LITERATURE REVIEW: THE IMPACT OF STUNTING ON THE LEARNING ACHIEVEMENT OF ELEMENTARY SCHOOL CHILDREN

Wulan Syarani Asdam and Septa Indra Puspikawati

Public Health Study Program, Faculty of Health, Medicine, and Life Sciences (FIKKIA), Universitas Airlangga, Indonesia

E-mail: wulansyaranisdm@gmail.com

ABSTRACT

Stunting can impact children's cognitive development by impairing the growth of neuronal cells in the brain. This condition may hinder children's ability to achieve academic success during their primary school years. This study examines the correlation between stunting and academic performance in elementary-aged children. A systematic literature review was conducted, involving the search for relevant articles and journals through the Google Scholar and PubMed databases. The inclusion criteria for this review encompassed nationally and internationally accredited references pertinent to the topic, published within the past five years. One article indicated no significant relationship between stunting and the academic performance of elementary school students. However, other studies identified a correlation between stunting and academic performance, with varying significance levels. Both internal and external factors influence academic achievement. Internal factors include students' learning motivation, concentration, parental involvement, and environmental conditions. Statistical analysis confirms a relationship between stunting and children's academic achievement.

Keywords: elementary school, learning achievement, stunting, stunting effect

INTRODUCTION

Indonesia is currently facing a double nutritional burden, which is common in several low—or middle-income countries. The double nutritional burden is a state of malnutrition that includes malnutrition and excess macro and micronutrients throughout life in populations, communities, families, and even individuals. (Shrimptom, 2012). Double nutritional burden is also defined as the co-existence of dietary deficiencies and excesses in communities in the same population (Djauhari, 2017).

The concept of the double burden of malnutrition was first introduced about a decade ago and is a global issue affecting both rich and poor countries. In 2020, it was found that 124 out of 143 countries worldwide (86.7%) faced a serious double burden of malnutrition, and 37 of these countries experienced three nutritional problems (stunting in children under five, anemia, and overweight) (Yangambi, 2020).

Stunting is a nutritional status based on Height-for-Age or Length-for-Age indices, which, when measured using anthropometric standards, fall within The thresholds are defined as a Z-score of less than -2 standard deviations (SD) to -3 SD for stunting, and less than -3 SD for severe stunting (Rahmadhita, 2020). Stunting can also be defined as a condition where a person's height is shorter compared to others of the same age (Sandjojo, 2017).

Based on the Global Nutrition Report data from 2020, children under the age of 5 have a fourfold higher risk of experiencing stunting (Yangambi, 2020). Prolonged malnutrition (chronic) can result in stunting. Stunting is a critical health issue that requires immediate intervention, and it is evident that stunting has become one of the focus areas of the Millennium Development Goals (MDGs) program (Agus Hendra AL Rahmad dan Ampera Miko, 2018).

In 2017, the global prevalence of stunting reached 22.2% of the total population, affecting approximately 150.8 million children under five years old. In that year, stunting affected 29% of children in Africa and 55% of children in Asia. Within Asia, the highest proportion was observed in South Asia (58.7%),

followed by Southeast Asia (14.9%), East Asia (4.8%), West Asia (4.2%), and Central Asia (0.9%). Among Asian countries, Indonesia had the third highest prevalence of stunting, following Timor Leste and India (WHO, 2018). Based on the Indonesian Nutritional Status Study (SSGI) 2021 conducted in 34 provinces, the national stunting rate decreased from 27.7% in 2019 to 24.4% in 2021. Although this prevalence has declined, according to WHO guidelines, it is still classified as high (>20%) and remains a public health issue (Kemenkes RI, 2022).

Various negative impacts can result from stunting conditions. The short-term effects of stunting include brain development disorders, intelligence impairment, physical growth disturbances, and metabolic issues in the body (Kementerian Keuangan Indonesia, 2022). Meanwhile, the long-term impacts that may arise include decreased cognitive abilities and academic performance, as well as reduced immune system resilience and an increased risk of contracting both communicable and non-communicable diseases. (Pratiwi, Sari and Ratnasari, 2021).

Cognitive abilities are brain-based skills required to perform various types of tasks ranging from simple to complex (Basri, 2018). Other research also mentions that stunting must be addressed as early as possible because it can affect intelligence levels, productivity, and academic achievement in children (Rahmah *et al.*, 2023).

The primary school age is the second golden age for the physical and mental development of children. This period holds a significant influence on their future. Malnutrition conditions such as stunting experienced by primary school-aged children can affect their ability to grasp the material presented in school, which impacts their academic performance (Picauly and Toy, 2013).

