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The Role of Maternal Clean and healthy living behavior in Preventing Stunting Among Toddlers

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ABSTRACT
The causes of growth retardation are multifactorial and include family factors, maternal health, and nutritional status. Maternal knowledge of nutrition, childcare practices, and educational level are key determinants of child development. Poor maternal health and nutritional status increase the risk of developmental delays in children. Chronic malnutrition may lead to stunting, which can negatively affect long-term child development. This study aimed to determine the relationship between maternal clean and healthy living behavior and the incidence of stunting among toddlers in Banyuanyar Village. This study employed a quantitative analytical design with a cross-sectional approach. The population consisted of 56 mothers with toddlers, and total sampling was applied. Maternal clean and healthy living behavior was assessed using a questionnaire developed by the Indonesian Ministry of Health. Stunting was measured using anthropometric observations based on height-for-age (H/A) indicators. Data were analyzed using the Chi-square test. The Chi-square analysis yielded a p-value of 0.000, indicating a statistically significant relationship between maternal clean and healthy living behavior and stunting among toddlers in Banyuanyar Village. In conclusion, maternal clean and healthy living behavior is an important factor in supporting toddler health and preventing stunting. Consistent implementation of hygiene, sanitation, and proper childcare practices can help reduce the risk of growth disorders. Strengthening clean and healthy living behavior through continuous education and community-based interventions is essential to promote optimal child growth and development.
Keywords: maternal; clean and healthy living behavior; stunting; toddler

INTRODUCTION
Child growth and development are essential indicators of the health status and quality of future human resources. Growth refers to quantitative changes in body size, while development encompasses cognitive, motor, language, and socio-emotional domains [1]. Optimal child growth and development are influenced by multiple factors, including nutritional intake, health status, parenting practices, and the family environment [2].

During early childhood, various growth and developmental disorders are commonly observed, including physical growth abnormalities and developmental delays. Physical growth disorders may manifest as wasting, stunting, or overweight, whereas developmental disorders may include behavioral problems, delays in gross and fine motor skills, speech and language impairments, and difficulties in socialization and independence [3]. Approximately 5–25% of children worldwide experience developmental disorders, representing a significant public health concern [4].

One of the major problems affecting child growth and development is stunting. Stunting is a condition of impaired growth caused by chronic malnutrition, resulting in a child's height being below the standard for their age [5]. The consequences of stunting extend beyond physical growth impairment and include reduced cognitive ability, lower learning capacity, and decreased productivity in adulthood. Globally, malnutrition remains a serious public health issue, with an estimated 144 million children under five years of age affected by stunting, 47 million experiencing wasting, and 38.3 million being overweight or obese. Approximately 45% of deaths among children under five are associated with malnutrition [6].

In Indonesia, data from the Indonesian Nutritional Status Survey provide a comprehensive overview of the nutritional status of children under five and its determinants. The survey, which used a two-stage stratified cross-sectional sampling method involving 334,848 children across 486 districts/cities in 33 provinces, reported an increase in wasting from 7.1% to 7.7% and underweight from 17.0% to 17.1%, while the prevalence of stunting decreased from 24.4% to 21.6% [7]. In Central Java Province, Surakarta City ranks 31st with a stunting prevalence of 16.2%, while wasting and underweight rank 19th and 26th, respectively.

The causes of stunting are multifactorial, including inadequate nutritional intake, poor maternal health status, suboptimal parenting practices, and environmental sanitation conditions [4]. One important but often overlooked factor is maternal clean and healthy living behavior, which includes practices such as handwashing with soap, the use of safe water, maintaining environmental cleanliness, and hygienic food preparation [8]. Children whose mothers do not consistently practice clean and healthy living behaviors are at higher risk of recurrent infections, such as diarrhea, which can impair nutrient absorption and contribute to stunting [9].

Previous studies have demonstrated a significant association between maternal clean and healthy living behavior and stunting. Dhefiana et al. [10] found a significant relationship in rural areas, while Hidayah et al. [11] reported that toddlers with mothers who had poor health behaviors were more susceptible to stunting. Jayanti & Flora [12] further highlighted that inadequate sanitation contributes to recurrent diarrheal diseases, thereby increasing the risk of stunting. However, most existing studies focus on nutritional intake and dietary patterns, and limited research has examined the role of maternal clean and healthy living behavior in urban settings, particularly in Banyuanyar Village.

