it can be observed that Pasuruan city has the highest prevalence of stunting in East Java, while Surabaya city has the lowest prevalence. However, each area among the 38 regencies/cities in East Java has a stunting prevalence rate below the World Health Organization's (WHO) threshold of 20%. Nevertheless, Pasuruan city (16.31%) and Probolinggo regency (15.71%) are approaching this limit.

Relationship of Factors Influencing Stunting Prevalence

There are several factors influencing the rate of stunting, categorized into three main causes: health factors (exclusive breastfeeding, early breastfeeding initiation, monitoring of growth and development of toddlers, vitamin A supplementation for toddlers, and maternal nutrition status), socio-economic factors (early marriage of mothers and household expenditure on food items), and environmental factors (access to adequate sanitation). The relationships between these 8 variables and stunting prevalence are presented in Tables 2 to 4.

Table 2. The Relationship Between Health Factors to Prevalence of Stunting

Methods	Health Factors				
	EXB	**EBI**	**TGD**	**VITA**	**MMN**
Pearson	-0.173	-0.408	-0.11	-0.117	0.221
Spearman	-0.208	-0.346	-0.111	-0.182	0.225
Kendall	-0.14	-0.24	-0.081	-0.118	0.128

Based on Table 2, it can be observed that there is a negative correlation between exclusive breastfeeding and the prevalence of stunting, indicating that providing exclusive breastfeeding to infants will decrease the prevalence of stunting. There is a negative correlation between early breastfeeding initiation (EBI) and the prevalence of stunting, suggesting that initiating breastfeeding early for infants will reduce the prevalence of stunting. There is a negative correlation between monitoring the growth and development of toddlers and the prevalence of stunting, indicating that monitoring the growth and development of toddlers will decrease the prevalence of stunting. There is a negative correlation between vitamin A supplementation for toddlers and the prevalence of stunting, suggesting that providing vitamin A to toddlers will decrease the prevalence of stunting. There is a positive correlation between maternal malnutrition and the prevalence of stunting, indicating that mothers with malnutrition will increase the risk of stunting.

Table 3. The Relationship Between Socioeconomic Factors to the Prevalence of Stunting

Methods	Socioeconomic Factors	
	MAR	**EXP**
Pearson	0.174	-0.4
Spearman	0.137	-0.393
Kendall	0.104	-0.246

Based on Table 3, it can be observed that there is a positive correlation between early marriage (below 17 years old) and the prevalence of stunting, indicating that early marriage before the age of 17 increases the prevalence of stunting. There is a negative correlation between household expenditure on food items (rice and side dishes) and the prevalence of stunting, suggesting that higher expenditure on food items reduces the prevalence of stunting.

Table 4. The Relationship Between Environmental Factor to the Prevalence of Stunting

Methods	SAN
Pearson	-0.247
Spearman	-0.302
Kendall	-0.176

Based on Table 4, it can be noted that there is a negative correlation between access to adequate sanitation facilities and the prevalence of stunting, indicating that ensuring proper and safe sanitation facilities increases the prevalence of stunting.

DISCUSSION

Distribution of Stunting in 38 Regencies/Cities in East Java

As depicted in Figure 1, the highest prevalence of stunting (highlighted in red) in East Java is found in Pasuruan city (16.31%) and Probolinggo regency (15.71%). While both areas have stunting prevalences below the WHO threshold (< 20%), there is a possibility that in the coming years, the stunting rates in Pasuruan city and Probolinggo regency may increase and no longer fall within the category of low stunting prevalence. Therefore, it is imperative for the East Java Provincial Government to focus on reducing stunting prevalence in these two areas.

The very low prevalence of stunting in East Java is observed in Surabaya city (1.01%), Bojonegoro regency (2.99%), Mojokerto city (3.28%), Mojokerto regency (3.79%), Banyuwangi regency (4%), Bangkalan regency (4.29%), Sampang regency (4.58%), and Tulungagung regency (4.67%). It is hoped that these 8 regencies/cities will serve as examples for the other 30 regencies/cities in reducing the risk of stunting, particularly Surabaya city.

