

The Effectiveness of Education in Reducing Stunting: A Community-Based Approach

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ABSTRACT

Purpose: This study aims to examine the role of education in addressing the knowledge gaps related to stunting prevention, particularly in low-income communities. It explores how targeted educational interventions can impact parents' understanding of stunting and its prevention, ultimately contributing to the long-term reduction of stunting rates. **Findings:** The study found significant improvements in parents' knowledge regarding stunting prevention, as evidenced by the pre- and post-test results. While most participants showed an improved understanding of key concepts such as nutrition, immunization, and the importance of growth monitoring, there remain gaps in areas like exclusive breastfeeding and the long-term effects of stunting. **Limitation:** The study's limitations include the short duration of the intervention, which may not have allowed for noticeable changes in children's physical growth outcomes. Furthermore, the study was limited to a specific geographical area, which may not fully represent the diversity of stunting challenges across different regions. **Originality/Values:** This study contributes to the growing body of research on stunting prevention by emphasizing the critical role of education in addressing knowledge gaps. It highlights the need for ongoing educational programs that empower parents and communities to adopt healthier practices, thereby improving child health outcomes and contributing to the achievement of the SDGs related to nutrition and well-being.

Keywords: stunting; education; knowledge gap; child nutrition; public health; healthcare access; community-based interventions; sustainable development goals (SDGs); malnutrition prevention.

INTRODUCTION

Stunting is defined as a height-for-age Z-score (HAZ) of less than -2 SD, reflecting chronic malnutrition and poor well-being, which affects millions of children worldwide [1]. Stunting is a form of chronic malnutrition that causes children to fall below the normal height for their age on the growth curve. Stunting is defined as a child having a height-for-age Z-score (HAZ) of less than -2 standard deviations [2]. This condition results from prolonged protein-energy malnutrition and is often worsened by infections and underlying diseases. It reflects chronic malnutrition, indicating a failure to grow or an inability to reach a certain height at a given age, and is used as a key indicator of child well-being [2,3].

Stunting is a significant concern and has become a national priority in Indonesia. According to WHO standards, a region is considered to have a chronic stunting issue if the prevalence exceeds 20%. In Indonesia, the Sustainable Development Goals (SDGs) report that the prevalence of stunting remains high, between 30% and 40%.

Although there has been some improvement, the prevalence of stunting among Indonesian children over the past decade has remained high, at an average of 37%. According to the report by Riset Kesehatan Dasar Indonesia, the prevalence was 30.8% in 2018 and 27.67% in 2019, showing only a 0.4% decrease within this period, which is still far from meeting the national target for reducing stunting. Stunting is considered a public health concern when prevalence exceeds 20% [4,5].

Grobogan Regency is one of the regencies in Central Java Province. The district capital is in Purwodadi. Based on data from Riskesdas in 2018, Grobogan District has the highest stunting rate in Central Java at 39.3% [4]. Based on data from the Studi Status Gizi Indonesia SSGI 2022, the stunting rate in Central Java Province is still 20.8%, while the stunting rate in Grobogan District is 19.3%. To address this, many government programs are carried out to overcome stunting, including conducting counseling, facilitating referral services facilitating the provision of social assistance, and conducting surveillance/continuous

observation to detect early risk factors for stunting [6].

Education is one of the most powerful tools for reducing stunting, as it can directly influence behaviors, knowledge, and decisions of the parents that will directly impact the child's health. Stunting, primarily resulting from chronic malnutrition, is often preventable when parents have adequate knowledge about nutrition, hygiene, healthcare, and child development [7].

A community-based approach to stunting prevention is a strategy that involves engaging local communities' families, local leaders, health workers, and other stakeholders to work together to prevent and reduce stunting through education, support, and locally relevant interventions. This approach emphasizes local involvement and relies on community members as active participants and leaders in promoting child health and nutrition. A community-based approach to reducing stunting harnesses local involvement, knowledge, and resources to tackle malnutrition. Rather than relying solely on centralized or government-led initiatives, this strategy emphasizes community participation and locally tailored solutions, resulting in more sustainable and culturally appropriate interventions. Increasing education and awareness is one of the things that will be emphasized in the community-based approach [8].

