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Article Reviews

Impact of Nutritional Interventions and Antenatal Care on Stunting in Indonesia: A Systematic Review

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Abstract

Maternal nutrition is vital for fetal growth, infant health and survival, and long-term development. Indonesia is ranked as the country with the highest number of stunting cases in Southeast Asia. To address this, the government has prioritized preventing stunting by providing iron tables to adolescent girls, offering antenatal care (ANC) and nutritional interventions to pregnant women, and providing nutritional support to children. Despite some progress, the reduction rate still needs to be increased to meet targets, partly due to health services and resource disparities. This study systematically reviews the literature on the impact of nutritional interventions ANC on stunting prevention in Indonesia. This review followed the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines. Articles were sourced from Google Scholar, PubMed, Science Direct, Embase, and ProQuest databases, with only articles discussing the impact of nutrition and ANC interventions on stunting in Indonesia included. Two reviewers independently extracted the data and assessed the quality of the studies. Searches across five databases yielded 245 articles. After screening, ten articles were selected for analysis. The results indicated that nutrition and ANC interventions positively impacted the reduction of stunting prevalence, with several studies reporting significant reductions in areas such as Malang, Central Sulawesi, and Kalimantan. Further research is needed to assess the long-term effectiveness of these interventions and develop more effective and sustainable intervention models.

Keywords *Nutrition Interventions, Antenatal Care, Stunting*

INTRODUCTION

Maternal nutrition plays a crucial role in fetal growth, infant health, and survival, as well as the long-term development of children (Likhar & Patil, 2022). The mother provides all the necessary nutrients in the first 1000 days, which includes the period from conception to the first six months of a child's life (Young et al., 2018). Initially, these nutrients are supplied in the womb and then through exclusive breastfeeding for the first six months. Maternal malnutrition during pregnancy significantly contributes to poor fetal growth and stunting in children (Black et al., 2013). Stunting is characterized by delayed linear growth and development in children, primarily due to chronic malnutrition (World Health Organization, 2018). According to WHO standards, stunting occurs when a child's height is at least two standard deviations below the Child Growth Standards median (World Health Organization, 2014). Stunting impacts children's overall health, leading to poor cognition, low academic performance, limited human capital, suboptimal physical growth, and an increased probability of developing chronic diseases in the future (Black et al., 2013; Diana et al., 2021). Stunting is a global issue, particularly prevalent in low- and middle-income countries (LMIC), affecting at least 136.4 million children (World Health Organization, 2014). In high-income countries, 2.1 million children are affected by this condition (World Health Organization, 2014).

Indonesia, one of the LMICs, has a high prevalence of stunting. It is ranked as the country with the highest number of stunting cases in Southeast Asia (Erlyn et al., 2021). Due to the urgency

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of the stunting problem in Indonesia, the government has prioritized accelerating stunting reduction in the 2020-2024 National Medium-Term Development Plan (RPJMN). The Ministry of Health has implemented three efforts to prevent stunting in Indonesia: providing Iron Tablets (TTD) for adolescent girls, offering Antenatal Care (ANC) and nutritional interventions for pregnant women, and providing nutritional interventions for children aged 6-24 months (Ministry of Health Republic Indonesia, 2022). Based on the 2023 Indonesian Health Survey (SKI), the prevalence of stunting in Indonesia was 21.5 percent, indicating a decrease of approximately 0.8 percent compared to the previous year (Ministry of Health Republic Indonesia, 2024). However, this figure is still far from the target reduction set for 2024, which is 14 percent. The number indicates that, although progress has been made in reducing stunting, the reduction rate is still insufficient to achieve the target. Other factors may influence the impact of government programs in addressing stunting, so additional programs may be needed to support the existing three programs.

Studies evaluating nutritional interventions and antenatal care (ANC) specifically for pregnant women are still limited in Indonesia. Previous systematic studies have generally discussed nutritional interventions without focusing on pregnant women (Zaleha & Idris, 2022; Manoppo & Huriah, 2022). It is essential to identify and evaluate more targeted interventions for pregnant women to reduce the prevalence of stunting significantly. Nutritional and antenatal care interventions are crucial in preventing stunting as they take advantage of the critical first 1000 days of life to provide optimal nutrition and care, making them more effective and efficient than interventions initiated after a child has already experienced stunting (Saleh et al., 2021). Research on nutrition interventions and antenatal care has been conducted through case studies (Muthia et al., 2020; Frety, 2021; Erlyn et al., 2021; Wardani et al., 2021; Salim & Muslimin, 2023). However, these case studies often focus on specific instances, limiting the findings' scope and generalizability. In contrast, systematic reviews offer a more comprehensive picture of the effects of interventions and reveal patterns and trends that may need to be visible in individual case studies (Khan et al., 2011). This study addresses the knowledge gap by systematically reviewing the literature on the impact of nutritional interventions and ANC on stunting prevention in Indonesia.