Preliminary observations conducted in Banyuanyar Village indicated that several toddlers were still classified as stunted, and many mothers were not consistent in implementing clean and healthy living practices, particularly in handwashing and food management. This finding suggests a gap between existing health programs and actual practices at the community level. Therefore, this study was conducted to examine the relationship between maternal clean and healthy living behavior and the incidence of stunting among toddlers in Banyuanyar Village. The findings are expected to provide a basis for strengthening family- and community-based interventions in stunting prevention efforts.

METHODS
This study was conducted at Posyandu RW XII, Banyuanyar Village, Surakarta, from January to June 2025. The study employed a quantitative analytical design with a cross-sectional approach, aiming to examine the relationship between maternal clean and healthy living behavior and the incidence of stunting among toddlers at a single point in time.

The study population consisted of all mothers with toddlers registered at Posyandu RW XII, totaling 56 respondents. A total sampling technique was applied, whereby all members of the population who met the inclusion criteria were included as research subjects. The inclusion criteria were mothers who had toddlers aged 0–60 months and were willing to participate in the study.

Maternal clean and healthy living behavior was measured using a structured and previously validated questionnaire based on household clean and healthy living behavior indicators established by the Indonesian Ministry of Health. The questionnaire covered several key behavioral domains, including handwashing with soap, use of clean water, availability and use of sanitary latrines, breastfeeding practices, routine monitoring of child growth, environmental hygiene, and other health-related household practices.

The dependent variable, stunting, was assessed using anthropometric measurements based on the height-for-age (H/A) index. Toddler height was measured using standardized procedures and compared with the World Health Organization child growth standards. Children with a height-for-age z-score below −2 standard deviations were classified as stunted.

Data collection was carried out during scheduled Posyandu activities. Respondents were first provided with an explanation of the study objectives and procedures, after which informed consent was obtained. Questionnaires were completed with researcher assistance when necessary, and anthropometric measurements were conducted by trained personnel using appropriate measuring tools.

Data were processed and analyzed using statistical software. Descriptive statistics were used to summarize respondent characteristics, clean and healthy living behavior distribution, and stunting incidence in the form of frequencies and percentages. Inferential analysis was performed using the Chi-square test to determine the relationship between maternal clean and healthy living behavior and stunting.

RESULTS

Table 1 shows that the majority of toddlers were aged 13–35 months (55.4%), followed by those aged 36–60 months (32.1%), while only a small proportion were aged ≤12 months (12.5%). In terms of gender distribution, male toddlers slightly outnumbered females, accounting for 53.6% and 46.4%, respectively. This indicates that most respondents were in the critical growth period of early childhood, where nutritional and environmental factors play a significant role in development.

Table 2 indicates that the majority of mothers (91.1%) demonstrated good clean and healthy living behavior, while only a small proportion (8.9%) were categorized as having poor behavior. This suggests that overall awareness and implementation of healthy practices among mothers in the study area are relatively high.

Table 3 shows that most toddlers (89.3%) had normal nutritional status, while 10.7% were classified as stunted. Although the proportion of stunting is relatively low compared to normal cases, it still represents a public health concern that requires attention.

Table 4 shows that all toddlers whose mothers had poor clean and healthy living behavior were classified as stunted (100%). In contrast, among mothers with good health behavior, the vast majority of toddlers had normal nutritional status (98%), with only a small proportion experiencing stunting (2%). These findings indicate a clear pattern in which better maternal health behavior is associated with more favorable child growth outcomes.

Table 1. Distribution based of age and gender of toddlers attending integrated health posts in the Banyuanyar Village

Demographic variable	Category	Frequency	Percentage
Age	≤ 12 months	7	12.5
	36–60 months	18	32.1
Gender	Male	30	53.6
	Female	26	46.4

Table 2. Distribution of maternal clean and healthy living behavior among mothers of toddlers in Banyuanyar Village

Clean and healthy living behavior	Frequency	Percentage
Poor	5	8.9
Good	51	91.1

Table 3. Distribution of stunting incidence among toddlers in Banyuanyar Village

Nutritional status (height-for-age)	Frequency	Percentage
Stunting	6	10.7
Normal	50	89.3