MATERIAL AND METHODS

This non-randomized intervention study was conducted in Brati District, Grobogan Regency. The intervention involved administering a questionnaire to mothers with children under five years old. The total number of participants was 120, comprising 50 mothers with children classified as short and 70 mothers with children of normal height. Participants were selected through stratified sampling, with inclusion criteria being mothers of children under five who consented to participate. The study was approved by the Faculty of Medicine, Universitas Airlangga, Health Research, and Ethics Committee, with ethical clearance number 17/EC/KEPK/FKUA/2024. The questionnaire, completed by the mothers, began with questions about their and their child's identity, including names and ages. It also included pre- and post-tests covering five main topics: understanding of stunting, risk factors for stunting, the impact of stunting, characteristics of stunted children, and stunting prevention methods. The questionnaire contained a total of seventeen questions and was adopted from a validated source [9].

Answers were scored, with correct responses receiving 10 points and incorrect responses receiving 0. Data from pre- and post-tests were analyzed using SPSS version 17. Categorical variables were presented as mean values with corresponding standard deviations and frequencies (percentages). Pre- and post-intervention test comparisons were conducted using the Wilcoxon test, with a significance level of $p < 0.05$.

For data that were not evenly distributed, the T-test was used to assess differences between groups.

Educational sessions were led by pediatricians and general practitioners between the pre- and post-test phases. Midwives and community health workers (cadres) supported the intervention by recording children's height and weight each month before the intervention (February to April 2024) and after (May to October 2024), providing data to assess the intervention's longer-term impact on stunting outcomes. The measurement results will be plotted in line graphs using Microsoft Excel.

RESULTS

Subject Characteristics

The table summarizes the demographic and anthropometric characteristics of the 120 study participants. The mean weight of participants was 10.42 kg, with a standard deviation of 8.27, indicating significant variability among the sample population. The mean height was 78 cm, with a standard deviation of 21.82, reflecting diverse growth patterns within the study group. The mean age of participants was 25.00 months, with a standard deviation of 12.23, suggesting that the sample largely consisted of toddlers. Of the 120 participants, 55 (45.8%) were female, and 65 (54.2%) were male, demonstrating a relatively balanced gender representation. Based on height-for-age Z-score criteria, 50 participants (41.67%) were classified as stunted, while 70 participants (58.33%) were classified as normal. This categorization underscores the focus of the study on addressing stunting.

The variability in weight and height, as evidenced by the high standard deviations, highlights the heterogeneity within the participant group. Such variability may reflect the inclusion of both stunted and non-stunted children, which is central to the study's objectives. The data presented in Table 1 form the basis for further analysis of the intervention's effectiveness in improving knowledge and practices related to stunting prevention.

TABLE 1: Respondent Characteristics.

Variable	Total (N=120)
Mean Weight (kg)	10.42 ± 8.27
Mean Height (cm)	78 ± 21.82
Mean Age (months)	25.00±12.23
Gender	
Female	55 (45.8%)
Male	65 (54.2%)
Height-for-Age (Z-Score)	
Stunted	50 (41.67%)
Normal	70 (58.33%)

Pre-Test and Post-Test Assessment

The pre-test and post-test assessments were conducted with all participants using a questionnaire in Bahasa Indonesia.

The questionnaire, which has been validated and used in a similar setting in Indonesia, was utilized for this study. However, 16 pre-test and post-test results were excluded from the analysis as they were deemed invalid due to non-compliance with the instructions, incomplete responses, or illegible entries.

Among the questionnaires deemed valid and included in the analysis, the results as seen in Table 2, revealed a mean pre-test score of 70.37, with a standard deviation of 13.19, reflecting variability in

participants' initial knowledge levels. Following the intervention, the mean post-test score increased to 79.02, with a reduced standard deviation of 10.28, indicating a narrowing of score variability and suggesting improved understanding among participants. Statistical analysis using the Wilcoxon test confirmed that the observed improvement in scores was statistically significant, highlighting the effectiveness of the educational intervention in enhancing knowledge about stunting.

TABLE 2: Pre-Test and Post-Test Assessment.

	Pre-Test	Post-Test	Description	P Value
Average	70.37+13.19	79.02+10.28	Improved	0,00 (Wilcoxon)

The analysis was further stratified based on whether the participants were mothers of stunted or non-stunted children.

The results indicated that both pre-test and post-test scores were lower in the population of mothers with stunted children compared to those with non-stunted children (Table 3).

TABLE 3: Pre-Test and Post-Test in Stunted and Non-Stunted Group.

