

Analysis of the Impact of Stunting on Early Childhood Cognitive Development in Lampenai Village, Wotu District, East Luwu Regency

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ABSTRACT

Stunting is a chronic nutritional problem that not only affects children's physical growth but also has implications for cognitive development and learning readiness. This study aims to analyze the impact of stunting on early childhood cognitive development in Lampenai Village, Wotu District, East Luwu Regency, and to examine the factors that influence and hinder such development. The research employed a qualitative approach with a descriptive design. The informants consisted of 11 participants, including 5 parents of stunted children, 5 children concerned, and 1 POSKESDES officer. Data were collected through observation, in-depth interviews, and documentation, and were analyzed using thematic analysis with triangulation techniques to ensure data validity. The findings indicate that stunted children experience difficulties in working memory, understanding instructions, language development, attention regulation, as well as symbolic thinking and problem-solving skills. Biological factors in the form of chronic malnutrition are reinforced by environmental factors such as limited cognitive stimulation, suboptimal parenting practices, and restricted access to quality education. These findings emphasize that stunting is a multidimensional issue requiring a cross-sectoral approach between the health and education sectors. The implications of this study highlight the importance of adaptive learning strategies in early childhood education settings and collaboration among teachers, families, and health services to minimize the long-term impact of stunting on children's cognitive development.

Keywords: *Stunting, cognitive development, early childhood, early childhood education, school readiness.*

1) INTRODUCTION

Early childhood refers to individuals who are in a fundamental developmental phase that determines the quality of their future life. At this stage, children possess unique characteristics and potentials that gradually develop through interaction with their environment. However, they are not yet socially mature and therefore require appropriate guidance and stimulation to achieve optimal development (Setiana Danarwulan, 2022). Therefore, Early Childhood Education (ECE) plays a strategic role in supporting children's growth and development during the golden age (0–6 years), a period when brain development occurs very rapidly. Early Childhood Education (ECE) aims to

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provide structured stimulation to ensure that all aspects of child development, including physical, cognitive, language, socio-emotional, and motor development, grow in a balanced manner. Appropriate educational approaches during this stage not only prepare children for the next level of education but also serve as a preventive effort against various developmental barriers, including the long-term impacts of stunting (Maghfiroh S, 2021).

Stunting is a condition of growth failure in children caused by chronic malnutrition over a prolonged period, characterized by height-for-age falling below the established standard (Hardiyanto R, 2023; Djoko, 2020). The World Health Organization defines stunting as impaired growth and development in children resulting from chronic malnutrition and recurrent infections, indicated by length or height that is below the designated standard deviation threshold (Bagus Pratama, 2020; UNICEF, WHO, & World Bank, 2020). This condition is influenced not only by inadequate nutritional intake but also by multidimensional factors such as exclusive breastfeeding practices, low birth weight, maternal education level, family income, parenting patterns, and dietary diversity (Susilawati, 2023).

Globally, stunting is an indicator of chronic malnutrition that affects millions of children and carries serious consequences for health and cognitive development (UNICEF, WHO, & World Bank, 2020). International studies show that chronic malnutrition during early life can hinder brain development, particularly in areas responsible for memory, attention, and executive function (Georgieff, 2007). Grantham-McGregor et al. (2007) emphasize that developmental disruptions during the first five years of life have the potential to reduce long-term cognitive capacity. Similarly, Prado & Dewey (2014) demonstrate that nutritional deficiencies in early life are associated with delays in cognitive development and later academic performance.

The short-term impacts of stunting include delays in cognitive, motor, and language development, as well as an increased risk of illness (Dina Auliana, 2020; Prasanti A., 2022). In the long term, this condition has implications for lower productivity, learning difficulties, concentration problems, and suboptimal academic performance (Hardiman D., 2020; Walker et al., 2007). Further, it is noted that children who experience growth impairment have a higher risk of cognitive function limitations and lower educational attainment.