LITERATURE REVIEW

Stunting is a condition characterized by inadequate growth in children, measured as a height significantly below the expected norm for their age. This condition is typically caused by chronic malnutrition and recurrent infections (Black et al., 2013). Stunting reflects prolonged malnutrition and is often indicative of poor child health. Leroy and Frongillo (2019) emphasized that stunting is a crucial marker of malnutrition and poor child health. Globally, stunting remains a significant public health issue. In developing countries, including Indonesia, the prevalence of stunting remains high despite reported declines in recent years (Erlyn et al., 2021). In Indonesia, the prevalence of stunting serves as a critical indicator for assessing children's nutritional and health status (Ministry of Health Republic of Indonesia, 2022).

Stunting, a condition characterized by inadequate growth in children, is influenced by various factors that can be categorized into three main groups. First, parental factors include the nutritional status of the mother during the first 1,000 days of the child's life, social factors such as maternal education, and the height of the mother or other relatives with short stature (Berhe et al., 2019). Poor maternal nutritional status and socioeconomic factors can impact nutrition access and understanding, thereby contributing to stunting (Young et al., 2018). Nutritional interventions for pregnant women and social support can mitigate the risk of stunting. Second, child factors encompass child nutrition, frequent infections, and the duration of weaning. Inadequate nutrition and frequent infections can impede child growth (Angkat, 2018). Third, environmental factors

include access to clean water, sanitation, and fetal health conditions. Improved sanitation, access to clean water, and quality antenatal care can mitigate the negative impacts of environmental factors on child growth (Sinatrya & Muniroh, 2019; Salim & Muslimin, 2023).

RESEARCH METHOD

We systematically reviewed the literature to gather evidence from the past decade on the effects of nutrition interventions and ANC on stunting prevention in Indonesia. This review followed the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines. It included studies published in Indonesian and English from 2014 to 2024, sourced from Google Scholar, PubMed, ScienceDirect, Embase, and ProQuest databases.

Search Strategy

We searched five databases using keywords and adjusted the search strategy to meet specific needs. An information specialist (KD) formulated this search strategy. The English language literature search included the keywords: ("nutritional interventions" OR "nutrition programs" OR "nutrition intervention") AND ("antenatal care" OR "prenatal care" OR "maternal care") AND ("stunting" OR "child stunting" OR "growth failure") AND ("Indonesia" OR "Indonesian"). The Indonesian language literature search included the keywords: ("*intervensi gizi*" OR "*program gizi*" OR "*intervensi nutrisi*") AND ("*perawatan antenatal*" OR "*perawatan prenatal*" OR "*perawatan maternal*") AND ("stunting" OR "*gagal tumbuh anak*" OR "*gangguan pertumbuhan*") AND ("Indonesia" OR "Indonesia").

Study Selection and Eligibility Criteria

This study evaluates the impact of nutritional interventions and antenatal care on stunting prevention in Indonesia. Articles included in this review were selected based on eligibility criteria established by two reviewers, EK and KS. The studies considered include cohort studies and randomized controlled trials (RCTs) on the impact of nutritional interventions or antenatal care on stunting incidence. In this review, we included only studies published in English and Indonesia that involved nutritional interventions, particularly in pregnant women, and ANC relevant to stunting prevention in Indonesia.

Data Abstraction and Quality Assessment

Two reviewers, EK and KS, independently assessed the eligibility of articles for this systematic review, which focused on the impact of nutritional interventions and ANC on stunting in Indonesia. This process included data abstraction from eligible articles and a quality assessment of the selected studies. In cases of disagreement between the assessors, reviewers discussed the issues and resolved them jointly. A data abstraction table was employed to report the results, which included the following categories: author, location, study design, actions, and impact on stunting. In assessing study quality, reviewers utilized relevant assessment tools, including (1) The Cochrane Risk of Bias tool for trials (RCTs and quasi-trials) and (2) The CEMBa (Center for Evidence-Based Management) tool for case studies. Refer to Figure 1 for a detailed overview of the article selection process.

