

Impact of Malnutrition on Iron Deficiency Anemia in Children

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ABSTRACT

Malnutrition is a serious health issue, particularly in developing countries like Indonesia. It is characterized by inadequate nutritional intake, including iron, which plays a crucial role in hemoglobin formation. As a result, children suffering from malnutrition often experience iron deficiency anemia (IDA), negatively affecting their growth, development, and overall health. This study is to determine the impact of malnutrition on the occurrence of iron deficiency anemia in children through a literature review. This study employs a Literature Review method by reviewing relevant national and international journals from the last ten years. Data were collected through searches on Google Scholar, ResearchGate, NCBI, Pubmed, and ScienceDirect. Out of 10 screened journals, 4 met the inclusion criteria and were further analyzed. The incidence of iron deficiency anemia in children is greatly influenced by malnutrition. Children with inadequate nutritional intake, particularly iron, tend to have lower hemoglobin levels, leading to anemia. Additionally, low socioeconomic status limits access to nutritious food, further exacerbating the prevalence of anemia. A lack of family awareness regarding the importance of a balanced diet also contributes to the high rates of iron deficiency anemia in children. This condition can adversely affect physical growth, cognitive development, and increase the risk of infections in children. There is a significant relationship between malnutrition and the incidence of iron deficiency anemia in children. Low socioeconomic status and insufficient iron intake are the primary factors contributing to the high prevalence of anemia. Comprehensive nutritional interventions are crucial to preventing the long-term negative impacts on children's growth and development.

Keyword : Children; iron deficiency anemia; malnutrition

Introduction

Malnutrition is one of the most serious health issues, especially in developing countries, including Indonesia. Malnutrition occurs when the body does not receive adequate nutrition according to its needs, particularly iron, protein, vitamins, and minerals. The Ministry of Health defines malnutrition as a condition characterized by low body weight compared to height, typically ranging from -2 SD to -3.¹ Based on data from WHO, UNICEF, and the World Bank in 2020, 5.7% of children worldwide suffer from malnutrition, with a prevalence in Southeast Asia reaching 8.2%.² In Indonesia, according to RISKESDAS 2018, 7.3% of boys and 6.2% of girls aged 5-12 years suffer from malnutrition. In the Province of DKI Jakarta, 5.99% of children aged 5 to 12 years have a nutritional deficiency status, and 1.91% of them suffer from severe malnutrition.^{3,4} This condition requires serious attention from the government to improve the nutritional status of children to reduce the negative impacts caused by malnutrition.

Anemia is a condition where the number of red blood cells or hemoglobin levels in the blood are below normal limits. This results in a reduced ability of the blood to carry oxygen to all body tissues, which can lead to fatigue, weakness, and various other health disorders.⁵ WHO reported that anemia was a global health problem affecting more than 1.6 billion people worldwide in 2021, with around 40% of children aged 6-59 months and 29.9% of women of reproductive age suffering from anemia in.² The highest prevalence of anemia occurs in children and women of reproductive age, demonstrating the significant impact of anemia on public health. Anemia in children can lead to growth and developmental disorders, as well as an increased risk of infections.

One of the main causes of anemia, particularly in developing countries, is iron deficiency anemia, which occurs due to insufficient iron intake from food. Iron is an essential component in the production of hemoglobin, and a lack of iron can hinder the formation of healthy red blood cells.⁶ Iron deficiency anemia is very common in children suffering from malnutrition because they do not receive adequate nutrition to meet the body's needs. According to a study in Southeast Asia, the prevalence of iron deficiency anemia is 34% in Malaysia and 16% in Thailand. In Indonesia, Riskesdas 2013 data show that around 28.1% of children aged 5 to 12 years suffer from iron deficiency anemia.^{1,7} This indicates that nutritional intake significantly affects the incidence of anemia in children, and prolonged malnutrition can contribute to the occurrence of iron deficiency anemia.⁸

Material and Methods

The method used is a Literature Review that examines and synthesizes various selected literatures to derive conclusions and new ideas. The references consist of primary data in the form of national and international journals from the past 10 years. The journals utilized address topics based on the keywords “malnutrition, iron deficiency anemia, children,” with a total of 6 national journals and 4 international journals identified through searches on Google Scholar, ResearchGate, journal websites (NCBI, PubMed, and ScienceDirect). From this, 4 journals were selected as they were found to be relevant to the topic.