Learning achievement can be defined as the outcomes achieved by students based on their cognitive abilities. Learning achievement consists of two words: learning and achievement. In general, learning can be interpreted as the process of behavioral change resulting from an individual's interaction with their

environment to acquire knowledge, skills, and experience. Meanwhile, achievement is the result of an activity that has been carried out or created, either individually or in groups (Rambe, 2019). Learning achievement can also be interpreted as the learning outcomes achieved after going through the teaching and learning process (Giovanni and Komariah, 2020). Achievement in learning is one of the indicators of success or the ability of students to comprehend teaching materials during their education in institutions. One factor influencing learning achievement is the nutritional status of the students.

The purpose of this literature review is to determine the relationship between stunting nutritional status and academic achievement among elementary school students based on previous research findings.

METHOD

This study was conducted using a systematic literature review method with inclusion and exclusion criteria based on the PICOS approach (Population, Intervention, Comparison, Outcome, and Study type). The literature search in this study utilized online-accessible databases, namely Google Scholar and ScienceDirect. The search in the online databases was conducted by entering specific keywords such as "Impact of Stunting", "Learning Achievement", "Primary School", and "Stunting". The search process in this article follows the PRISMA Flowchart Diagram. The research articles used were those published from the last 5 years. The reason for reviewing articles from the last 5 years is to ensure the currency of data and information relevant to the latest research developments. This is important because recent studies reflect the most current trends, technologies, or findings, providing a more valid and contextual basis for analyzing the topic. Additionally, focusing on articles from this period helps maintain the relevance of the findings to current scientific and practical conditions. Additionally, the articles were open-access.

Table 1. PICOS Criteria

Parameter	Inclusion	Exclusion
Population	Children of primary school age	
Intervention	Stunting	
Outcome	Learning Achievement	
Study Type	Cross-sectional study type	Systematic literature review, literature review, and meta analysis

The search results based on the selected database identified a total of 32 articles from the ScienceDirect database and 80 articles from the Google Scholar database that matched the predefined keywords. All the articles found in both databases were subsequently assessed for their relevance. The titles and abstracts of all articles were analyzed based on the established criteria. The analysis results showed that 6 articles met the predetermined criteria.
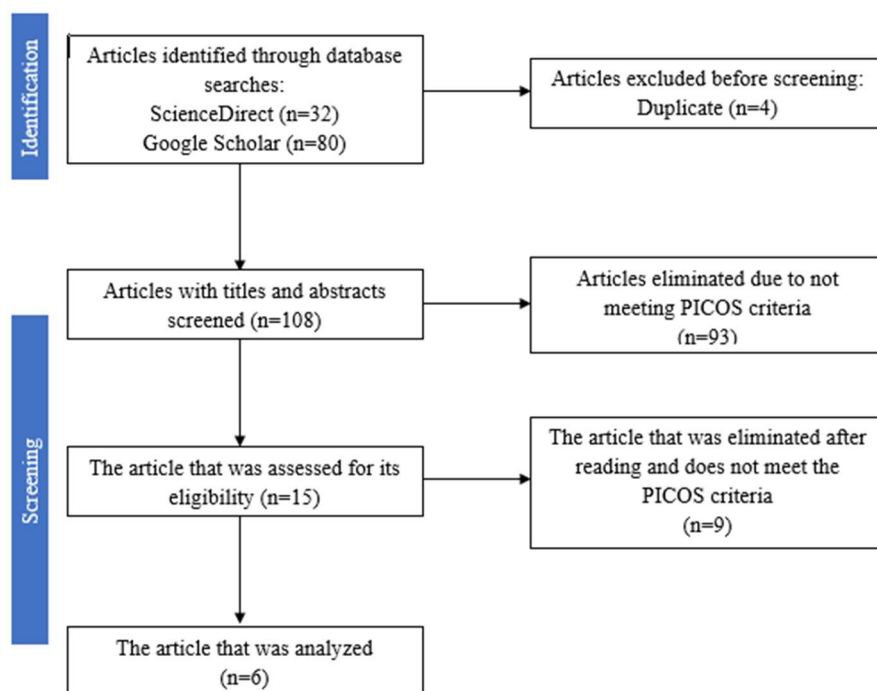

Figure 1. PRISMA Flowchart Diagram

RESULT

Based on the results of the article on the relationship between stunting and elementary school students' academic achievement that the author has gathered, it is found that only one article shows no relationship between stunting and elementary school students' academic achievement. Meanwhile, in other articles, a relationship was found with varying significance levels. There are several factors influencing students' academic achievement besides stunting. These factors can originate from students' internal and external environments. Internal factors include students' learning motivation, concentration, parental approach, and attention, as well as environmental factors. The relationship between stunting and elementary school students' academic achievement is evidenced by statistical analysis.

