The Relationship Between Stunting and Delays in Motor and Cognitive Development in Infants Aged 0-24 Months

Ustifina Hasanah Hasibuan

STIKES As Syifa Kisaran, Sumatera Utara, Indonesia, herfina90@gmail.com

KEYWORDS
Stunting, motor development, cognitive development.

ABSTRACT
Aims: This Research to elucidating the relationship between stunting and delays in motor and cognitive development. Infants aged 0-24 months were selected for investigation because this period is a critical window during which the impact of stunting is most evident in the physical and mental development of children. Instrument & Method. The research instruments used include in-depth interviews with mothers of infants and local health workers as well as direct observation of infant motor and cognitive development. The research method applied was a qualitative approach with thematic analysis. Findings The results showed that stunting has a significant contribution to delays in motor and cognitive development, especially in infants aged 12-24 months. These delays are seen in motor skills such as sitting and walking, as well as cognitive delays in responding to stimuli and communicating. Conclusion: The findings of this research demonstrate a strong correlation between stunting and delays in motor and cognitive development in infants aged 0-24 months. Infants with stunted growth exhibit significant delays in reaching motor developmental milestones, such as sitting, crawling, and walking, as well as delays in cognitive abilities, including responding to stimuli, remembering, and speaking.

1. Introduction

Stunting represents a significant and pervasive public health concern in Indonesia, particularly in rural communities. Stunting, or failure to thrive, is defined as a child's failure to reach the expected height for their age due to chronic malnutrition experienced during critical periods of growth, particularly the first 1,000 days of life (from pregnancy until the child is two years old). This is a critical period during which the development of a child's brain and vital organs occurs, as well as forming the foundation of a child's cognitive and motor skills for the future (Ningrum, 2024).

The prevalence of stunting in Indonesia remains a significant concern for the government, with elevated rates observed particularly in rural areas. A report from the Indonesian Toddler Nutrition Status Survey (SSGBI), conducted by the Ministry of Health, indicates that the stunting rate in Indonesia in 2021 reached approximately 24.4% [1]. This represents a decrease from the figures recorded in previous years. The prevalence of stunting is generally higher in rural areas than in urban areas. This is due to a number of factors, including low access to nutritious food, a lack of knowledge about the importance of adequate nutrition during pregnancy and early childhood, and inadequate health infrastructure (Sari, 2023).

In rural areas such as Mutiara Village, East Kisaran, Kisaran, Sumatera Utara, the challenges faced in relation to stunting include limited access to quality health services and economic hardships that impact the fulfilment of nutritional needs of pregnant women and children under five. The communities in these areas generally rely on local agricultural products, which often do not fulfil the necessary micronutrient requirements, such as iron, calcium and vitamin A, which are essential for optimal child growth (Syihab et al., 2021).

Stunting has a significant impact on children's physical growth and motor and cognitive development. Children who are stunted tend to have a shorter height than their peers, which is an early indicator of long-term malnourishment. Additionally, stunting is associated with an increased risk of delays in motor and cognitive development, which can have a detrimental impact on children's quality of life in the future (Kartika et al., 2024).

Motor development is defined as the acquisition of physical abilities, including the ability to perform movements involving large and small muscles. Gross motor skills encompass the ability to sit, crawl, stand, and walk, while fine motor skills involve more detailed activities such as holding small objects, grasping, and building blocks. Stunted children often experience delays in reaching these motor development milestones (Sadikeen et al., 2024).

Motor development pertains to a child's capacity to execute physical movements involving both large and small muscles. Gross motor encompasses a child's ability to sit, crawl, stand, and walk, whereas fine motor encompasses more intricate activities such as holding small objects, grasping, and building blocks. Children who are stunted often experience delays in reaching these motor development milestones (Supriatin et al., 2020).

Chronic malnutrition has an adverse impact on a child's muscle strength and coordination. Consequently, children who are stunted are slower to achieve motor milestones than children who are of a normal height (Inamdar et al., 2024). Research indicates that stunted children are more likely to be late in reaching motor milestones, such as the ability to sit unaided at around 8-10 months of age and walking at 12-18 months of age. This delay is not only caused by physical weakness, but also by the influence of stunting on brain functions that control coordination and movement.