Relationship Between Exclusive Breastfeeding and Stunting Prevalence

Table 2 explains that there is a negative correlation between exclusive breastfeeding and stunting prevalence, meaning that the more infants receive exclusive breastfeeding, the lower the stunting rate. This finding is consistent with research by Pratama and Irwandi (2021), which states that there is a negative correlation between exclusive breastfeeding and the occurrence of stunting. Most stunted children stop breastfeeding after 2-3 months.

Exclusive breastfeeding will certainly improve the nutrition of infants because breast milk is the primary source of energy and nutrition for infants. Therefore, as a mother, it is crucial to provide exclusive breastfeeding to infants and not consider breast milk solely for babies under 3 months. Most mothers now underestimate breast milk and replace breast milk with cow's milk or soy milk like commercial dairy products sold in the market. However, the quality of the breast milk produced is far better than the powder milk usually used by most mothers.

Relationship Between Early Breastfeeding Initiation (EBI) and Stunting Prevalence

Table 2 shows that there is a negative correlation between early breastfeeding initiation (EBI) and stunting prevalence, meaning that the more infants receive early breastfeeding initiation (EBI), the lower the stunting rate. This result is consistent with research conducted by Lintang and Azkiya (2022), which shows a relationship between early breastfeeding initiation (EBI) and the incidence of stunting in infants aged 0-24 months. Mothers who do not breastfeed their babies as soon as possible have an 11-fold greater chance of causing the baby to suffer from stunting.

Early breastfeeding initiation (EBI) is something that is important to do because during childbirth, the baby tends to seek his mother and ask for breast milk from his mother. However, most mothers overlook this where many mothers do not breastfeed their babies as soon as possible. It should be noted, only 70 percent of mothers who provide breast milk as soon as possible after childbirth.

Relationship Between Monitored Toddlers' Growth-Development and Stunting Prevalence

Through Table 2, it can be observed that there is a negative correlation between monitoring toddlers' growth-development and the prevalence of stunting, meaning that the more toddlers are monitored for their growth and development, the lower the prevalence of stunting. Mothers who regularly take their children for health facility check-ups related to growth and development will be easily monitored by health professionals in terms of nutrition, health, and other aspects. This will certainly reduce the risk of children suffering from stunting. So, it is advisable for mothers to frequently bring their children to health facilities for monitoring their growth and development.

Relationship Between Vitamin A Supplementation in Toddlers and Stunting Prevalence

Table 2 explains that there is a negative correlation between vitamin A supplementation in toddlers and stunting prevalence, meaning that providing vitamin A to toddlers reduces the risk of stunting. This finding is consistent with the research by Bujawati et al. (2023), which states that there is a negative correlation between vitamin A supplementation in toddlers and the occurrence of stunting, where toddlers who do not receive vitamin A are at higher risk of stunting.

Since the body cannot produce vitamin A, supplementation is necessary to meet the body's requirement for vitamin A. Vitamin A is abundant in plant products such as beta-carotene and animal products such as eggs, milk, meat, and liver. Vitamin A is highly beneficial for children, especially in enhancing immune function and preventing epithelial cell abnormalities, among other benefits (Health Office of Badung Regency, 2022).

Relationship Between Maternal Malnutrition and Stunting Prevalence

Through Table 2, it is evident that there is a positive correlation between maternal malnutrition and stunting prevalence, meaning that more malnutrition during pre-pregnancy and pregnancy increases the risk of stunting. This finding is consistent with the research by Mirza et al. (2023), which indicates that maternal nutrition during pregnancy influences the occurrence of stunting.

Maternal nutrition intake during pre-pregnancy and pregnancy plays a crucial role in the initial phase of fetal development and neonatal growth (Rikayoni and Rahmi, 2023). Maternal nutrition before and during pregnancy is crucial for the fetus because the fetus is directly connected through the umbilical cord, where everything the mother consumes reaches the fetus through the umbilical cord. Therefore, it is essential for mothers to pay attention to their nutritional intake as it will affect the health of the fetus.

Relationship Between Early Marriage of Mothers and Stunting Prevalence

Through Table 3, it can be noted that there is a positive correlation between early marriage of mothers (before 17 years old) and stunting prevalence, meaning that more women marrying early before the age of 17 are likely to have children at risk of stunting. This result is supported by the study by Ayudha et al. (2024), which states that higher prevalence of early marriage of mothers leads to higher prevalence of stunting. Young mothers are likely to have children at a younger age, have more children throughout their lives, and have pregnancies too frequently. Therefore, by marrying early, the family is likely to fall into the category of families giving birth to stunted children.