Table 2. Literature Review Results

Authors & Year	Title	Method	Result
(Amir *et al.*, 2020)	*Hubungan Stunting dengan Prestasi Belajar Peserta Didik Sekolah Dasar*	Cross-sectional Study	Based on the cross-tabulation results of subjects with stunting conditions, both respondents indicated with stunting and those not indicated with stunting tend to have 'very good' learning achievement in all three subjects. Therefore, no significant correlation exists between stunting and academic performance.
(Beckmann *et al.*, 2021)	Prevalence of Stunting and Relationship between Stunting and Associated Risk Factors with Academic Achievement and Cognitive Function: A Cross-Sectional Study with South African Primary School Children	Cross-sectional Study	There is a relationship between academic achievement in tests conducted on stunted children, with higher results observed in females compared to males. This indicates a link between stunting and academic performance, albeit with a weak level of significance at $r \leq 0.30$.
(Nadirawati, Haniarti, 2019)	Stunting Relationship with the Learning Achievements of Kiru-Kiru Elementary School Children in Soppeng Riaja District Barru	Cross-sectional Study	Based on research conducted on 31 students classified as stunted, 23 students showed poor academic performance. This indicates a correlation between stunting and its impact on students' academic achievement.

(Sarda *et al.*, 2022)	*Hubungan Stunting dengan Prestasi Belajar Siswa di SD Negeri Diule Kecamatan Tolitoli Utara Kabupaten Tolitoli*	Cross-sectional Study	Out of 36 students classified with stunted nutritional status, 12 students' academic performance was influenced by their stunting condition, while 24 others were influenced by other factors. Based on the study, it can be concluded that there is a weak correlation between stunted nutritional status and the academic achievement of students at Diule Public Elementary School, Tolitoli Utara Subdistrict, Tolitoli Regency. Therefore, it can be inferred that the issue of stunting is still mild and does not significantly hinder students' learning abilities.
(Anggraini *et al.*, 2019)	*Hubungan Stunting dengan Prestasi Belajar di SD Negeri 03 Bengkulu Selatan*	Cross-sectional Study	From the conducted research, it was found that 6 students have stunting nutritional status, with 5 of them having poor learning achievement while 1 student has good learning achievement. Based on the statistical tests conducted, a significant correlation was identified between the incidence of stunting and the academic performance of students at SD Negeri 03 Bengkulu Selatan Elementary School.
(Nurmalasari and Anggunan, 2020)	*Hubungan Stunting dengan Kadar Hemoglobin dan Prestasi Belajar pada Anak SD Negeri 13 Teluk Pandan Pesawaran*	Cross-sectional Study	The analysis results of the relationship between stunting and students' learning achievement at Teluk Pandan Public Elementary School found that 39 students were classified as stunted. Among these 39 students, 15 (38.5%) exhibited 24 students (61.5%) demonstrated good academic performance, while the remaining students showed poor academic performance. Statistical analysis revealed a significant correlation between stunted growth in students and their academic achievement.

DISCUSSION

In the study titled 'The Relationship between Stunting and Academic Achievement among Elementary School Students,' 355 respondents met the study criteria. Among them, 38 respondents were classified as stunted, with 20 (52.6%) of them being male (Amir *et al.*, 2020).

To examine the relationship between stunting and students' academic performance, researchers used the respondents' report card scores for Mathematics, Indonesian Language, and Physical Education (PJOK), which were analyzed through cross-tabulation

In the cross-tabulation Chi-square test results with a 95% significance level, the probabilities for the subjects of Bahasa Indonesia (p-value=0.374), Mathematics (p-value=0.730), and PJOK (p-value=0.623) indicate no significant relationship between stunting and academic achievement among elementary school students with stunting status at MIN 5 and MIN 9 in Banda Aceh City.

In contrast to previous studies, the article titled 'Prevalence of Stunting and Relationship between Stunting and Associated Risk Factors with Academic Achievement and Cognitive Function: A Cross-Sectional Study with South African Primary School Children' showed a relationship between academic achievement and tests conducted on children with stunting status. However, the relationship obtained from 'The Flanker Test Performance' showed a weak level of significance ($r \leq 0.30$). This can be seen from the values of $r=0.19$ for female students and $r=0.13$ for male students (Beckmann *et al.*, 2021).

The value indicates a slightly stronger relationship between stunting and academic achievement among female students compared to male students. This study aligns with the research titled "The Relationship between Stunting and Academic Achievement of Students in Public Elementary Schools in Diule District, North Tolitoli Regency." The study involved 36 stunted students (31%) out of a total of 120 sampled students (Sarda *et al.*, 2022).

The cross-tabulation results revealed that 31 students (26%) demonstrated good academic

achievement, comprising those with stunted nutritional status, whereas 5 students (4%) exhibited poorer academic performance from the stunted category. Based on the correlation test results with a significance level of 95%, a correlation coefficient of 0.331 was obtained, indicating a weak relationship between stunted nutritional status and academic performance, as the value falls within the range of 0.20 to 0.399 (Sarda *et al.*, 2022).