Cognitive development is a mental process that involves perception, memory, information processing, reasoning, and problem-solving (Kontantinus, 2021). In the context of early childhood

education in Indonesia, cognitive developmental achievements include learning and problem-solving skills, logical thinking, and symbolic thinking (Regulation of the Minister of Education and Culture of the Republic of Indonesia, 2014). Children's cognitive development progresses gradually, beginning with the mastery of concepts through concrete experiences, transitioning toward symbolization, and eventually reaching the stage of using symbols abstractly (Umi Kulsum, 2022). Within the age range of 0–7 years, cognitive development includes the ability to recognize objects, develop language, use imagination, and engage in simple abstract thinking (Ari Kusuma, 2021).

Although numerous studies have examined the impact of stunting on child development, most have focused on medical aspects or quantitative measurements of developmental outcomes. Research that specifically analyzes the impact of stunting on early childhood cognitive development within an educational context, particularly in rural areas, remains limited. Furthermore, the implications of these findings for early childhood education practices and teacher competencies have not been extensively explored in depth.

Lampenai Village, Wotu District, East Luwu Regency, is one of the areas facing the issue of stunting among early childhood populations. This condition provides an important context for examining how stunting affects children's cognitive development within the local social realities, as well as how educational institutions can respond to it in an adaptive manner.

Based on the above description, this study aims to analyze the impact of stunting on early childhood cognitive development in Lampenai Village, Wotu District, East Luwu Regency, and to examine its implications for early childhood education practices.

This study provides empirical, theoretical, and pedagogical contributions to the field of early childhood education by presenting contextual evidence on the impact of stunting on children's cognitive development in rural areas of Indonesia, thereby enriching the global literature with a local perspective from a developing country. From an interdisciplinary standpoint, the study integrates findings from health and neurocognitive research with early childhood education practices, affirming that stunting is not merely a medical issue but also an educational concern that affects school readiness and the quality of learning. Furthermore, this research offers a conceptual foundation for strengthening early childhood teachers' competencies in identifying cognitive developmental delays and designing adaptive learning strategies for children at risk of stunting. It also encourages

collaboration between educational institutions and health services as a holistic approach to improving the quality of early childhood education.

2) METHODS

Research design

This study employed a qualitative approach with a descriptive design. The descriptive qualitative approach aims to understand and describe social phenomena in depth within their natural context without manipulating variables (Sulaiman Saat, 2020). This design was selected to contextually explore the impact of stunting on early childhood cognitive development in Lampenai Village, Wotu District, East Luwu Regency, while considering the biological and environmental factors that influence children's development.

Participants and Informant Selection Technique

The study involved 11 participants, consisting of 5 parents of children identified as stunted, 5 of the children concerned, and 1 Village Health Post (POSKESDES) officer. Informants were selected using purposive sampling based on the criterion that the children had been officially recorded as experiencing stunting according to village health service data. The involvement of parents aimed to obtain information regarding the children's growth history, parenting practices, and home-based stimulation, while the POSKESDES officer provided supporting data related to the children's health and growth conditions.

Data Collection Techniques

Data were collected through three main techniques: observation, in-depth interviews, and documentation (Ardiansyah, 2023).

- a. **Observation** was conducted to examine children's behavior during learning activities and social interactions, particularly in relation to their ability to understand instructions, regulate attention, use language, and engage in activities.
- b. **In-depth interviews** were carried out in a semi-structured manner with parents and the POSKESDES officer to explore information regarding health history, nutritional intake, parenting practices, and changes in the children's cognitive development.

- c. **Documentation** was used to complement the data in the form of growth records, health information, and other supporting documents relevant to the children's stunting condition.

Data Validity

Data validity was ensured through triangulation techniques (Alfansyur, 2020). This study applied the technique of triangulation by comparing and integrating data obtained from observations, interviews, and documentation to ensure the consistency of information. The triangulation process was carried out by cross-checking observational findings of children's behavior with parents' statements and available health records, thereby enhancing the credibility of the research findings.