Cognitive development can be defined as a child's capacity to think, learn, solve problems and interact with their surrounding environment. Children who are stunted are at an increased risk of experiencing cognitive delays, which can be observed in their ability to solve simple problems, remember information and respond to stimuli from their environment (Savova et al., 2024).

Stunting affects brain development, particularly during the period of rapid brain growth that occurs during the first 1,000 days of life. During this time, the brain forms thousands of synaptic connections that are essential for cognitive abilities. Nutritional deficiencies, especially of protein, iron and omega-3, can disrupt synapse formation and affect the brain's neuroplasticity, which is the brain's ability to learn and adapt to new information (Karismadarma et al., 2023).

The available evidence indicates that children who are stunted have difficulties in processing information, are at risk of having a lower IQ, and have difficulty focusing and learning. These delays can have long-term effects, affecting their academic performance and social skills later in life (Hartati et al., 2024).

The present study focuses on the relationship between stunting and delayed motor and cognitive development.

This study focuses on infants aged 0-24 months in Manukan , Gambiranom, Sleman, with the objective of elucidating the relationship between stunting and delays in motor and cognitive development. Infants aged 0-24 months were selected for investigation because this period is a critical window during which the impact of stunting is most evident in the physical and mental development of children.

The research method employed was a descriptive qualitative approach, whereby data was gathered through in-depth interviews with the infant's mother and local health workers, as well as direct observation of the infant's motor and cognitive development. Through interviews with the infant's mother, the research team was able to gain deeper insight into the child's feeding and nutritional patterns, as well as the parenting techniques employed. Field observations were conducted to directly assess the children's motor development, including the ability to sit, stand, crawl, and walk, as well as their cognitive abilities, such as responsiveness to stimuli, social interaction, and memory.

It is anticipated that this research will provide a more nuanced understanding of the relationship between stunting and developmental delays, and offer guidance for the design of effective intervention programmes that can prevent and reduce stunting rates in rural areas such as Manukan Village. Additionally, the findings from this study are expected to inform the government's efforts to address the issue of stunting at the national level, while also raising public awareness about the crucial role of adequate nutrition during children's growth period.

2. Instrument and Methods

Descriptive qualitative approach is a research method that aims to understand phenomena in depth and describe the characteristics or dynamics that occur in a particular context, without changing or manipulating variables. In this study, a descriptive qualitative approach was used to explore and understand the relationship between stunting and delays in motor and cognitive development in infants aged 0-24 months in Mutiara Village, East Kisaran, Kisaran. This approach was chosen because it aims to provide a clear picture of the reality experienced by the research subjects (infants, parents, and health workers) naturally, in their environment (McCarthy et al., 2022).

Data Collection Technique

To obtain in-depth and relevant data, this study used two main data collection techniques, namely in-depth

interviews and direct observation. These two methods aim to provide complementary information and strengthen the analysis of the relationship between stunting and infant development, both in terms of motor and cognitive.

In-depth Interviews

In-depth interviews are a qualitative data collection technique conducted by meeting face-to-face and exploring information directly from the research subject in detail. In-depth interviews in this study were conducted with two main groups of informants, namely:

Mothers of Infants: Interviews were conducted to understand parenting patterns, nutritional intake, health conditions during pregnancy, and challenges faced in caring for infants. Mothers of infants were selected as interview subjects because they are the main source of information related to daily child care and infant health history. In addition, mothers can provide a clear picture of their feeding patterns, access to health services, and understanding of stunting. The interviews also explored mothers' perceptions of their child's motor and cognitive development, which could be compared with observations.

Local Health Workers (Midwives and Posyandu): Local health workers, such as midwives and posyandu cadres, play an important role in monitoring infant growth and development in the community. Interviews with health workers were conducted to obtain information related to the infant's health history, preventive measures that have been taken, and interventions provided to infants identified as stunted. Health workers also provided insights on factors affecting stunting and child development based on their experience in handling cases in the area. Information from health workers was useful in corroborating data obtained from interviews with mothers and direct observation.

