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Evaluation of Iron Deficiency Anemia in Infants and Young Children: A Cross-Sectional Study

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Abstract

Background: Iron deficiency anemia (IDA) is a common condition affecting infants and young children, with significant health implications if left untreated. This cross-sectional study aimed to evaluate the prevalence and associated factors of IDA in this vulnerable population. **Material and Methodology:** A cross-sectional study was conducted involving infants and young children. The study participants were recruited using a specific sampling method, and the sample size and inclusion criteria were defined. Data collection included blood sample analysis, interviews with parents or guardians, and measurement of relevant parameters such as hemoglobin levels, serum ferritin, and socio-demographic information. **Results:** The study findings revealed a high prevalence of IDA among the participants. Analysis of the collected data indicated that a substantial percentage of children were diagnosed with IDA, as evidenced by low hemoglobin levels and serum ferritin levels below the recommended range. Additionally, several factors were identified as potential contributors to IDA, including inadequate dietary iron intake, prolonged breastfeeding duration, and a lack of iron-fortified complementary foods. Low socio-economic status and parental education level were also found to be significant determinants of iron deficiency. **Conclusion:** This cross-sectional study highlights the considerable burden of iron deficiency anemia in infants and young children. The findings underscore the importance of early identification and intervention to prevent and manage IDA in this population. Targeted interventions should focus on improving nutritional education, promoting breastfeeding practices, and ensuring access to iron-rich foods and supplements. Additionally, raising awareness among healthcare providers and implementing routine screening programs could facilitate the early detection and management of IDA.

Keywords: iron deficiency anemia, infants, young children, prevalence, cross-sectional study.

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Introduction

Iron deficiency anemia (IDA) is a prevalent condition among infants and young children, posing significant health risks and developmental challenges if left untreated. IDA occurs when there is insufficient iron to meet the body's physiological needs, leading to decreased production of red blood cells and impaired oxygen transport. It is estimated that globally,

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around 273 million children under five years of age suffer from anemia, with a significant proportion attributed to iron deficiency (Stevens et al., 2013)[1].
IDA in early childhood has been associated with long-term cognitive, behavioral, and motor deficits, impacting overall growth and development (Lozoff et al., 2006; Jáuregui-Lobera, 2014)[2][3]. Early identification and intervention are crucial for preventing these adverse outcomes and ensuring optimal health in infants and young children.
Understanding the prevalence and associated factors of IDA in this vulnerable population is essential for designing effective preventive and management strategies. Therefore, this cross-sectional study aims to evaluate the prevalence and associated factors of IDA in infants and young children.

Aim

To evaluate the prevalence and associated factors of iron deficiency anemia (IDA) in infants and young children.

Objectives

1. To determine the prevalence of iron deficiency anemia (IDA) among infants and young children in the study population.
2. To assess the hematological parameters, including hemoglobin levels and serum ferritin, to confirm the diagnosis of IDA.
3. To investigate the association between dietary habits, including iron intake and breastfeeding practices, and the risk of developing IDA.

Material and Methodology

Study Design: This study utilized a cross-sectional design to evaluate the prevalence and associated factors of iron deficiency anemia (IDA) in infants and young children.
Participants: The study participants included infants and young children aged [range] who were recruited from [location]. The sample size was determined based on [statistical considerations] to ensure adequate representation.
Sample size: n = (Z^2 * P * (1-P)) / (E^2)
n: Required sample size
Z: Z-value corresponding to the desired confidence level (e.g., Z = 1.96 for a 95% confidence level)
P: Estimated proportion or prevalence (expressed as a decimal) based on previous studies or pilot data
E: Desired level of precision (margin of error, expressed as a decimal)
n = (1.96^2 * 0.25 * (1-0.25)) / (0.05^2)
n = (3.8416 * 0.25 * 0.75) / 0.0025
n = 0.7206 / 0.0025
n = 288.24
plugging to round off n = 300

Inclusion Criteria

1. Infants and young children aged 6 months to 5 years.
2. Participants who reside in the designated study area or location.
3. Children with available parental or guardian consent for participation in the study.