The two studies are in line with previous research titled "The Relationship between Stunting and Academic Achievement of Elementary School Children in Slum Areas, Central Jakarta Municipality." This research indicates that the z-score for stunting and child concentration parameters are weakly correlated with children's academic achievement, with an R-value of 0.177 for the stunting parameter (Arfines and Puspitasari, 2017).

Another study indicates that there is a significant relationship between stunting nutritional status and elementary school students' academic achievement. A study titled "The Relationship between Stunting and Academic Achievement of Elementary School Children in Kiru-Kiru Public Elementary Schools, Soppeng Riaja Subdistrict, Barru Regency" confirms a significant association. It reports that out of 31 stunted respondents, 8 (25.8%) showed good academic performance, while 23 (74.2%) exhibited poor academic performance (Nadirawati, Haniarti, 2019).

The reviewed studies consistently explore the relationship between stunting and academic performance in elementary school students, all employing a cross-sectional design. Several studies, such as those by Beckmann et al. (2021) and Anggraini et al. (2019), found a significant, albeit weak, correlation between stunting and learning outcomes. However, other research, like Amir et al. (2020), indicated no meaningful relationship, suggesting that stunted students can achieve good academic performance. Additionally, environmental factors and gender differences contributed to variations in findings. For instance, Beckmann et al. (2021) noted that female students performed better than

males, while Sarda et al. (2022) identified other external factors influencing academic achievement beyond stunting.

These discrepancies may stem from differences in sample size, geographic and socio-economic contexts, or methods of data collection. Such variations highlight the complexity of the stunting-education relationship and suggest that stunting alone may not be the sole determinant of academic success. Policymakers and researchers should consider these nuances when designing interventions, as strategies must address broader socio-environmental factors alongside nutritional improvement to effectively enhance students' learning outcomes.

The study titled "The Relationship between Stunting and Learning Achievement in Public Elementary School 03, South Bengkulu" showed cross-tabulation results indicating that 5 out of 6 stunted children (83.3%) have poor learning achievement, while the remaining 16.7% have good learning achievement. After analyzing using the Chi-square test, a p-value of 0.016

was found, which is less than the significance level α. Other studies have also indicated a significant relationship between stunting and students' learning achievement in elementary schools.

The study titled "The Relationship between Stunting and Learning Achievement of Elementary School Children in Kiru-Kiru, Soppeng Riaja Subdistrict, Barru District" found a significant relationship, with 8 stunted respondents (25.8%) having good learning achievement and 23 stunted respondents (74.2%) having poor learning achievement (Anggraini *et al.*, 2019). In conclusion, based on the statistical test results, there is a correlation between stunting incidence and academic achievement.

In the article titled "The Relationship between Stunting, Hemoglobin Levels, and Learning Achievement in Students at SD Negeri 13 Teluk Pandan Pesawaran," the analysis revealed that out of 39 stunted students, 15 had poor learning achievements while 24 had good learning achievements. Statistical analysis yielded a p-value of 0.026 (p<0.005), indicating a significant

association between stunting status and learning achievement (Nurmalasari and Anggunan, 2020).

Stunting represents a manifestation of growth impairment in children. When stunting occurs, it can disrupt the body and the development of various parts of the child's body. One crucial area requiring optimal growth is the brain, which houses millions of nerve cells crucial for a child's cognitive responses. Therefore, stunting plays a significant role in a child's academic achievement (Picauly and Toy, 2013).

The research conducted by Dezi Ilham and Wilda Laila (2017) is consistent with these three studies. Out of a total of 12 stunted students, 9 students (75%) had low learning achievements, while 3 students (25%) had high learning achievements. After conducting a Chi-square statistical test, a p-value of 0.026 was found, indicating that the occurrence of student stunting is associated with student learning achievements at SDN 09 Nanggalo in 2017 (Ilham and Laila, 2018). Another study indicated that stunting significantly correlates with the level of intellectual intelligence among newly enrolled

elementary school children in Nanggalo District, Padang City, as evidenced by bivariate analysis with p<0.05 (p=0.013) (Ginting and Pandiangan, 2019). Another research also demonstrated that poor dietary patterns increase the risk of declining academic performance by 0.828 times (Saniarto and Panunggal, 2013).

CONCLUSION

This literature review indicates that children with stunted growth tend to achieve lower learning outcomes compared to children with normal nutritional status. Therefore, there is a need for monitoring the nutritional intake of pregnant women and children, as well as identifying factors to prevent stunting, to optimize children's learning achievements during their critical early years (elementary school age).

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