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Risk Factors of Anemia in Children Age 6 Months to 5 Years Presenting to Qazi Hussain Ahmad Medical Complex

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ABSTRACT

Background: Anemia in children is a significant public health problem, particularly in developing countries, where it adversely affects physical, cognitive, and social development. This study aims to identify the key risk factors contributing to anemia in children aged 6 months to 5 years presenting to Qazi Hussain Ahmad Medical Complex, Nowshera.

Methods: This cross-sectional study was conducted over six months, including 135 children with anemia. Participants were recruited using a non-probability consecutive sampling technique. Data were collected through structured interviews with mothers, focusing on maternal, socioeconomic, and child-related factors. Information on maternal age, education, inter-pregnancy intervals, breastfeeding practices, socioeconomic status, and recent child morbidity (e.g., diarrhea) was recorded. Data were analyzed using IBM SPSS version 23, with chi-square tests applied to evaluate the association between risk factors and anemia severity. A p-value ≤ 0.05 was considered statistically significant.

Results: The most prevalent risk factors for anemia were poor socioeconomic status (59.3%), low maternal education (55.6%), and poor breastfeeding practices (44.4%). Other significant factors included short inter-pregnancy intervals (37.0%), younger maternal age (<24 years; 31.1%), and recent diarrhea episodes (22.2%). These factors were significantly associated with the severity of anemia, with p-values ≤ 0.05 for all associations.

Conclusion: Childhood anemia is influenced by a combination of socioeconomic, maternal, and child-related factors. Addressing these risk factors through targeted public health interventions, maternal education programs, and improved access to healthcare services can significantly reduce the burden of anemia in children.

Keywords: Anemia, Risk Factors, Children, Socioeconomic Status, Maternal Education, Breastfeeding, Morbidity, Qazi Hussain Ahmad Medical Complex.

INTRODUCTION

Anemia is a condition characterized by a reduction in hemoglobin concentration, hematocrit, or red blood cell count below the normal reference range for an individual's age, sex, and environmental conditions[1]. According to the World Health Organization (WHO), anemia in children under the age of five is defined as a hemoglobin level below 11.0 g/dL. It remains one of the most widespread nutritional disorders globally, with a particularly high prevalence in developing regions such as Africa, Asia, and Southeast Asia, where it affects approximately one in every four children[2].

Childhood anemia poses significant challenges to physical, mental, and social development, both in the short and long term[3]. It weakens immune function, impairs motor and cognitive development, and reduces school performance. In adulthood, childhood anemia can lead to diminished work productivity and earning potential, adversely impacting national economic growth. Thus, addressing anemia during early childhood is critical for ensuring individual well-being and broader societal progress[4].

The primary cause of anemia in children is iron deficiency, accounting for nearly half of the cases worldwide[5]. Factors contributing to iron deficiency include inadequate dietary intake, poor absorption, increased demand during periods of rapid growth, chronic blood loss, and inappropriate early introduction of complementary foods, such as cow's milk before six months of age. Beyond iron deficiency, other causes include deficiencies in folate, vitamin B12, and vitamin A, as well as infections like malaria, intestinal parasites, and chronic diseases. Genetic conditions such as hemoglobinopathies, hemolysis, and bone marrow disorders also play a role[6].

Several demographic and socioeconomic factors influence the prevalence of anemia. Studies have shown that younger children (below 24 months), those from underprivileged households, and those experiencing malnutrition or household food insecurity are at a higher risk[4]. Additionally, maternal factors such as poor education, low health status, and early initiation of complementary feeding are strongly associated with anemia. For instance, Dutta et al. observed that children under 24 months were disproportionately affected, with 68.6% of cases falling within this age group, and recent diarrhea episodes contributed to 22.0% of the anemia cases.

The rationale was to Understand the risk factors that contribute to anemia in children is essential for designing effective prevention and control strategies. By identifying the most prevalent risk factors in the local population, this study aims to provide insights that can guide public health initiatives, improve awareness, and promote better child health outcomes. The was to determine the frequency of risk factors for anemia in children aged 6 months to 5 years presenting at Qazi Hussain Ahmad Medical Complex, Nowshera.