The interviews followed a semi-structured guide, where the researcher had a list of main questions designed to elicit information related to stunting and child development. However, the interviews remained flexible, allowing mothers and health workers to explain or add information they deemed important.

In addition to interviews, this study also used direct observation techniques to objectively observe the motor and cognitive development of infants suspected of being stunted. Direct observation is a technique in which the researcher goes directly to the field and observes the behaviour or situation of the research subject in everyday life, without interference or manipulation from the researcher. In this study, observations were conducted on infants aged 0-24 months, especially those who had been identified as stunted or developmentally delayed:

Researchers observed several aspects of infant motor and cognitive development, including:Observation Criteria:

Observations were conducted in the infant's home or natural environment to avoid behavioural changes due to the presence of the researcher. Observation criteria followed standard infant development guidelines based on the World Health Organization (WHO) growth and development charts. The researcher also documents the physical environment in which the infant lives, access to clean water, and sanitation conditions as supporting factors that may affect child development.Example of Observation Situation:

During the observation, the researcher notes whether or not the suspected stunted infant can sit up unaided at the appropriate age. In addition, the researcher also observes how the infant responds to sounds or visual stimuli such as toys. If the suspected stunted infant shows slow or no response to these stimuli, this could be an indicator of delayed cognitive development.

Motor Development:

Researchers observe the infant's ability to achieve age-appropriate motor development milestones, such as:

a. Sitting up unaided (usually achieved by 8-10 months of age).

b. Crawling (usually achieved at 7-9 months of age).

c. Walking (usually achieved at 12-18 months of age).

d. Grasping objects or showing hand-eye coordination (usually at 6-12 months).

Cognitive Development:

a. Infant cognitive development is observed through:

b. Response to visual and sound stimuli (such as following the movement of objects or responding when called by name).

c. Ability to remember and learn (such as recognising parents' faces or trying to imitate the sounds and actions of others).

d. Theability to use simple language (such as saying simple words like ‘mama’ or ‘dada’).

Advantages of Descriptive Qualitative Approach in This StudyThe descriptive qualitative approach has several advantages in the context of this study, including:

Depth of Data: Through in-depth interviews and direct observation, the researcher was able to extract very rich and in-depth information about the infant's mother's experience, parenting patterns, and the infant's condition in a more comprehensive manner.

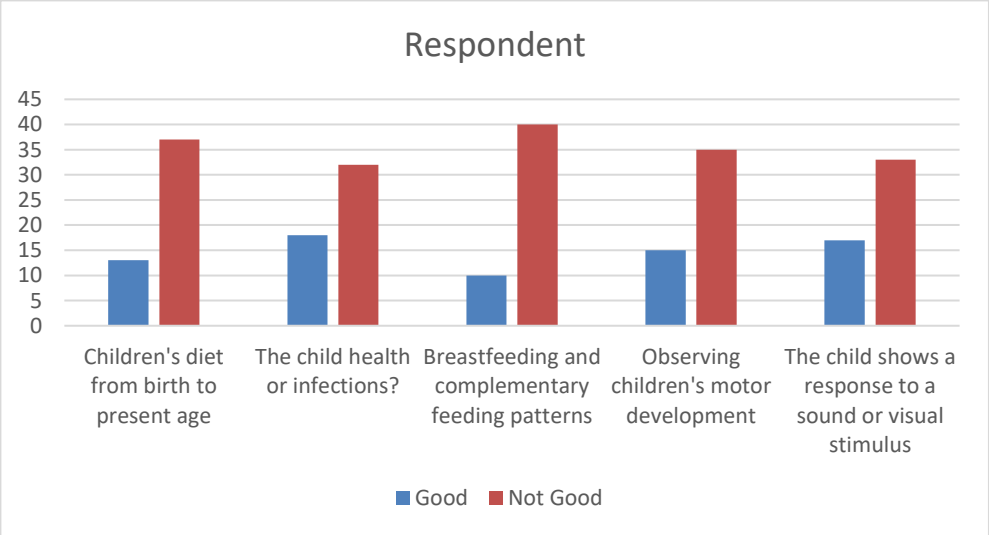
Contextualisation: This approach allows researchers to understand stunting and developmental delays in the unique and specific context of Manukan Village, including the social, economic and environmental factors at play.