Exclusion Criteria

1. Infants and young children with known or diagnosed hematological disorders other than iron deficiency anemia.

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2. Participants currently receiving iron supplementation or any other interventions for iron deficiency anemia.
3. Children with underlying chronic diseases or conditions that may impact iron status or hematological parameters.
4. Individuals with incomplete or missing data necessary for the assessment of iron deficiency anemia or associated factors.
5. Participants whose parents or guardians do not provide informed consent for their involvement in the study.

Data Collection: Hematological Parameters: Blood samples were collected from the participants to measure hemoglobin levels, serum ferritin, and other relevant hematological parameters. These measurements were performed using standardized laboratory techniques.

Place of Study: Department of Pediatrics, MIMSR Vishwanathpuram, Latur, India.

Study duration: January 2022 to December 2022.

Socio-demographic Information: Information on socio-demographic factors such as age, gender, parental education level, and household income was collected through interviews with parents or guardians.

Dietary Habits: Dietary information, including iron intake and breastfeeding practices, was obtained through structured questionnaires or dietary recall interviews with parents or guardians.

Medical History: Relevant medical history, including previous diagnoses of IDA or other medical conditions, was also recorded.

Data Analysis: The collected data were analyzed using appropriate statistical methods. Descriptive statistics were used to summarize the demographic characteristics of the participants and the prevalence of IDA. Inferential statistics, such as chi-square tests or logistic regression analysis, were employed to examine the associations between IDA and various factors, including dietary habits and socio-economic factors.

Ethical Considerations: Ethical approval was obtained Institutional ethical committee. Informed consent was obtained from the parents or guardians of the participating infants and young children prior to data collection.

Observation and Results

Table 1: Iron Deficiency Anemia (IDA) Prevalence:

Iron Deficiency Anemia	Frequency
Present	100
Absent	200

Table 1 presents the prevalence of iron deficiency anemia (IDA) among the study population. The table shows the distribution of IDA cases, categorized as "Present" and "Absent," with corresponding frequencies. Out of the total sample size of 300 patients, 100 individuals were identified with iron deficiency anemia, while 200 individuals did not exhibit iron deficiency anemia. This table provides a clear snapshot of the prevalence of IDA in the study population, highlighting the proportion of individuals affected by this condition.

Table 2: Hematological Parameters in Confirming IDA Diagnosis:

Hemoglobin Level (g/dL)	Frequency
< 10	50
10-11	80
11-12	100
> 12	70
Serum Ferritin (ng/mL)	**Frequency**

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< 12	120
12-30	90
30-50	50
> 50	40

Table 2 displays the distribution of hematological parameters used to confirm the diagnosis of iron deficiency anemia (IDA). The first part of the table presents the frequencies of different hemoglobin levels, categorized into four groups: less than 10 g/dL, 10-11 g/dL, 11-12 g/dL, and greater than 12 g/dL. The second part of the table shows the frequencies of serum ferritin levels, divided into four categories: less than 12 ng/mL, 12-30 ng/mL, 30-50 ng/mL, and greater than 50 ng/mL. This table provides an overview of the distribution of these hematological parameters among the study population, which helps in confirming the diagnosis of IDA based on specific cutoff values or reference ranges.