METHODOLOGY

Study Design

This study was a cross-sectional analysis conducted at the Department of Pediatrics, Qazi Hussain Ahmad Medical Complex, Nowshera, Pakistan

The study was carried out over six months. The study was approved by the College of Physicians and Surgeons, Pakistan (CPSP) under RTMC Registration Number: PED-2021-305-6338 and the Research Review Board of Qazi Hussain Ahmad Medical Complex under the same registration number. Written informed consent was obtained from all guardians, and strict confidentiality and anonymity were maintained. The study adhered to the principles of the Declaration of Helsinki.

The sample size was calculated using the WHO sample size formula with an expected frequency of diarrhea as a morbidity factor (22.0%), a 7% margin of error, and a 95% confidence level. The final sample size was 135 children.

Sampling Technique

Participants were selected using a non-probability consecutive sampling method, ensuring all eligible children presenting during the study period were included.

Sample Selection

Inclusion Criteria:

1. Children aged 6 months to 60 months.
2. Both male and female participants.
3. Children diagnosed with anemia as defined by the operational criteria.

Exclusion Criteria:

1. History of blood transfusion within the last four months.
2. Known cases of blood dyscrasias.
3. Recent use of iron supplements (within the last three months).
4. Children separated from their mothers.
5. Children with congenital disorders such as Down syndrome.

Data Collection

After approval from the Research Review Board of the hospital, children meeting the inclusion criteria were recruited from the outpatient department of pediatrics. Written informed consent was obtained from the parents or guardians. Baseline information, including the child's age (in months), gender, height, and weight, was recorded.

Mothers were interviewed in simple, clear language to collect data on maternal age, educational status, inter-pregnancy intervals, breastfeeding duration, and household socioeconomic status. A structured questionnaire was used to document risk factors, including younger maternal age (<24 years), low maternal education (<matric), short inter-pregnancy intervals (<2 years), poor breastfeeding practices (<6 months exclusive), poor socioeconomic status (monthly income <Rs. 30,000), and recent morbidity (e.g., diarrhea in the last 30 days). All data were recorded by the principal investigator on a specially designed proforma.

Data Analysis

Data were analyzed using IBM SPSS version 23. Mean and standard deviations were calculated for numerical variables such as age, height, weight, and hemoglobin levels. Frequencies and percentages were computed for categorical variables like gender and the presence of risk factors.

Stratification was performed to control potential effect modifiers such as age, gender, and BMI. Post-stratification, chi-square tests were applied to evaluate the associations between risk factors and anemia severity. A p-value ≤ 0.05 was considered statistically significant.

RESULTS

This study analyzed 135 children aged 6 months to 5 years presenting with anemia at the Department of Pediatrics, Qazi Hussain Ahmad Medical Complex, Nowshera. Data were collected using a structured proforma.

The study included 135 children aged 6 months to 5 years. The average age of the participants was approximately 25 months, with toddlers (13–36 months) constituting the largest age group (48.1%), followed by infants (22.2%) and preschoolers (29.6%). A slight male predominance was observed, with 55.6% being boys. The mean hemoglobin level was 8.9 ± 1.2 g/dL, indicating that most children had moderate anemia based on WHO definitions. The average height and weight of the children were 84.3 cm and 11.5 kg, respectively, which are consistent with mild growth deficits often associated with anemia.

Table 1. Baseline Characteristics of the Study Population

Variable	Classification	Frequency (n)	Percentage (%)
Age (months)	6–12 months (Infants)	30	22.2%
	13–36 months (Toddlers)	65	48.1%
	37–60 months (Preschoolers)	40	29.6%
Gender	Male	75	55.6%
	Female	60	44.4%
Height (cm)	-	84.3 ± 11.2	-
Weight (kg)	-	11.5 ± 2.7	-
Hemoglobin Level (g/dL)	Mild Anemia (10–11 g/dL)	60	44.4%
	Moderate Anemia (7–9.9 g/dL)	65	48.1%
	Severe Anemia (<7 g/dL)	10	7.4%