Qualitative methods allow researchers to adjust questions or focus of observation according to field findings, making it more adaptive to the dynamics that exist in the research location.

3. Findings

Table 1. Questions for respondent

Item no.	Questions	Good	Not Good	Total Respondent
1	Children's diet from birth to present age	13	37	50
2	The child health or infections	18	32	
3	Breastfeeding and complementary feeding patterns	10	40	
4	Observing children's motor development	15	35	
5	The child shows a response to a sound or visual stimulus	17	33	



(Source: Author)

Table 2. Motor and Cognitive Development

Item no.	Questions	Good	Not Good	Total Respondent
1	Sitting up unaided (8-10 months old)	10	40	50
2	Walking (12-18 months old)	15	35	
3	Responding to visual stimuli	12	38	
4	Say simple words (12-18 months old)	15	35	

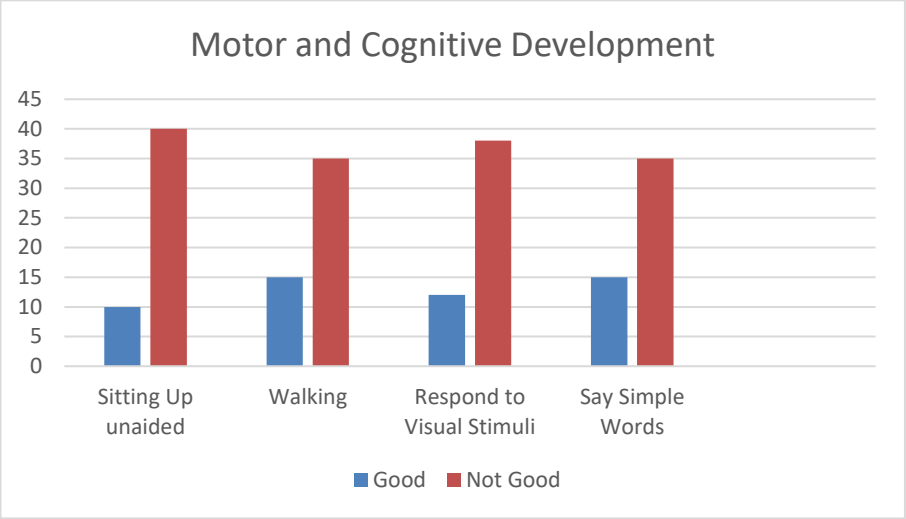


Figure 1. Graphic export for model (AMOS)

(Source: Author)

4. Discussion

From the results of the above research, it was found that most of the children in Manukan Village, Gambiranom have the opportunity to suffer from stunting. out of 50 children studied, more than 50% of the children experienced motor and cognitive disorders and experienced delays in development. This is influenced by several factors such as lack of complementary food and breast milk to health and infections suffered by children.

Stunting, defined as a form of chronic malnutrition, has been demonstrated to impact not only a child's physical growth but also their motor and cognitive development (Nishiura et al., 2024). Infants who are stunted often exhibit delays in reaching various developmental milestones, both motor and cognitive, when compared to infants who grow normally. These developmental milestones include the infant's ability to move, interact, and respond to stimuli from their environment (Fujihara et al., 2024).

Infant motor development can be divided into two categories: gross motor and fine motor. Gross motor encompasses a baby's capacity to utilise their large muscles, including those responsible for sitting, crawling and walking (Asna & Syah, 2023). Fine motor, on the other hand, refers to the ability to use smaller muscles, such as those in the fingers, to grasp objects, pick things up or perform more precise movements.

Infants who are stunted often exhibit delays in gross and fine motor development (van Est-Bitincka et al., 2023). The following are some common delays observed in stunted infants:

- The ability to sit up without assistance is one of the earliest milestones in motor development. Typically, infants reach this milestone between 6 and 9 months of age. However, stunted infants tend to be delayed in achieving this ability. Malnutrition can lead to weak muscles and suboptimal bone development, which can prolong the time required for stunted infants to sit upright independently (Robertson et al., 2024).