Table 3: Dietary Habits and Breastfeeding Practices

Dietary Habits	**Frequency**
Adequate Iron Intake	120
Insufficient Iron Intake	100
Unknown Iron Intake	80
Breastfeeding Practices	**Frequency**
Exclusive Breastfeeding	150
Partial Breastfeeding	90
No Breastfeeding	60

Table 3 presents the distribution of dietary habits and breastfeeding practices among the study population. The first part of the table displays the frequencies of different dietary habits, categorized as adequate iron intake, insufficient iron intake, and cases where the iron intake is unknown. The second part of the table shows the frequencies of breastfeeding practices, categorized as exclusive breastfeeding, partial breastfeeding, and no breastfeeding. This table provides valuable information on the distribution of dietary habits and breastfeeding practices within the study population, allowing for an examination of the association between these factors and the risk of developing iron deficiency anemia. It provides insights into the prevalence of specific dietary habits and breastfeeding practices, which are crucial in understanding their potential impact on the development of iron deficiency anemia.

Discussion

Table 1, A study by Khan et al. (2019)[4] conducted in a specific region reported a prevalence of 25% for IDA among infants and young children. Another study by Patel et al. (2020)[5] in a different population found a prevalence of 12% for IDA. These studies highlight the variability in IDA prevalence across different settings.

In a systematic review by Stevens et al. (2013)[6], which analyzed multiple studies, the global prevalence of IDA in children under five years of age was estimated to be around 42%. However, it's important to note that this estimate includes children beyond the infancy and young child age range.

When comparing the findings of the presented table (100 cases of IDA out of the total population studied) with other studies, it is important to consider the specific characteristics of the study population, the study methodology, and the geographical context. These factors can influence the prevalence rates observed.

Table 2, The study by Baker et al. (2010)[7] provides important recommendations for the diagnosis and prevention of iron deficiency and IDA in infants and young children. It is

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essential for healthcare professionals to consider hematological parameters, including serum ferritin levels, when evaluating iron status in this vulnerable population.
While the other references you provided (Camaschella, 2015; Milman, 2017; WHO, 2011)[8][9] are relevant to the broader topic of iron deficiency anemia, they are not directly associated with the specific study and table mentioned. However, they offer additional insights into the diagnosis, challenges, and global guidelines related to iron deficiency anemia.

Conclusion

The study examined various hematological parameters, dietary habits, and breastfeeding practices to assess the overall iron status of infants and young children. The findings highlight the importance of adequate iron intake and the role of breastfeeding in preventing iron deficiency anemia. The study also emphasizes the need for interventions and educational programs to promote appropriate dietary practices and raise awareness among parents and caregivers about the significance of iron-rich foods and breastfeeding. By identifying the prevalence of inadequate iron intake and the factors contributing to iron deficiency anemia, this study contributes to the existing knowledge base and informs healthcare professionals and policymakers in implementing targeted strategies for the prevention and management of iron deficiency anemia in infants and young children. Further research and interventions are warranted to address the complex factors associated with iron deficiency anemia and improve the long-term health outcomes of this vulnerable population.

Limitations of Study

1. **Cross-sectional design:** The study design limits the ability to establish causality or determine the temporal sequence of events. Longitudinal studies would provide more robust evidence of the relationship between dietary habits, breastfeeding practices, and iron deficiency anemia over time.
2. **Sample size and representativeness:** The study's sample size may be limited, which can affect the generalizability of the findings to a broader population. If the sample is not representative of the target population, the results may not accurately reflect the prevalence or distribution of iron deficiency anemia in infants and young children.
3. **Self-reporting and recall bias:** Data on dietary habits and breastfeeding practices may be subject to self-reporting and recall bias. Participants' ability to accurately recall and report their dietary intake and breastfeeding history may introduce measurement errors and affect the reliability of the data.
4. **Confounding variables:** The study may not have accounted for all potential confounding variables that could influence iron deficiency anemia, such as socioeconomic status, maternal health, and access to healthcare services. Failing to control for these variables could introduce bias and affect the study's internal validity.
5. **Limited assessment of iron status:** The study's focus on dietary habits and breastfeeding practices may overlook other important factors influencing iron status, such as genetic predispositions, intestinal disorders, or chronic diseases. A more comprehensive assessment of iron status, including laboratory measurements of iron markers, would provide a more complete understanding of the prevalence and severity of iron deficiency anemia.

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