	Pre-Test	Post-Test	Description	P Value
Stunted	66.05±13.31	75.63±12.20	Improved	0,00 (T-Test)
Non-Stunted	73.52±12.31	81.49±7.76	Improved	0,00 (Wilcoxon)

In the stunted group, the mean pre-test score was 66.05 with a standard deviation of 13.31, and the mean post-test score increased to 75.63 with a standard deviation of 12.20. This improvement was statistically significant, as confirmed by a paired T-test. The total increase in scores was notably higher in this group compared to the non-stunted group. For the non-stunted population, the mean pre-test score was 73.52 with a standard deviation of 12.31, and the post-test score rose to 81.49 with a standard deviation of 7.76.

In analyzing the responses, a noticeable improvement in the percentage of correct answers was observed across most questions in the post-test. The questions with the highest percentage of correct answers (pre- and post-test) include those about the importance of immunization (Question 15, 95% pre-test and 99% post-test), the importance of nutrition (Question 16, 95% pre-test and 99% post-test), and stunting being a growth disorder (Question 1, 96% pre-test and 100% post-test). Questions 12 and 13 had the lowest percentage of correct answers before the intervention, indicating significant gaps in knowledge. Detailed data on all 17 questions can be found in Table 4.

TABLE 4: Pre-Test and Post-Test Assessment.

Questions	Pre-Test		Post-Test	
	Correct	Incorrect	Correct	Incorrect
1. Is stunting a growth disorder in children?	96%	4%	100%	0%
2. Is stunting a developmental disorder in children caused by malnutrition?	88%	12%	95%	5%
3. According to mothers, are all short children considered to be stunted?	82%	18%	93%	7%
4. Can a lack of nutritious food contribute to stunting?	88%	12%	95%	5%
5. Can suboptimal breastfeeding lead to stunting?	48%	52%	64%	36%
6. Does poor parenting contribute to stunting?	64%	36%	83%	17%
7. Is one of the harmful effects of stunting a negative impact on intelligence?	66%	34%	86%	14%
8. Does stunting not have a negative impact on children's growth?	46%	54%	57%	43%
9. Does stunting lower the immune system, making children more susceptible to illness?	80%	20%	93%	7%
10. Is one of the characteristics of stunting that children appear consistently tired and fatigued?	52%	48%	64%	36%
11. Are children who suffer from stunting shorter than their peers?	83%	17%	88%	12%

Questions	Pre-Test		Post-Test	
	Correct	Incorrect	Correct	Incorrect
12. Are children who suffer from stunting shorter than their peers?	10%	90%	22%	78%
13. Do mothers exclusively breastfeed their child without complementary foods until the child is 6 months old?	33%	67%	28%	72%
14. Do mothers provide complementary foods when the child reaches 6 months of age?	87%	13%	94%	6%
15. Is complete immunization important for preventing stunting?	95%	5%	99%	1%
16. Is it important to provide adequate nutrition for children?	95%	5%	99%	1%
17. Do pregnant women eat less compared to when they are not pregnant?	84%	16%	86%	14%

From February to October, both stunted and non-stunted children showed gradual increases in weight and height as can be seen in Figures 1 and 2, with non-stunted children consistently outpacing their stunted counterparts. By October, non-stunted

children averaged 11.01 kg in weight, while stunted children reached 10.51 kg. Similarly, non-stunted children's height increased from 79.61 cm to 85.75 cm, and stunted children's height grew from 79.15 cm to 86.21 cm.