Data Analysis Procedure

Data were analyzed using a thematic analysis approach. Thematic analysis was employed to identify, organize, and interpret patterns of meaning (themes) emerging from the qualitative data. This approach enabled the researcher to systematically and contextually identify patterns related to the impact of stunting on children's cognitive development.

Ethical Considerations

This study adhered to research ethics principles, particularly because it involved early childhood participants. Informed consent was obtained from parents or legal guardians prior to the data collection process. The identities of participants were kept confidential by using initials or specific codes in reporting the research findings. All collected data were used solely for academic and research purposes.

3) RESULTS AND DISCUSSION

Overview of Cognitive Development in Early Childhood Affected by Stunting in Lampenai Village, Wotu District

Early childhood cognitive development is a mental process involving the ability to think, understand, remember, reason, and connect various experiences gained from the surrounding environment. As previously explained, cognitive development includes the ability to relate one event to another, process observed information, and develop reasoning skills, creativity, language, and

memory. In the context of early childhood education, cognitive abilities play a crucial role in shaping learning readiness and the quality of children's social interactions.

The results of interviews and observations indicate that children experiencing stunting in Lampenai Village face not only physical growth impairments but also various limitations in cognitive development. Stunting caused by chronic malnutrition particularly during the first 1,000 days of life affects critical periods of brain development that determine children's future learning capacity. International literature emphasizes that early life is a sensitive phase for the formation of neural connectivity, myelination, and the development of executive functions closely related to memory and attention (Georgieff, 2007; Prado & Dewey, 2014).

Field findings show that stunted children often experience difficulties in understanding and following complex instructions. They tend to require repeated guidance to complete simple tasks and demonstrate limitations in problem-solving that require logical thinking. In addition, speech delays and limited vocabulary appear to be prominent. Children experience challenges in expressing ideas or experiences verbally and have difficulty remembering newly learned information. This condition is consistent with the findings of Dinny Rahmayanty (2024), which state that stunted children encounter difficulties in activities requiring logical reasoning and problem-solving, as well as language delays that affect communication with peers and adults.

Memory impairment was also identified as one of the characteristics found in this study, affecting both short-term and long-term memory. Children frequently forgot instructions or material that had just been taught. A. Rahmidini (2020) states that stunting, categorized as suspect cognitive development, may lead to a reduction of approximately 15–20 percent in brain cell numbers, which has implications for long-term cognitive capacity. Globally, Grantham-McGregor et al. (2007) emphasize that chronic malnutrition in early life is associated with lower cognitive development potential and reduced educational attainment in the future.

In addition to language and memory aspects, stunted children also demonstrated difficulties in maintaining attention and concentration. Observations revealed that children were easily distracted, quickly became bored, and struggled to complete learning activities or educational play tasks thoroughly. This is consistent with the findings of Blair and Raver (2015), who state that early developmental disruptions can affect self-regulation and executive functions, including the ability to sustain attention in learning situations.

Previous research also indicates that developmental delays in stunted children are evident in their inability to name colors, distinguish object sizes, recognize gender, and match familiar pictures (A. Rahmidini, 2020). These findings align with observations in Lampenai Village, where several children experienced difficulties in mastering basic concepts that should have been acquired according to their developmental stage.

During the critical developmental period of 6–24 months, inadequate nutritional status also influences children's personal-social development. Children with developmental delays exhibit low social responsiveness, limited interest in interaction, and minimal expression when their names are called (Wiwik Utami, 2020). These findings indicate that the impact of stunting is not limited to purely cognitive aspects but is also related to the quality of social interaction, which forms part of children's readiness for learning in early childhood education settings.

Overall, the profile of cognitive development among stunted children in Lampenai Village shows impairments in memory, language, attention, problem-solving, and social interaction. These findings reinforce international literature stating that stunting has multidimensional effects on child development and directly influences school readiness (Walker et al., 2007; Prado & Dewey, 2014). Therefore, this condition requires serious attention from the education sector, particularly in designing learning strategies that are responsive to the needs of children at risk of cognitive developmental delays.