- Crawling: The ability to crawl typically emerges between 8 and 10 months of age. Crawling necessitates the coordination of gross motor skills between the hands and feet, as well as the capacity to lift the body off the floor. Infants with stunted growth often encounter difficulties in achieving this due to the presence of weak muscle strength and a delayed development of motor coordination.

- The ability to walk is a significant indicator of motor development, typically emerging between 12 and 18 months of age. However, infants with stunted growth often fail to achieve this milestone, requiring a longer period to develop the requisite leg strength and balance. This delay can be attributed to a lack of muscle strength that should have been developed through adequate nutrition.

In addition to motor delays, stunted infants also demonstrate delays in cognitive development. Cognitive development refers to a baby's ability to process information, learn, remember, and respond to stimuli from the environment. There are several key indicators of cognitive development that show delays in babies who are stunted.

The ability to respond to visual and auditory stimuli is a key indicator of cognitive development. Typically, healthy infants will demonstrate a high level of responsiveness to such stimuli at an early age. However, infants who are stunted tend to demonstrate a slower rate of development in this ability. For example, they may exhibit delays in following the movement of objects with their eyes or responding to the call of their name. This could be attributed to impaired brain development resulting from a lack of intake of essential nutrients, such as iron, iodine and essential fatty acids, during the crucial period of brain development.

Learning and memory: A healthy infant's cognitive development encompasses the capacity to learn and remember new information, such as recognising faces or understanding routines. Stunted infants frequently exhibit delays in this domain. They may demonstrate difficulties in remembering or learning simple patterns, such as where specific toys are located or who their primary caregiver is. This delay is often attributed to a reduced number of synaptic connections in the brain due to nutritional deficiencies during critical periods of growth.

Communication and speech: In addition to delays in responding to stimuli, stunted infants also tend to experience delays in the development of speech. Typically, healthy infants reach the stage of saying simple words such as 'mama' or 'papa' at 12-18 months of age. However, stunted infants often take longer to reach this milestone. Impaired brain development caused by malnutrition also affects the areas of the brain responsible for communication and language.

A number of factors contribute to the delayed motor and cognitive development of stunted infants. These factors are typically associated with nutritional conditions, general health, and inadequate parenting.

Nutritional deficiencies represent the primary causal factor in stunting (Bortagarai et al., 2021). Deficiencies in macronutrients and micronutrients, including protein, iron, zinc, and iodine, exert a direct impact on physical growth and brain development. The early postnatal period represents a critical window of opportunity for the development of organs, particularly the brain. Nutritional deficiencies during this period can disrupt the formation of brain tissue, impair brain function, and reduce the infant's capacity to process information and learn (Flensborg-Madsen et al., 2023).

For instance, iron is crucial for neurodevelopment. Iron deficiency can impair cognitive abilities and result in diminished memory and information processing. Similarly, a deficiency in protein and calories will impact muscle and bone development, which play a pivotal role in motor development.

Furthermore, stunted infants are prone to recurrent infections, including diarrhoea, respiratory infections and other infectious diseases. Repeated infections can exacerbate stunting by impairing the body's ability to absorb nutrients effectively and depleting the energy required for growth and development (Nurlela Mariana Nababan, 2023).

Diarrhoeal infections result in the loss of essential nutrients, including fluids, electrolytes and protein. Consequently, infants with frequent infections experience delays in motor and cognitive development due to inadequate nutrient intake, which is necessary for optimal growth and development (Valdes et al., 2024).

In addition to the aforementioned factors, parenting also plays an important role in child development. Unsupportive parenting, such as a lack of cognitive and physical stimulation, can exacerbate developmental delays in stunted infants (B. Faltová, A. Mojžíšová, J. Holá, L. Shuranová, and Z. Čermák, 2024). Early stimulation is essential for a baby's brain development. For example, playing with the infant, talking, and providing visual and auditory stimulation can help accelerate cognitive development (Kozakevich et al., 2022).