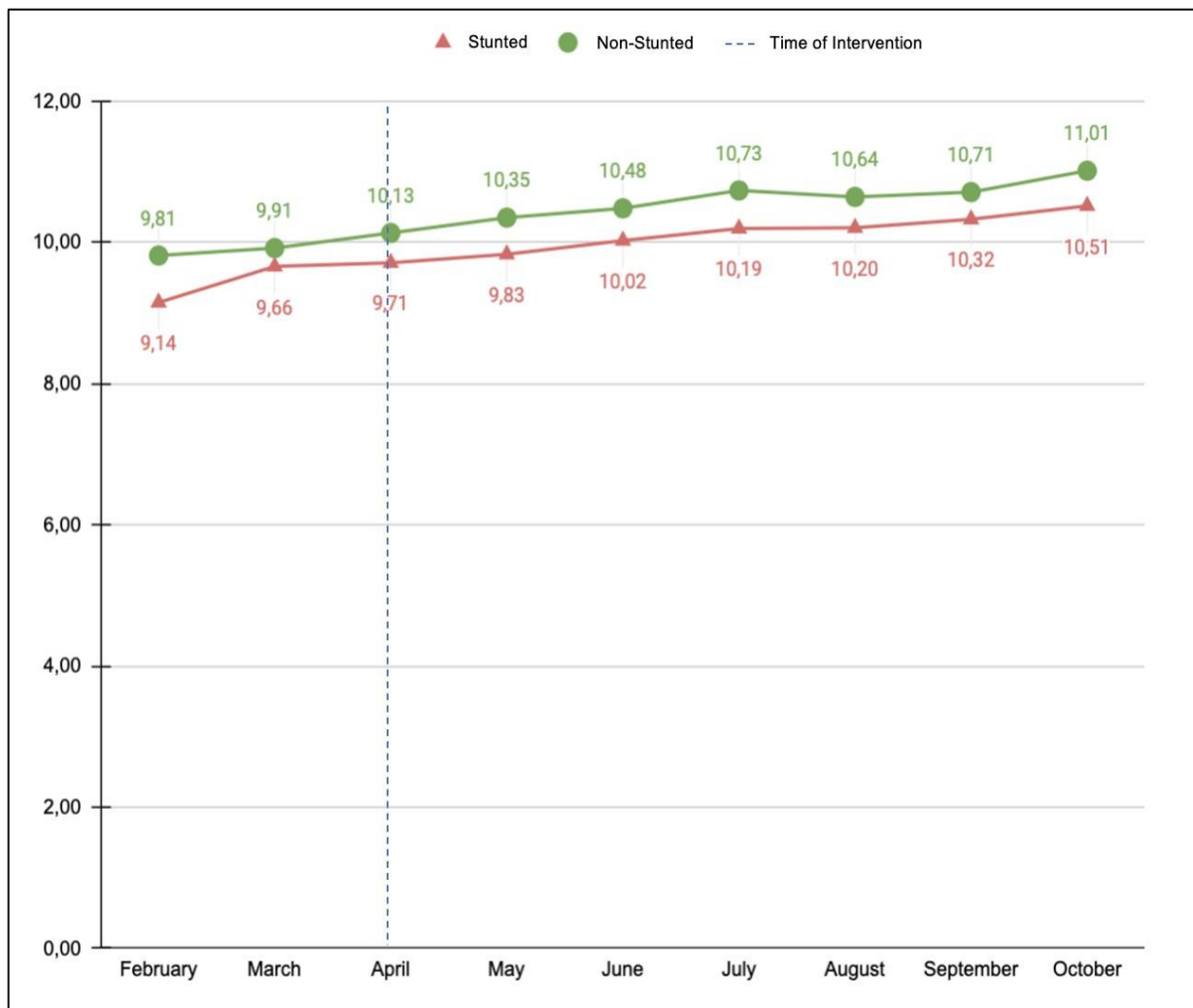


FIGURE 1: Weight Comparison between Stunted and Non-Stunted Children.