Factors Influencing Cognitive Development in Early Childhood Affected by Stunting in Lampenai Village, Wotu District

The cognitive development of young children experiencing stunting in Lampenai Village, Wotu District, is influenced by various interacting factors, including both biological and environmental components. Stunting, as a condition of chronic malnutrition, is the primary factor contributing to cognitive developmental delays. Prolonged inadequate nutritional intake, particularly during the first 1,000 days of life, can disrupt brain growth and development, especially in areas responsible for memory, attention, and information processing (Hardiyanto R., 2023; Djoko, 2020). From a neurocognitive perspective, chronic nutritional deficiencies may affect myelination processes and synapse formation, which are crucial for the development of logical thinking and problem-solving abilities (Georgieff, 2007; Prado & Dewey, 2014).

Research findings indicate that stunted children in Lampenai Village experience limitations in understanding complex instructions, sustaining attention, and developing analytical skills. This condition aligns with studies by Grantham-McGregor et al. (2007) and Walker et al. (2007), which state that chronic growth impairment in early life is associated with lower cognitive development potential and reduced educational achievement in the future. Nurharlinah (2024) further emphasizes that health problems in children can hinder growth and development due to decreased intake and absorption of essential nutrients. Unstable health conditions may also weaken the immune system and increase the risk of infections, thereby worsening developmental outcomes.

However, the findings also reveal that biological factors do not operate in isolation. Family and social environments play a significant role in either reinforcing or mitigating the impact of stunting on cognitive development. Several parents acknowledged limitations in providing adequate cognitive stimulation, such as intensive verbal interaction, educational play, and consistent emotional support. A lack of interaction and stimulation within the family environment has been shown to hinder children's language development (Suci Nurul A., 2024). This is consistent with Susilawati (2023), who notes that maternal education level, family income, and parenting practices are influential factors affecting both the occurrence and impact of stunting.

Theoretically, the development of executive functions and self-regulation in children is strongly influenced by the quality of caregiving environments and the stimulation provided (Blair & Raver, 2015). Children who do not receive adequate environmental support tend to experience delays in language development, attention, and social interaction. Wiwik Utami (2020) states that during the critical developmental period of 6–24 months, children with poor nutritional status exhibit low social responsiveness and limited interest in interaction. These findings demonstrate that cognitive developmental barriers in stunted children are cumulative in nature, resulting from the combined effects of biological factors and insufficient environmental stimulation.

In addition, limited access to quality education and insufficient physical activities that support exploration serve as additional inhibiting factors. Children who do not receive structured and stimulating learning experiences in early childhood education settings are at risk of experiencing widening developmental gaps. UNICEF, WHO, and the World Bank (2020) emphasize that stunting is closely linked to social inequality, poverty, and limited access to basic services, which indirectly affect the quality of children's development.

Overall, the factors influencing and hindering the cognitive development of stunted children in Lampenai Village are multidimensional and mutually reinforcing. Chronic malnutrition as a biological factor is exacerbated by unsupportive environments, limited cognitive stimulation, restricted social interaction, and suboptimal access to education. These findings underscore that interventions to minimize the impact of stunting cannot be carried out partially; rather, they require a holistic approach involving families, early childhood education institutions, and integrated health services.

The Impact of Stunting on Early Childhood Cognitive Development in Lampenai Village, Wotu District

The findings of this study indicate that stunting has a significant impact on the cognitive development of young children in Lampenai Village, Wotu District. These impacts are evident across several key cognitive domains, including memory, language, attention, problem-solving skills, and learning readiness. Stunting resulting from chronic malnutrition during early life affects the development of brain structures and functions involved in thinking and information processing (Georgieff, 2007; Prado & Dewey, 2014).