Table 4. The relationship between maternal clean and healthy living behavior and the incidence of stunting

Clean and healthy living behavior	Incidence of stunting		p-value
	Stunting: f (%)	Normal: f (%)	
Poor	5 (100)	0 (0)	0.000
Good	1 (2)	50 (98)	

DISCUSSION

Indicators of clean and healthy living behavior

Clean and healthy living behavior refers to a set of household-level behavioral indicators aimed at preventing disease, maintaining environmental hygiene, and supporting child growth and development [13]. The implementation of clean and healthy living behavior in Banyuanyar Village demonstrates generally favorable conditions, as reflected by the majority of respondents fulfilling most clean and healthy living behavior indicators. This finding indicates a relatively high level of community awareness and practice regarding hygiene, sanitation, and maternal–child health, which theoretically contributes to reducing the risk of stunting.

In this study, eight clean and healthy living behavior indicators were selected as key benchmarks for household health behavior due to their strong relevance to stunting prevention. These indicators include maternal health services (delivery assisted by skilled health personnel and antenatal care), child growth monitoring (routine weighing), hygiene practices (use of clean water and handwashing with soap), sanitation facilities (use of healthy latrines), environmental control (mosquito nest eradication), household exposure (non-smoking family members), and infant nutrition (exclusive breastfeeding). The selection of these indicators is based on national policy guidelines [13] and supported by international evidence indicating that the integration of health services, environmental hygiene, and nutritional practices significantly influences child nutritional status.

The first indicator, skilled birth attendance and antenatal care, is critical because maternal health during pregnancy directly affects neonatal outcomes. Routine antenatal care (ANC) ensures adequate nutritional monitoring, provision of iron supplementation, and early detection of pregnancy-related complications. Previous research has shown that adequate ANC is associated with a reduced risk of low birth weight, which is a major determinant of stunting [14].

Routine toddler weighing was included as it serves as an essential tool for early detection of growth faltering. Integrated health service posts (*Posyandu*) play a vital role in monitoring children's weight and height, allowing early intervention when abnormalities are identified. According to the World Health Organization, regular growth monitoring is a key strategy in preventing stunting during the first 1,000 days of life [15].

Water, Sanitation, and Hygiene (WASH) factors are widely recognized as major determinants of stunting. A systematic review found that access to clean water, adequate sanitation, and proper handwashing practices significantly influence stunting incidence among children under five in Indonesia [16]. In Banyuanyar Village, the availability of clean water, use of healthy latrines, and handwashing practices represent important assets for stunting prevention.

Handwashing behavior is associated with a reduced risk of gastrointestinal and respiratory infections, which indirectly lowers the risk of stunting. A study conducted in the Bambang Community Health Center area found that handwashing with soap was significantly associated with stunting, whereas the use of healthy latrines was not [10].

Although mosquito nest eradication is more commonly associated with vector-borne diseases such as dengue, its inclusion in clean and healthy living behavior reflects broader environmental health practices. Households that maintain mosquito-free environments tend to demonstrate better overall hygiene behavior. PSN is formally recognized as one of the clean and healthy living behavior household indicators [13].

The absence of smoking in the household and the practice of exclusive breastfeeding were also included due to their significant influence on child nutritional status. Exposure to cigarette smoke can lead to respiratory problems, decreased appetite, and impaired nutrient absorption. Conversely, exclusive breastfeeding plays a crucial role in protecting infants from infection and ensuring adequate nutritional intake during the first six months of life. Previous studies indicate that children exposed to household smoking have a higher risk of stunting, while exclusive breastfeeding is associated with reduced stunting prevalence [9].

Overall, the majority of respondents met these eight clean and healthy living behavior indicators, suggesting that clean and healthy living behavior implementation in Banyuanyar Village can be categorized as good. This condition is essential for maintaining child health and supporting sustainable stunting reduction efforts. However, continuous monitoring and health education remain necessary to maintain these achievements and address any remaining gaps.

Incidence of stunting

Stunting remains a significant public health issue in the study area. According to the Indonesian Nutritional Status Survey (SSGI), the national prevalence of stunting decreased from 21.5% in 2023 to 19.8% in 2024 [6]. This suggests that stunting prevalence in the study area requires continued attention and targeted interventions.