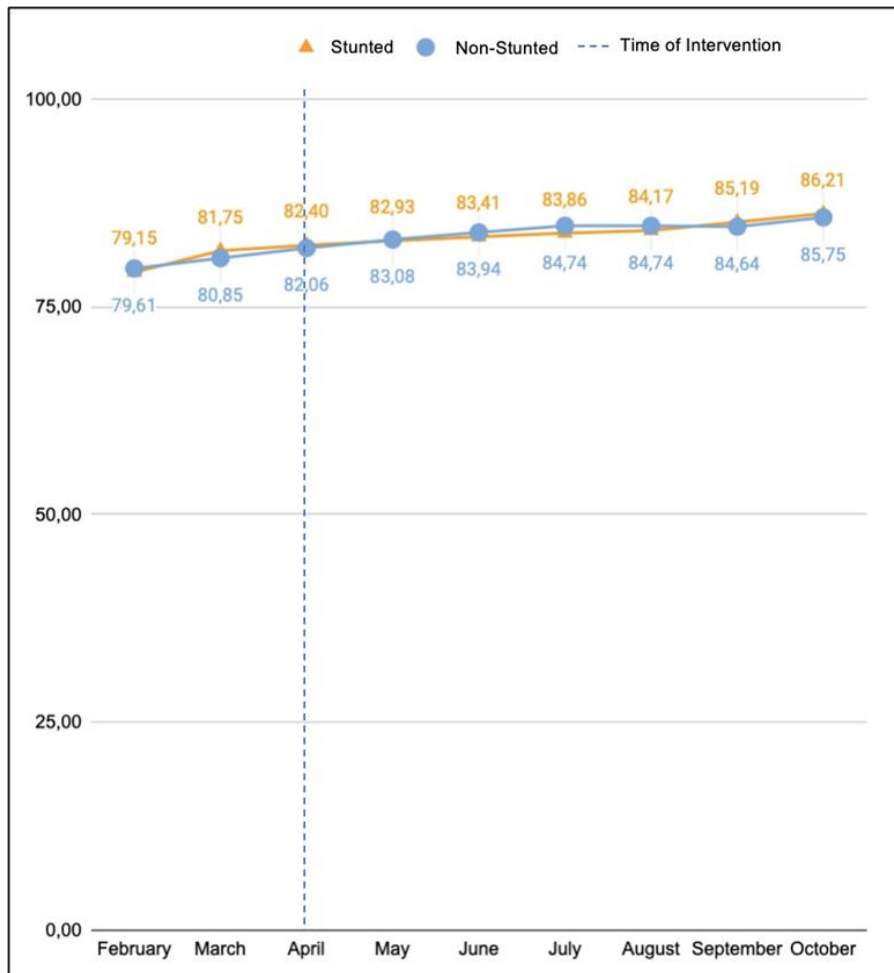


FIGURE 2: Height Comparison between Stunted and Non-Stunted Children.

However, it is important to note that the study commenced in April, and the data collected prior to this (February to March) occurred before the intervention began. Therefore, any weight or height changes during this period are not influenced by the intervention.

DISCUSSION

Addressing the Education Gap on Stunting

The long-term effects of stunting can be severe including impaired cognitive development, reduced productivity, and an increased risk of chronic illnesses [10]. The educational gap leaves many individuals unaware of these consequences, diminishing the urgency around prevention efforts. The gap arises from multiple factors, including limited access to health information, cultural beliefs, socioeconomic barriers, and inadequate healthcare infrastructure. In areas with low literacy or low socioeconomic levels, traditional and cultural beliefs heavily influence daily practices.

This gap is reflected by the pre-and post-test results of mothers of stunted and non-stunted children. In the stunted group, as seen in Table 3, the mean pre-test score was 66.05 while the mean pre-test score was 73.52 for the nonstandard group, reflecting a gap in education level prior to intervention. These findings suggest that parental knowledge about stunting may have a direct impact on a child’s growth and development. Additionally, the data underscores

the significant role of education in improving parental understanding of stunting, particularly among those with stunted children.

A further detailed analysis of each question was done and the result can be seen in Table 4. A noticeable improvement in the percentage of correct answers was observed across most questions in the post-test. For instance, Question 2, which addressed the link between stunting and malnutrition, showed an increase from 88% to 95%, highlighting the positive impact of the educational intervention. However, certain gaps remain. For example, Question 5, concerning the effect of suboptimal breastfeeding on stunting, had a low percentage of correct answers in the pre-test (48%) but saw a significant improvement in the post-test (64%), suggesting that the intervention helped raise awareness about breastfeeding practices. In contrast, Question 8, which asked whether stunting does not affect growth, still showed a high rate of incorrect answers (54%) in the pre-test, with only a modest improvement post-test (43%), indicating that further clarification on this concept may be needed.

The questions with the highest percentage of correct answers (pre- and post-test) include those about the importance of immunization (Question 15, 95% pre-test and 99% post-test), the importance of nutrition (Question 16, 95% pre-test and 99% post-test), and stunting being a growth disorder (Question 1, 96% pre-test and 100% post-test).

Questions 12 and 13 had the lowest percentage of correct answers before the intervention, indicating significant gaps in knowledge. Question 12 (about the link between stunting and being overweight in adulthood) had only 10% correct answers in the pre-test, and Question 13 (about exclusive breastfeeding for the first six months) had only 33% correct answers in the pre-test.

After the intervention, the correct answers to these questions increased slightly (22% for Q12 and 28% for Q13), but there remains a substantial gap. Question 12 aims to assess participants' understanding of the long-term consequences of stunting, including its association with other health risks such as obesity in later life. However, more than half of the participants were unable to correctly identify the potential link between stunting in childhood and the risk of developing overweight or obesity in adulthood. Question 13 addresses knowledge about infant nutrition, specifically the guidelines for exclusive breastfeeding and the introduction of complementary foods. Despite the widespread recommendations from health authorities for exclusive breastfeeding for up to 6 months, more than half of the participants gave incorrect responses, indicating a gap in understanding regarding infant feeding practices. These findings suggest that there is a significant lack of knowledge in critical areas related to stunting prevention and child nutrition. It highlights the need for more focused education on these topics to improve parents' understanding and practice.