As an indicator of chronic malnutrition, stunting not only reflects impaired linear growth but also serves as a marker of long-term developmental risks. Perumal, Bassani, and Roth (2021) emphasize that stunting is often used as a proxy for children's overall health and developmental status, as it is associated with various cognitive barriers and educational outcomes. Therefore, stunting should not be understood merely as an anthropometric measurement, but as a complex indicator reflecting both biological and social vulnerability in children.

Specifically, children experiencing stunting demonstrate limitations in working memory, characterized by difficulties in recalling recently provided instructions and information. They tend to require repeated explanations to understand tasks and experience challenges in completing activities that involve multiple stages of thinking. This condition aligns with the findings of Grantham-McGregor et al. (2007), which state that chronic malnutrition during the first five years of life can reduce long-term cognitive development potential.

In addition, the impact of stunting is evident in language development. Children demonstrate limited vocabulary, difficulty constructing simple sentences, and reduced verbal participation. These barriers not only affect children's social interactions but also influence symbolic thinking and early

literacy readiness. Dinny Rahmayanty (2024) notes that stunted children tend to experience difficulties in activities requiring logical reasoning and effective communication. Internationally, Walker et al. (2007) emphasize that early growth impairment is associated with lower educational achievement and cognitive skills during the school years.

Another impact is observed in children's ability to sustain attention and concentration. Observations indicate that children are easily distracted, quickly become bored, and struggle to complete learning activities independently. Blair and Raver (2015) explain that executive function and self-regulation play crucial roles in school readiness, and impairments in these areas can affect the quality of children's participation in learning processes. This condition demonstrates that the impact of stunting is not solely biological but also directly influences academic performance and engagement in early childhood education settings.

Beyond purely cognitive aspects, stunting is also associated with personal-social development. Wiwik Utami (2020) states that children with poor nutritional status during the critical period of 6–24 months exhibit low social responsiveness and limited interest in interaction. This finding is relevant to the results in Lampenai Village, where several children appeared less responsive to calls or instructions and less active in group interactions.

Overall, the impact of stunting on early childhood cognitive development in Lampenai Village is multidimensional, encompassing limitations in memory, language, attention, problem-solving, and social interaction. These findings reinforce global literature indicating that stunting is a major risk factor for low school readiness and learning quality (UNICEF, WHO, & World Bank, 2020). Therefore, stunting should not be viewed solely as a health issue, but also as an educational concern that requires adaptive and collaborative pedagogical responses.

In the context of early childhood education, these findings highlight the importance of responsive learning strategies tailored to the needs of stunted children, such as step-by-step instruction, the use of visual media, strengthened language stimulation, and active learning approaches that enhance children's engagement. Collaboration among early childhood education institutions, families, and health services is essential to minimize the long-term impact of stunting on children's cognitive development.

Synthesis of Discussion

Based on the overall findings, it can be concluded that stunting among young children in Lampenai Village, Wotu District, East Luwu Regency has a multidimensional impact on cognitive development. The effects are not limited to physical growth but also influence memory, language, attention, problem-solving skills, and social interaction. This condition indicates that stunting extends beyond a health issue and directly affects learning readiness and the quality of children's participation in early childhood education.

Overall, the findings demonstrate that the impact of stunting on early childhood cognitive development is both multidimensional and cumulative. It affects not only memory, language, and attention but also school readiness and long-term learning quality. Recent global literature emphasizes that early childhood development should be understood through a cross-sectoral approach integrating health, nutrition, and education across the life course (Black et al., 2021). Therefore, interventions for stunted children require comprehensive strategies involving families, health services, and educational institutions as structured environments for developmental stimulation.

At the level of cognitive development, children experiencing stunting show limitations in working memory, difficulties in understanding complex instructions, and challenges in sustaining attention during learning activities. These limitations are closely associated with disruptions in brain structure and function due to chronic malnutrition during critical growth periods (Georgieff, 2007; Prado & Dewey, 2014). International literature highlights that growth impairment during the first five years of life may reduce long-term cognitive capacity and educational attainment (Grantham-McGregor et al., 2007; Walker et al., 2007). The findings in Lampenai Village illustrate the concrete manifestation of these impacts within a local educational context.