The occurrence of stunting is influenced by multiple factors. Recent studies identify low birth weight, parental height, feeding practices, and recurrent infections as major determinants of stunting [17]. In addition, indirect factors such as access to healthcare services, environmental sanitation, clean water availability, and socioeconomic status also play significant roles [18]. Therefore, the observed prevalence in this study may reflect the interaction of these various determinants within the local context.

Inadequate nutritional intake during early childhood can impair linear growth, resulting in stunting. Nutrition plays a fundamental role in supporting optimal child development, and deficiencies during critical growth periods can lead to long-term consequences. Impaired physical growth is also associated with delays in neurological development, including motor, cognitive, and social functions [19].

Given this situation, comprehensive prevention strategies are required. These include nutrition-specific interventions such as improving maternal nutrition, promoting exclusive breastfeeding, and ensuring appropriate complementary feeding, as well as nutrition-sensitive interventions such as improving sanitation, ensuring access to clean water, and strengthening health education. These multisectoral approaches are essential to achieve the national target of reducing stunting prevalence to below 14.2% by 2029.

The relationship between clean and healthy living behavior indicators and stunting incidence

Indicators related to skilled birth attendance and antenatal care were more prevalent among non-stunted children compared to stunted children. However, statistical analysis showed no significant association between these variables and stunting incidence. Similar findings have been reported in previous studies, which found no relationship between the frequency or quality of antenatal care and stunting [20-22]. This suggests that other factors, such as birth weight, food security, and maternal education, may play a more dominant role. Routine participation in *Posyandu* activities also showed no significant association with stunting ($p = 0.700$). Although *Posyandu* plays an important role in growth monitoring, its effectiveness depends on the quality of service utilization and maternal practices at home [23,24].

The use of clean water did not show a statistically significant relationship with stunting ($p = 0.300$). This finding indicates that the availability of clean water alone is insufficient without proper utilization, hygiene practices, and water management. Previous studies suggest that the impact of clean water on nutritional status becomes more significant when combined with adequate hygiene behavior [16]. Similarly, handwashing practices did not demonstrate a significant association with stunting in this study. Although theoretically important in preventing infections, the effectiveness of handwashing depends on consistency and integration with other hygiene practices [16]. The use of healthy latrines also showed no significant relationship with stunting. While sanitation plays a role in preventing infection, its effectiveness depends on proper use, maintenance, and environmental conditions [25-31].

Mosquito nest eradication did not show a significant association ($p = 0.151$). This may be due to the relatively uniform implementation of PSN across households, reducing variability in the data. Although mosquito nest eradication contributes to environmental health, its direct impact on stunting is limited [32,33]. Non-smoking behavior among family members also showed no statistically significant relationship with stunting ($p = 0.117$). Although exposure to cigarette smoke has been linked to increased stunting risk, the effect may depend on the duration and intensity of exposure [36,37]. Exclusive breastfeeding was not significantly associated with stunting ($p = 0.680$). This finding suggests that while exclusive breastfeeding is important, child nutritional status is also strongly influenced by complementary feeding practices and other environmental factors [38-41].

Overall, the findings indicate that while clean and healthy living behavior indicators are theoretically important, their relationship with stunting is complex and influenced by multiple interacting factors. Effective stunting prevention therefore requires a comprehensive and integrated approach.

Study Limitations

This study has several limitations. The cross-sectional design does not allow for causal inference, as it only captures relationships at a single point in time. The relatively small sample size may affect statistical power and limit the detection of significant associations. Data collection relied on self-reported measures, which may introduce recall bias and social desirability bias. Additionally, the study was conducted in a single geographic area, limiting the generalizability of the findings to broader populations.

CONCLUSION

In conclusion, maternal clean and healthy living behavior is an important factor in supporting toddler health and preventing stunting. Consistent implementation of hygiene, sanitation, and proper childcare practices can help reduce the risk of growth disorders. Strengthening clean and

healthy living behavior through continuous education and community-based interventions is essential to promote optimal child growth and development.

Ethical consideration, competing interest and source of funding

-Ethical considerations in this study included obtaining informed consent from all respondents, ensuring the confidentiality and anonymity of participant data, and providing equal treatment to all participants throughout the research process.
-There is no conflict of interest related to this publication.
-Source of funding is authors.

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