Barriers to Effective Stunting Prevention

Socioeconomic Challenges, Literacy Levels, and Cultural Beliefs

Families from low-income backgrounds often face immediate financial pressures that prioritize basic survival over health education. Limited resources make it challenging for these families to attend educational sessions, which may be held at a distance from their communities, or to implement dietary guidelines that require purchasing specific foods. Instead, many low-income communities turn to local traditional healers, such as orang pintar or dukun sehat, who are more accessible and trusted within the community than formal healthcare providers. These traditional practitioners provide culturally familiar support that often feels more relevant or accessible than the information offered by distant health facilities [7].

Low literacy levels also pose a significant barrier to understanding health information, which is often presented in complex, technical terms that can be abstract and difficult to apply in daily life. Parents with limited formal education may struggle to fully grasp stunting's causes, risks, and preventive measures, making it challenging for them to effectively implement what they have learned.

In addition, cultural beliefs around child health and nutrition can conflict with medical recommendations, creating further obstacles to stunting prevention. Certain traditional practices or

dietary customs may not align with the nutritional guidelines needed to prevent stunting.

For instance, some communities rely on specific foods or feeding practices passed down through generations, which may not provide adequate nutrition for growth. Formal health advice can sometimes be met with skepticism, particularly when it contradicts longstanding beliefs or practices, reducing the likelihood of acceptance or adherence to recommended health practices. These combined factors underscore the need for culturally sensitive, accessible health education that addresses socioeconomic, literacy, and cultural barriers to stunting prevention.

Local Facility Barriers to Effective Stunting Education

Many communities face significant challenges when it comes to accessing adequate healthcare facilities and professional services. Often, families must rely on local health practitioners, such as dukun sehat, who are more readily accessible than formal healthcare providers. The distance to primary health facilities, which may require travel by motorbike or bicycle, can deter families from seeking essential health education and services, especially if they face time or financial constraints. This reliance on local healers, while convenient, may limit exposure to comprehensive health information that is crucial for stunting prevention.

Additionally, government health education programs aimed at combating stunting may be understaffed and under-resourced. The limited availability of healthcare professionals can diminish the reach and overall effectiveness of these programs. Health workers may find themselves overwhelmed by the demands placed upon them, making it difficult to provide the necessary attention and support to families seeking information on child health and nutrition. Consequently, the quality of health education suffers, leading to reduced community engagement and participation in available initiatives.

Moreover, government health education programs can often be sporadic and poorly advertised. When communities do not receive timely and clear information about upcoming workshops or educational sessions, families may miss critical opportunities to learn about stunting prevention and nutritional guidelines. This inconsistency can create confusion within the community regarding when and where to access vital health resources, resulting in gaps in knowledge and practice.

Another significant barrier to effectively addressing stunting is the inconsistency in measurement practices among health workers, particularly among community health workers such as cadets and midwives. Accurate measurement of children's height and weight is essential for assessing their growth and identifying stunting. However, many health workers receive limited training on proper measurement techniques and may lack the necessary

tools to obtain reliable data. This often results in inaccuracies that can obscure the true prevalence of stunting within communities, potentially misguiding intervention efforts and leading to ineffective resource allocation.

To address these challenges, it is crucial to implement additional training programs for health workers focused on accurate measurement practices and data collection techniques. Quality control measures should also be established to ensure that community-level data is reliable and reflective of the actual health status of children. By improving the accuracy of growth measurements and enhancing the reach of health education programs, stakeholders can better identify the prevalence of stunting and tailor interventions to meet the specific needs of communities. Ultimately, addressing these barriers will be essential in developing effective strategies for stunting prevention and improving overall child health outcomes.

Education Role in Long Terms Outcome

Education plays a pivotal role in increasing awareness about the causes, consequences, and prevention of stunting. Well-informed parents are better equipped to make dietary and health-related decisions that promote optimal growth and nutrition for their children. For instance, education can enhance understanding of balanced diets, the importance of micronutrients, and appropriate feeding practices during critical growth periods.