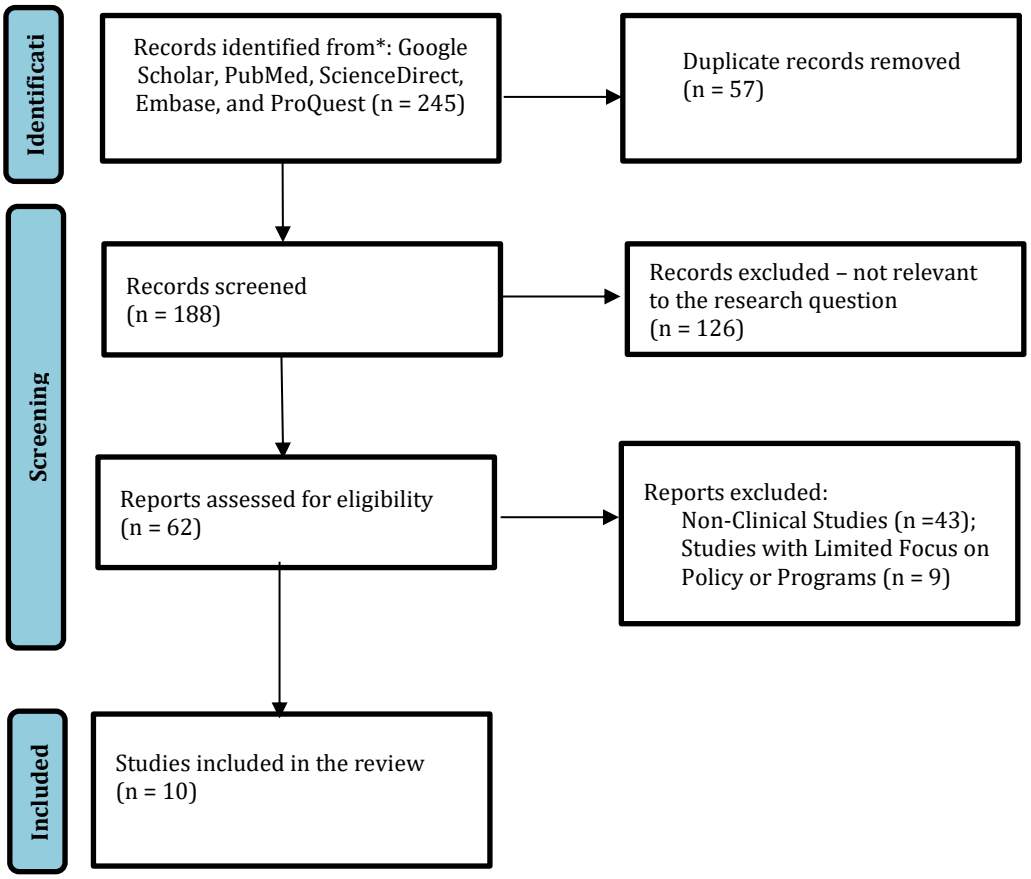

Figure 1. PRISMA Flow Diagram

FINDINGS AND DISCUSSION

Descriptive Summary of Studies

A comprehensive literature search was conducted across five databases: Google Scholar, PubMed, ScienceDirect, Embase, and ProQuest, yielding 245 articles. The subsequent elimination of duplicates and the application of inclusion and exclusion criteria refined the selection to 10 articles deemed suitable for further analysis. We thoroughly examined these articles to evaluate the impact of nutritional interventions and antenatal care on preventing stunting in Indonesia. The following table presents the extracted data from the selected literature.

Table 1. Data Extraction

Author(s) and Years	Locus	Study Design	Impact on Stunting
Saranani et al. (2023)	Southeast Sulawesi	RCT/Trial	There is an increase in the weight of pregnant women, but it is not statistically significant.
Mitra et al. (2022)	Pekanbaru	RCT/Trial	There is no specific data on stunting reduction from nutritional intervention and ANC.