In addition to memory and attention, language delay emerged as a dominant indicator. Children with stunting tend to have limited vocabulary, reduced verbal participation, and difficulties in symbolic thinking. This aligns with Dinny Rahmayanty (2024), who states that stunted children experience challenges in logical reasoning and effective communication. Language delays not only affect early academic abilities but also influence the quality of children's social interactions within learning environments.

Furthermore, the study shows that biological factors in the form of chronic malnutrition do not operate independently in causing cognitive developmental barriers. Environmental factors such as

family conditions, parenting practices, parental education levels, and limited cognitive stimulation further reinforce these effects (Susilawati, 2023; Suci Nurul A., 2024). A lack of verbal interaction and emotional support at home contributes to delays in speech and social responsiveness. Wiwik Utami (2020) emphasizes that during the critical developmental period of 6–24 months, children with poor nutritional status exhibit low social responsiveness and limited interest in interaction. Thus, cognitive developmental barriers among stunted children are cumulative and interactive, resulting from the combined influence of biological and environmental factors.

These findings align with the ecological developmental approach, which positions children as individuals who develop through the interaction between biological conditions and their social environment. UNICEF, WHO, & the World Bank (2020) emphasize that stunting is closely linked to social inequality and limited access to basic services. Therefore, interventions addressing stunting cannot be carried out partially; instead, they require a cross-sectoral approach involving families, educational institutions, and health services.

In the context of early childhood education, the results of this study underscore the importance of adaptive and responsive pedagogical strategies tailored to the needs of stunted children. Early childhood educators need to understand the characteristics of cognitive developmental barriers that may arise, such as limitations in working memory, attention difficulties, and language delays, in order to design learning experiences that are more structured, gradual, and rich in stimulation. In this way, education functions not only as a means of knowledge transfer but also as an intervention instrument to minimize the long-term impact of stunting on child development.

Overall, the findings demonstrate that stunting has broad implications for early childhood cognitive development in Lampenai Village. These impacts are multidimensional, shaped by the interaction between biological and environmental factors, and directly influence school readiness and learning quality. This synthesis provides an important foundation for formulating conclusions and recommendations aimed at strengthening the role of education and teacher training in addressing the challenges of stunting at both local and national levels.

4) CONCLUSION

This study demonstrates that stunting has a significant impact on the cognitive development of young children in Lampenai Village, Wotu District, East Luwu Regency. The impact is not limited to

physical growth but also affects fundamental cognitive domains, including working memory, the ability to understand instructions, language development, attention regulation, problem-solving skills, and social interaction. Children experiencing stunting tend to show limitations in sustaining concentration, retaining information, and developing symbolic and logical thinking skills. These barriers directly influence school readiness and the quality of children's participation in early childhood education activities. In addition to biological factors in the form of chronic malnutrition during critical developmental periods, this study also found that environmental factors—such as limited cognitive stimulation at home, suboptimal parenting practices, and restricted access to quality education—further reinforce the impact of stunting on children's development.

Recommendations

Based on the findings of this study, integrated efforts are required to minimize the impact of stunting on early childhood cognitive development through collaboration among teachers, parents, and policymakers. Early childhood educators should implement adaptive learning strategies such as step-by-step instruction, the use of visual media, strengthened language stimulation, and active learning approaches that enhance children's engagement. Parents are encouraged to improve the quality of interaction and cognitive stimulation at home through intensive communication, educational play activities, and the provision of adequate nutrition. At the policy level, synergy between the education and health sectors is essential, particularly through integrated nutrition intervention programs combined with the strengthening of early childhood education services and teacher training on early detection and management of children at risk of stunting. Furthermore, future research employing longitudinal approaches or mixed methods is recommended to examine the long-term impact of stunting on school readiness and children's academic achievement.

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