Figure 1 and 2 highlights the weight and height increase of both stunted and non-stunted groups. Changes in growth, particularly weight and height, typically require time to manifest. As the intervention focused on educating parents about stunting prevention and proper nutrition, noticeable changes in growth may not be immediate. Continuous education and long-term engagement with parents are essential to ensure sustained improvements in nutrition and stunting prevention. Thus, while the study highlights the importance of stunting education, it is unlikely that the observed changes in weight and height can be directly attributed to the intervention alone. A longer-term follow-up would be necessary to assess the full impact.

From the figure we can conclude that it is essential that this education is not a one-time event; it must be delivered regularly and consistently to reinforce learning and ensure lasting impact. Ongoing educational initiatives can empower communities to challenge and change harmful cultural beliefs and practices that may contribute to stunting. Regular workshops, community meetings, and accessible resources are vital to keep the information fresh and applicable, promoting the adoption of healthy behaviors that align with medical recommendations and nutritional guidelines.

The Government's Role in Long-Term Stunting Prevention through Education

The government plays a pivotal role in ensuring the long-term sustainability and effectiveness of stunting eradication efforts through education, a critical element in achieving the Sustainable Development Goal (SDG) of eliminating stunting. To truly make an impact, government initiatives must go beyond merely mandating stunting education; they must be integrated into existing public health programs, such as Posyandu (community health services), to ensure consistent and widespread access to vital information. Furthermore, it is essential that these efforts are not limited to centralized interventions, but that local health facilities are actively empowered to play a central role in stunting prevention. This can be achieved by increasing the number of trained personnel working in stunting-related fields, providing better incentives, and enhancing the availability of necessary resources and infrastructure [11].

To ensure the effectiveness and relevance of these programs, it is critical to establish robust feedback mechanisms and regularly evaluate the impact of interventions. Continuous monitoring and evaluation help identify gaps, challenges, and areas for improvement, ensuring that stunting education is not only reaching its target audience but is also being applied effectively in real-life settings. By collecting data and insights from the community, the government can adapt and refine strategies to ensure that interventions are effective, culturally sensitive, and tailored to the specific needs of each region [11].

Ultimately, through sustained investment in education, community empowerment, and comprehensive program evaluation, the government can facilitate lasting change in stunting prevention. This integrated approach will not only help achieve the SDG of eradicating stunting but also lay the foundation for healthier, more productive generations in the future [12].

Limitations

The study has several limitations that must be addressed to improve future interventions. One significant limitation is the short observation period, which restricts the ability to assess the long-term impact of the educational intervention on child growth and stunting prevention. Additionally, reliance on self-reported data from mothers may introduce reporting bias, potentially overestimating knowledge gains or changes in behavior. The limited diversity of the study sample, focusing on a specific demographic or geographic area, also reduces the generalizability of the findings. Furthermore, potential inaccuracies in anthropometric measurements, due to inconsistent training or equipment among local health workers, further challenge the reliability of the results. Finally, certain gaps in educational content delivery were evident, as marginal improvements were observed in understanding critical topics, such as the long-term health consequences of stunting and optimal breastfeeding practices.

Recommendations

To address these limitations, it is recommended that future studies extend the follow-up period, enhance data collection training for health workers, and refine educational content to target persistent knowledge gaps. Additionally, expanding the study to diverse populations, integrating complementary interventions to address underlying factors, and promoting continuous community-driven education will enhance the sustainability and impact of stunting prevention programs.

CONCLUSIONS

In conclusion, this study underscores the critical role of education in addressing stunting and its long-term impacts on child health and development. The findings highlight significant gaps in parents' knowledge about stunting, particularly regarding its causes, consequences, and preventive measures. Educational interventions demonstrated measurable improvements in knowledge, as evidenced by increased post-test scores, although gaps in understanding certain topics persist. Barriers such as socioeconomic challenges, low literacy levels, cultural beliefs, and limited healthcare accessibility further complicate stunting prevention efforts.

While the intervention had a positive impact, addressing stunting requires sustained, targeted, and culturally sensitive educational programs. Continuous education, enhanced training for health workers, and community-based approaches are essential to ensure lasting behavior change and improved outcomes. Future efforts should focus on overcoming barriers to access and understanding while integrating long-term follow-up and complementary strategies to address underlying socioeconomic and health disparities. By fostering informed communities and health workers and empowering parents, these initiatives can contribute to breaking the cycle of stunting and improving the overall health and well-being of future generations.

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