Author(s) and Years	Locus	Study Design	Impact on Stunting
Maulana et al. (2022)	Malang	RCT/Trial	There was a reduction in the prevalence of stunting from 28.3% in 2017 to 11.41% in 2020.
Siahaan (2023)	Surabaya	RCT/Trial	Significant increase in hemoglobin (Hb) levels, albumin, and maternal weight following the intervention, as well as an increase in birth weight. Improved Hb and upper arm circumference (LILA) levels were correlated with higher birth weight.
Helmizar and Rahmi (2021)	West Sumatera	RCT/Trial	Maternal weight increased from 58.64 kg to 59.74 kg after the education, with a significant difference ($p = 0.003$).
Siregar et al. (2023)	East Kalimantan	RCT/Trial	An increase in stunting prevention behaviours was observed after the intervention.
Nurfatimah et al. (2021)	Central Sulawesi	Cohort studies	A significant reduction in the prevalence of stunting was observed in the intervention group compared to the control group.
Paratmanitya et al. (2021)	Yogyakarta	RCT/Trial	This article does not directly assess the impact on stunting but focuses on increasing early antenatal visits.
Beatty et al. (2024)	South Sumatra, West Kalimantan, and Central Kalimantan	RCT/Trial	A significant decrease in stunting rates in the intervention group.
Permatasari et al. (2021)	West Java	RCT/Trial	The article does not directly report significant changes in stunting prevalence resulting from these interventions.

Table 1 shows various approaches and contexts to prevent stunting in Indonesia. Researchers conducted these studies in diverse locations, including both urban and rural areas across various regions, such as Southeast Sulawesi (Saranani et al., 2023), Pekanbaru (Mitra et al., 2022), Malang (Maulana et al., 2022), Surabaya (Siahaan, 2023), West Sumatra (Helmizar & Rahmi, 2021), East Kalimantan (Siregar et al., 2023), Central Sulawesi (Nurfatimah et al., 2021), Yogyakarta (Paratmanitya et al., 2021), South Sumatra (Beatty et al., 2024), West Kalimantan (Beatty et al., 2024), Central Kalimantan (Beatty et al., 2024), and West Java (Permatasari et al., 2021). The research loci differ across the ten articles we analyzed.

The methodology used in these studies primarily consisted of randomized controlled trials (RCTs) and cohort studies (Nurfatimah et al., 2021), focusing on various interventions related to nutrition and antenatal care (ANC). These interventions include the provision of nutritional supplements (Saranani et al., 2023; Siahaan, 2023) and education on maternal and child nutrition (Mitra et al., 2022; Maulana et al., 2022; Helmizar & Rahmi, 2021; Siregar et al., 2023; Nurfatimah et al., 2021; Paratmanitya et al., 2021; Beatty et al., 2024; Permatasari et al., 2021). The majority of stunting prevention efforts in Indonesia focus on the provision of ANC.

Regarding impact, several studies reported positive results related to stunting prevention. For example, there was a significant decrease in stunting prevalence in Malang from 28.3% to 11.41% following a comprehensive education and nutrition intervention (Maulana et al., 2022). Similarly, in Central Sulawesi, stunting prevalence was significantly lower in the intervention group (3.1%) compared to the control group (28.1%) at six months of age (Nurfatimah et al., 2021). In South Sumatra, West Kalimantan, and Central Kalimantan, a nutrition education and supplementary feeding program have significantly decreased stunting prevalence from 40% to 25% in the intervention group (Beatty et al., 2024).

However, some studies did not directly report a decrease in stunting but showed improvements in maternal health and behaviours related to stunting prevention (Saranani et al., 2023; Mitra et al., 2022; Siregar et al., 2023; Paratmanitya et al., 2021; Permatasari et al., 2021). Additionally, the nutrition and antenatal care (ANC) interventions were implemented for only 12 days, with no subsequent evaluation or measurement of the success of these activities.

CONCLUSIONS

This study indicates that nutrition and antenatal care (ANC) interventions in Indonesia have been implemented across various locations using randomized controlled trials (RCTs) and cohort studies. Further evaluation is needed to assess the long-term success of these interventions. Further research will evaluate the long-term effectiveness of nutritional interventions and antenatal care in preventing stunting in Indonesia, focusing on developing more effective and sustainable intervention models.

LIMITATION & FURTHER RESEARCH

This systematic review has several limitations. Including only ten studies restricts the range of evidence and may not fully represent the diverse contexts of nutritional and ANC interventions in Indonesia. The interventions varied in approach, duration, and delivery, complicating effectiveness assessment. Many studies focused on related health improvements rather than directly measuring changes in stunting rates, limiting precise impact evaluation. Short intervention durations and varying study quality also affect reliability. Potential publication bias may favour more positive results. Future research should address these limitations by expanding the sample size, standardizing intervention methods, and including long-term follow-up to assess the impact on stunting prevention better.

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