However, in many families with poor economic conditions, a lack of knowledge about proper parenting and limited time and resources mean that babies do not receive the stimulation they require. This exacerbates existing stunting conditions, resulting in infants experiencing more severe developmental delays compared to children who receive better care (Ezuruike et al., 2022).

The motor and cognitive developmental delays experienced by stunted infants not only affect their infancy, but also have significant long-term impacts. Stunted children are at an elevated risk of learning difficulties at school, lower social skills, and prolonged physical and mental health problems (Kim et al., 2024). Therefore, in order to address stunting, comprehensive interventions are required that include improved nutrition, enhanced health services, and the education of parents on the importance of early stimulation (Pujihasvuty et al., 2024).

The results of this study are in accordance with the findings of Bortagarai et al. (2021), which identified several

significant factors associated with fine and gross motor delays. These include maternal pregnancy and obstetric history, such as planned pregnancy, type of delivery, and number of prenatal consultations. The following factors were identified as significant: consultations, medication use and pregnancy disorders; infant biological features and risks (sex, mechanical ventilation, feeding difficulties); sociodemographic factors (mother's career and education level, number of children and people living in the same household); and psychosocial issues related to participation in family routines and the presence of psychological risks (Bortagarai et al., 2021).

Similarly, research by Nababan (2023) indicates that several factors influence stunting, including maternal knowledge about exclusive breastfeeding, environmental sanitation, antenatal care, and health worker visits based on statistical tests. There is a significant relationship between the causes of stunting and an increase in the incidence of stunting is an indicator of inequality in health services. Therefore, it can be expected that health workers must improve nutritional status (Nurlela Mariana Nababan, 2023).

5. Conclusion

This study underscores the significant impact of stunting on motor and cognitive development in infants aged 0-24 months. The findings reveal that stunted infants experience substantial delays in motor skills such as sitting, crawling, and walking, as well as cognitive delays in areas like responding to stimuli, memory, and language development. Stunting, primarily due to chronic malnutrition during pregnancy and early childhood, hampers brain and nervous system development, which is critical during the first 1,000 days of life. Additionally, stunted infants are often more susceptible to recurrent infections, exacerbating health and developmental delays. Contributing factors include limited access to health services, poor nutritional resources, and a lack of parental awareness regarding the importance of nutrition. To address these issues, early nutritional interventions are crucial, starting in the prenatal period with adequate maternal nutrition, followed by exclusive breastfeeding and appropriate complementary feeding. Targeted government programs focusing on high-risk groups, especially those with low socio-economic status, can support families through nutritional counseling, supplementation, and affordable healthcare. Addressing stunting with a holistic approach involving healthcare, education, and social welfare sectors is essential to providing all children with equal opportunities for optimal growth and development.The study emphasizes the strong link between stunting and developmental delays, showing that chronic malnutrition disrupts key milestones in motor and cognitive growth. This developmental lag has long-term implications for the child's ability to learn, interact, and thrive in their environment. The study may be limited by factors such as sample size, geographic focus, and the inability to control for all environmental and genetic factors contributing to stunting. Further studies could benefit from longitudinal designs and larger, more diverse populations to validate these findings across various contexts. Future research could explore the effectiveness of specific nutritional interventions and government programs on reducing stunting rates. Additionally, research on the interaction between genetic predisposition and environmental factors, as well as the impact of maternal education, could yield deeper insights into preventive measures. This study highlights the need for a comprehensive approach to stunting prevention, emphasizing early intervention. Health services should prioritize prenatal and postnatal nutritional support, while social policies should ensure accessible healthcare and nutrition education for low-income families. Empowering parents with knowledge and resources can significantly mitigate the adverse effects of stunting, ultimately supporting healthier, more resilient communities.

Acknowledgments: The authors wish to express their gratitude toward Institute and all people for support this research.

Ethical Permissions: No ethical code and permissions needed.

Conflicts of Interests: The authors declared no conflicts of interests.

Authors' Contribution:

Funding/Support: No Funding Support.