Results and Discussion

Definition of Malnutrition and Iron Deficiency Anemia

Malnutrition is a condition that occurs when the body does not receive sufficient nutrients according to its needs, especially iron, protein, vitamins, and minerals.⁹ Malnutrition is often characterized by low body weight compared to height or body weight that is below the standard growth chart for children. Iron, one of the essential nutrients, plays a role in the formation of hemoglobin, a protein in red blood cells that functions to transport oxygen throughout the body. Iron deficiency can lead to iron deficiency anemia (IDA), a condition where hemoglobin levels are below normal.¹⁰

Iron deficiency anemia (IDA) is the most common nutritional deficiency problem in children worldwide, particularly in developing countries, including Indonesia. This condition is caused by a lack of iron in the body.⁹ Iron deficiency anemia in children can lead to growth and developmental disorders and increase the risk of infections. This condition is one of the most significant health problems, especially in developing countries, including Indonesia.⁵

Epidemiology of Malnutrition and Iron Deficiency Anemia in Children

Approximately 5.7% of children worldwide suffered from malnutrition in 2021, with a prevalence in Southeast Asia reaching 8.2%.² **In Indonesia**, 7.3% of boys and 6.2% of girls aged 5-12 years experienced malnutrition.¹¹

Anemia is also a significant issue, with approximately 28.1% of children aged 5 to 12 years in Indonesia suffering from anemia, most of which is caused by iron deficiency.¹ Epidemiologically, the highest prevalence is found at the end of infancy and early childhood, due to factors such as iron deficiency during pregnancy, rapid growth during childhood accompanied by low iron intake from food, or the use of iron-deficient infant formula. Additionally, IDA is commonly found during adolescence due to rapid growth, inadequate

iron intake, and exacerbation from blood loss due to menstruation in adolescent girls. Household Health Survey (SKRT) data from 2007 showed the prevalence of IDA. The incidence rate of iron deficiency anemia (IDA) in Indonesian children under five is around 40-45%. SKRT data from 2001 indicated the prevalence of IDA in infants aged 0-6 months, 6-12 months, and children under five was 61.3%, 64.8%, and 48.1%, respectively.⁸

Impact of Malnutrition on Iron Deficiency Anemia in Children

Based on the literature review, malnutrition significantly influences the risk of iron deficiency anemia in children. A study revealed that children suffering from malnutrition tend to have lower hemoglobin levels compared to those with good nutritional status. The study also indicated that insufficient dietary iron intake is the primary cause of anemia in malnourished children. This exacerbates the condition, as iron is essential for the production of healthy red blood cells.¹²

Another study found that the prevalence of iron deficiency anemia is higher among children living in areas with low socioeconomic status. This condition is attributed to limited access to nutritious foods and low awareness of the importance of a balanced nutritional intake. In developing countries like Indonesia, these socioeconomic factors worsen the situation, leading to a high prevalence of iron deficiency anemia in malnourished children.⁸

Impact of Iron Deficiency Anemia on Children's Growth and Development

Iron deficiency anemia has a significant impact on children's growth and development. Studies show that children with anemia are at risk of experiencing delays in cognitive and physical development. Anemia can cause impairments in learning ability, concentration, and academic performance. Additionally, anemia increases the risk of infections, as the body does not receive enough oxygen to support the immune system.¹³

Children with low hemoglobin levels tend to be weaker and less active, which can negatively affect their quality of life. If left untreated, this condition can persist into adulthood, impacting productivity and overall health.⁷

Intervention and Prevention

To address malnutrition and iron deficiency anemia in children, appropriate nutritional interventions are crucial. Iron supplementation programs and food fortification are essential measures implemented in many developing countries to improve iron intake among vulnerable groups, including children. In Indonesia, programs such as the provision of iron supplementation tablets for adolescent girls and pregnant women represent efforts to

prevent anemia early.^{10,14}

Additionally, community education on the importance of a balanced diet must be intensified, particularly among low-income families with limited access to nutritious foods. Further research is needed to evaluate the effectiveness of nutritional interventions in reducing the prevalence of iron deficiency anemia and improving the nutritional status of children.

The findings of this literature review affirm that malnutrition significantly contributes to the occurrence of iron deficiency anemia in children. Malnourished children are at higher risk of anemia, as demonstrated by various studies analyzed. These findings align with previous research, which shows that low iron intake in malnourished children is directly associated with their low hemoglobin levels.^{8, 15, 16}

These findings are particularly relevant to the situation in Indonesia, where the prevalence of iron deficiency anemia among children remains high, especially in areas with low socioeconomic status. The implications of this review suggest that proper nutritional interventions, including iron supplementation and nutrition education, are essential to prevent the long-term impacts of iron deficiency anemia.

Conclusion

From the review of the articles, it is evident that there is a significant relationship between malnutrition and the incidence of iron deficiency anemia (IDA) in children. A lack of essential nutrients, particularly iron, leads to low hemoglobin levels, which negatively impact physical growth, cognitive development, and increase the risk of infections. Children living in areas with low socioeconomic status have a higher prevalence of IDA due to limited access to nutritious food and low awareness of the importance of a balanced diet. To reduce the prevalence of IDA, comprehensive nutritional interventions are necessary, including expanding access to nutritious foods, education on the importance of balanced nutrition, iron supplementation programs, and enhancing primary healthcare services focused on early identification and intervention for nutritional and anemia-related issues.

Declaration of Generative AI in Scientific Writing

The authors affirm that this article used generative artificial intelligence tools, including ChatGPT and Claude, solely to improve grammar and clarity, including in the methods section. These tools were not used for generating content, data analysis, or interpretation. The authors are fully responsible for the accuracy and integrity of the content as well as the conclusions presented in this study

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