When mothers marry early, there are many unprepared aspects such as the readiness of the couple regarding adequate nutrition during pregnancy, immature psychological and reproductive aspects, and lack of knowledge regarding proper

childcare. Additionally, couples who marry early tend to have poorer economic conditions, resulting in inadequate nutritional needs for the mother and child in the future. Therefore, there is a need for socialization and prevention of marriage for couples who are not old enough to avoid the risk of stunting.

When a mother marries early, there are many unprepared aspects such as the readiness of the couple, who married early, regarding sufficient nutrition intake during pregnancy, immature psychological and reproductive aspects, and lack of knowledge regarding proper childcare practices. Additionally, couples who marry early tend to have poorer economic conditions, resulting in inadequate nutritional needs for the mother and child in the future. Therefore, there is a need for socialization and prevention of marriage for couples who are not old enough to avoid the risk of stunting.

Relationship Between Household Expenditure on Food Items and Stunting Prevalence

Through Table 3, it can be observed that there is a negative correlation between household expenditure on food items and stunting prevalence, meaning that the larger the household expenditure on food items such as rice and side dishes, the lower the risk of stunting. This aligns with the research by Islamiah (2022), which indicates that household food expenditure has an influence on stunting prevalence.

Expenditure on food items is a critical aspect in reducing stunting. Adequate nutrition for children through proper food items with diverse nutritional coverage will reduce the risk of stunting in children. It is important to note that the necessary food expenditure should focus on nutritious and suitable food items, not on inadequate and less nutritious ones. Recently, the government's program of free meals and milk for pregnant women is one of the government's aids in reducing the risk of stunting in children, alongside many other initiatives such as counseling for pregnant women and others.

Relationship Between Adequate Sanitation Facilities and Stunting Prevalence

Through Table 3, it can be observed that there is a negative correlation between adequate sanitation facilities and stunting prevalence, meaning that better access to adequate sanitation facilities reduces the risk of stunting. This result is supported by Astuti (2022), which states that households with access to adequate sanitation facilities have a significant negative relationship with stunting prevalence. For every 1% decrease in households with access to adequate sanitation, the risk of stunting increases by 1.56%, assuming other variables remain constant.

Houses without adequate and safe sanitation indirectly increase the risk of stunting because poor sanitation can lead to infectious diseases, diarrhea, and worm infections in children, which can disrupt the digestive process and nutrient absorption, thereby causing stunting.

CONCLUSION

Through the analysis results, it is concluded that there is a relationship between health, socio-economic, and environmental factors with the prevalence of stunting. In terms of health factors, exclusive breastfeeding reduces the risk of stunting, early initiation of breastfeeding (EBI) reduces the risk of stunting, monitoring child growth and development lowers the risk of stunting, giving vitamin A to children reduces the risk of stunting, while maternal malnutrition increases the risk of stunting in children. In terms of socio-economic factors, underage marriage increases the risk of stunting, while greater household expenditure on healthy and nutritious food reduces the prevalence of stunting. Regarding environmental factors, access to adequate and safe sanitation reduces the prevalence of stunting in children.

RECOMMENDATIONS

It is hoped that the government will continue to reduce the prevalence of stunting through various preventive measures as has been done so far. Furthermore, it is recommended for the government to provide counseling to prospective couples about the dangers of early marriage, the importance of maternal health and nutrition, and knowledge related to child health. This is necessary to reduce the risk of stunting, which remains a problem in Indonesia. The government, through healthcare professionals, is expected to provide frequent healthcare services to pregnant women and children, such as monitoring child growth and development, ensuring exclusive breastfeeding, early initiation of breastfeeding, and vitamin A supplementation. It is also hoped that parents, especially mothers, will pay attention to their own health as well as the needs of their children, such as breastfeeding, vitamin supplementation, and monitoring child growth and development. Additionally, it is recommended to ensure that household expenditure on food items is adequate and to pay attention to adequate and safe sanitation for the family.

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