Reference

[1] Asna, A. F., & Syah, M. N. H. (2023). Chronic Energy Malnutrition in Mothers Associated with Stunting. Jurnal Gizi Dan Dietetik Indonesia (Indonesian Journal of Nutrition and Dietetics), 11(2), 77. https://doi.org/10.21927/ijnd.2023.11(2).77-84

[2] B. Faltová, A. Mojžíšová, J. Holá, L. Shuranová, and Z. Čermák. (2024). "Health and school difficulties of children in foster care in the experience of their foster parents,." Medicni Perspekt., Vol. 29, No. 2, Pp. 143–151, Jun. https://doi.org/10.26641/2307-0404.2024.2.3076

[3] Bortagarai, F. M., Moraes, A. B. de, Pichini, F. dos S., & Souza, A. P. R. de. (2021). Risk factors for fine and gross motor development in preterm and term infants. CoDAS, 33(6). https://doi.org/10.1590/2317-1782/20202020254

[4] Ezuruike, E. O., Ibeneme, C. A., & Uwaezuoke, S. N. (2022). Dyselectrolytemia in under-five children with acute diarrhoea-induced dehydration: a cross-sectional study in a South-East Nigerian hospital. International Journal of Contemporary Pediatrics, 9(11), 1006. https://doi.org/10.18203/2349-3291.ijcp20222759

[5] Flensborg-Madsen, T., Mortensen, E. L., Dammeyer, J., & Wimmelmann, C. L. (2023). Early Motor Developmental Milestones and Personality Traits in Midlife: A 50-Year Follow-Up Study. Children, 10(4), 718. https://doi.org/10.3390/children10040718

[6] Fujihara, M., Watanabe, S., Kodama, K., Nakamura, K., Stanyon, M., Kanke, S., & Kassai, R. (2024). A qualitative descriptive study examining the impact of child-raising experience on Japanese family doctors. Journal of General and Family Medicine. https://doi.org/10.1002/jgf2.730

[7] Hartati, S., Zuhroh, D. F., & Auparai, S. (2024). Mother's knowledge and attitudes towards preventing stunting in their toddlers (1-5 years) in West Java Indonesia. Malahayati International Journal of Nursing and Health Science, 7(1), 80–86. https://doi.org/10.33024/minh.v7i1.202

[8] Inamdar, K., Tripathi, T., Molinini, R. M., Fang, W., Salgaonkar, A., & Dusing, S. C. (2024). Relationship Between Prone Skills and Motor-Based Problem-Solving Abilities in Full-Term and Preterm Infants During the First 6 Months of Life. Developmental Psychobiology, 66(6). https://doi.org/10.1002/dev.22525

[9] Karismadarma, D. R., Sugiyanto, S., Ekawati, F. F., & Riyadi, S. (2023). Relationship between Arm Muscle Strength, Lemb Muscle Strength, and Eyes-Feet Coordination with Basic Movement Ability of Elementary School Students. INTERNATIONAL JOURNAL OF MULTIDISCIPLINARY RESEARCH AND ANALYSIS, 06(07). https://doi.org/10.47191/ijmra/v6-i7-70

[10] Kartika, A. W., Setyoadi, S., Hayati, Y. S., & Setiowati, C. I. (2024). Roles and challenges of health cadres in handling stunting: a qualitative study. Healthcare in Low-Resource Settings. https://doi.org/10.4081/hls.2024.13057

[11] Kim, S.-H., Lee, S.-H., & Kim, S.-J. (2024). Effects of applying physical activity programs according to type of developmental delay in children. The K Association of Education Research, 9(3), 89–111. https://doi.org/10.48033/jss.9.3.6

[12] Kozakevich, E. B., Kozakevich, V. K., Ziuzina, L. S., Fesenko, M. E., & Melashchenko, E. I. (2022). Prediction of recurrent course of respiratory infections in premature infants. Modern Pediatrics. Ukraine, 7(127), 53–58. https://doi.org/10.15574/SP.2022.127.53

[13] McCarthy, E. K., Murray, D. M., & Kiely, M. E. (2022). Iron deficiency during the first 1000 days of life: are we doing enough to protect the developing brain? Proceedings of the Nutrition Society, 81(1), 108–118. https://doi.org/10.1017/S0029665121002858

[14] Ningrum, A. F. (2024). Sentiment Analysis of Public Opinion on Handling Stunting in Indonesia using Random Forest. Jurnal Statistika Dan Aplikasinya, 8(1), 31–40. https://doi.org/10.21009/JSA.08103

[15] Nishiura, S., Miyawaki, D., Hirai, K., Sukigara, A., Kakishita, Y., & Inoue, K. (2024). Association between hallucinations and sensory processing difficulties in children and adolescents. Frontiers in Psychiatry, 15. https://doi.org/10.3389/fpsyt.2024.1472328

[16] Nurlela Mariana Nababan. (2023). Factors Influencing Stunting Incidence. International Journal Of Health Science, 3(3), 01–06. https://doi.org/10.55606/ijhs.v3i3.2498

[17] Pujihasvuty, R., Nasution, L., Fajarningtiyas, D. N., Naibaho, M. M. P., Oktriyanto, Sari, D. P., Amrullah, H., Rahmadhony, A., Muthmainnah, M., & Devi, Y. P. (2024). Family economic resilience and early childhood parenting practices. British Journal of Midwifery, 32(1), 22–31. https://doi.org/10.12968/bjom.2024.32.1.22

[18] Robertson, C. M. T., Khademioureh, S., Dinu, I. A., Sorenson, J. A., & Joffe, A. R. (2024). Differences in gross motor and fine motor outcomes for toddlers after early complex cardiac surgery. Cardiology in the Young, 34(8), 1653–1661. https://doi.org/10.1017/S1047951124000428

[19] Sadikeen, S. S., Haque, N., Hossain, M. M., & Uddin, M. J. (2024). Impact of food price inflation on stunting in under five aged children in Bangladesh. Health Economics Review, 14(1), 68. https://doi.org/10.1186/s13561-024-00549-9

[20] Sari, D. T. (2023). Government Health Expenditure and Stunting Prevalence Reduction in Indonesia. Jurnal Perencanaan Pembangunan: The Indonesian Journal of Development Planning, 7(2), 192–208. https://doi.org/10.36574/jpp.v7i2.452

[21] Savova, E. M., Zavarina, A. Y., Shvedunova, V. N., & Ermolenko, M. L. (2024). Features of Physical and Motor Development of Children with Congenital Heart Diseases. I.P. Pavlov Russian Medical Biological Herald, 32(1), 121–132. https://doi.org/10.17816/PAVLOVJ322794

[22] Supriatin, E., Sudrajat, D. A., Annisa R, F., & Lindayani, L. (2020). THE EFFECT OF STUNTING ON COGNITIVE AND MOTOR DEVELOPMENT IN TODDLER CHILDREN : LITERATURE REVIEW. Jurnal Ilmu Keperawatan Anak, 3(2), 31–41. https://doi.org/10.32584/jika.v3i2.782

[23] Syihab, S. F., Stephani, M. R., Kumalasari, I., & Suherman, A. (2021). Socioeconomic Status in Relation to Stunting and Motor Skill Development of Toddlers in Urban and Rural Areas. Jurnal Kesehatan Masyarakat, 16(3), 340–347. https://doi.org/10.15294/kemas.v16i3.24382

[24] Valdes, C., Nataraj, P., Kisilewicz, K., Simenson, A., Leon, G., Kang, D., Nguyen, D., Sura, L., Bliznyuk, N., & Weiss, M. (2024). Impact of Nutritional Status on Total Brain Tissue Volumes in Preterm Infants. Children, 11(1), 121. https://doi.org/10.3390/children11010121

[25] van Est-Bitincka, L. A. C., Schuiringa, H. D., van der Heijden, P. T., van Aken, M. A. G., & Laceulle, O. M. (2023). Youth's Social Environments: Associations with Mental Problems and Achievement of Developmental Milestones in Times of Crises. Adolescents, 3(2), 366–381. https://doi.org/10.3390/adolescents3020025