The data revealed that poor socioeconomic status was the most frequent risk factor, affecting 59.3% of the children, followed by low maternal education (55.6%). Poor breastfeeding practices (less than six months exclusive breastfeeding) were also common, observed in 44.4% of cases. Low inter-pregnancy intervals (less than two years) were reported in 37% of cases, while younger maternal age (<24 years)

accounted for 31.1%. Interestingly, recent diarrhea episodes were recorded in 22.2% of children, further highlighting the interplay between infectious morbidity and anemia. These findings emphasize that maternal and socioeconomic factors play a critical role in childhood anemia in this population.

Table 2: Frequency of Risk Factors for Anemia

Risk Factor	Classification	Frequency (n)	Percentage (%)
Maternal Age	Younger Maternal Age (<24 years)	42	31.1%
	Maternal Age \geq 24 years	93	68.9%
Maternal Education	Illiterate (No Formal Education)	30	22.2%
	Primary Level (Grade 1–5)	25	18.5%
	Middle Level (Grade 6–8)	20	14.8%
	Matriculation (Grade 9–10)	35	25.9%
Inter-Pregnancy Interval	Higher Education (Above Matric)	25	18.5%
	Very Short (<12 months)	20	14.8%
	Short (12–24 months)	30	22.2%
	Optimal (25–36 months)	50	37.0%
Duration of Breastfeeding	Long (>36 months)	35	25.9%
	Poor Breastfeeding (<6 months)	60	44.4%
Socioeconomic Status	Adequate Breastfeeding (\geq 6 months)	75	55.6%
	Low Income (<Rs. 15,000/month)	40	29.6%
	Lower-Middle Income (Rs. 15,000–30,000)	40	29.6%
	Middle Income (Rs. 30,001–50,000)	35	25.9%
Recent Morbidity (Diarrhea)	Upper-Middle and High Income (>Rs. 50,000)	20	14.8%
	Present	30	22.2%
	Absent	105	77.8%

The association between anemia severity and risk factors revealed several significant trends. Children with younger mothers (<24 years) showed higher rates of moderate anemia, with 47.6% of such children falling into this category ($p = 0.045$). Poor breastfeeding practices were another significant contributor, with 50% of children in this group having moderate anemia ($p = 0.025$). Low maternal education emerged as a strong determinant, as more than half of these children had moderate anemia ($p = 0.012$). Socioeconomic status also had a notable impact, with 52.5% of children from low-income households showing moderate anemia and 12.5% having severe anemia ($p = 0.009$). Lastly, recent diarrhea episodes contributed significantly to anemia severity, particularly among those with severe anemia ($p = 0.041$). These findings underscore the importance of addressing modifiable risk factors, such as improving maternal education and promoting adequate breastfeeding, to mitigate the impact of anemia.

Table 3: Association Between Risk Factors and Severity of Anemia

Risk Factor	Mild Anemia (10–11 g/dL)	Moderate Anemia (7–9.9 g/dL)	Severe Anemia (<7 g/dL)	P-value
Maternal Age	15 (35.7%)	20 (47.6%)	7 (16.7%)	0.045
Maternal Education	25 (33.3%)	40 (53.3%)	10 (13.4%)	0.012
Inter-Pregnancy Interval	18 (36.0%)	25 (50.0%)	7 (14.0%)	0.032
Breastfeeding Duration	22 (36.7%)	30 (50.0%)	8 (13.3%)	0.025
Socioeconomic Status	28 (35.0%)	42 (52.5%)	10 (12.5%)	0.009
Morbidity (Diarrhea)	10 (33.3%)	15 (50.0%)	5 (16.7%)	0.041

This study highlights the multifactorial nature of anemia in children, with maternal, socioeconomic, and child-specific factors all playing vital roles. The most prevalent risk factors, such as poor socioeconomic status and low maternal education, point to the need for targeted public health interventions. Addressing

these underlying determinants through education, breastfeeding promotion, and socioeconomic support could significantly reduce anemia's prevalence and severity in this vulnerable population.

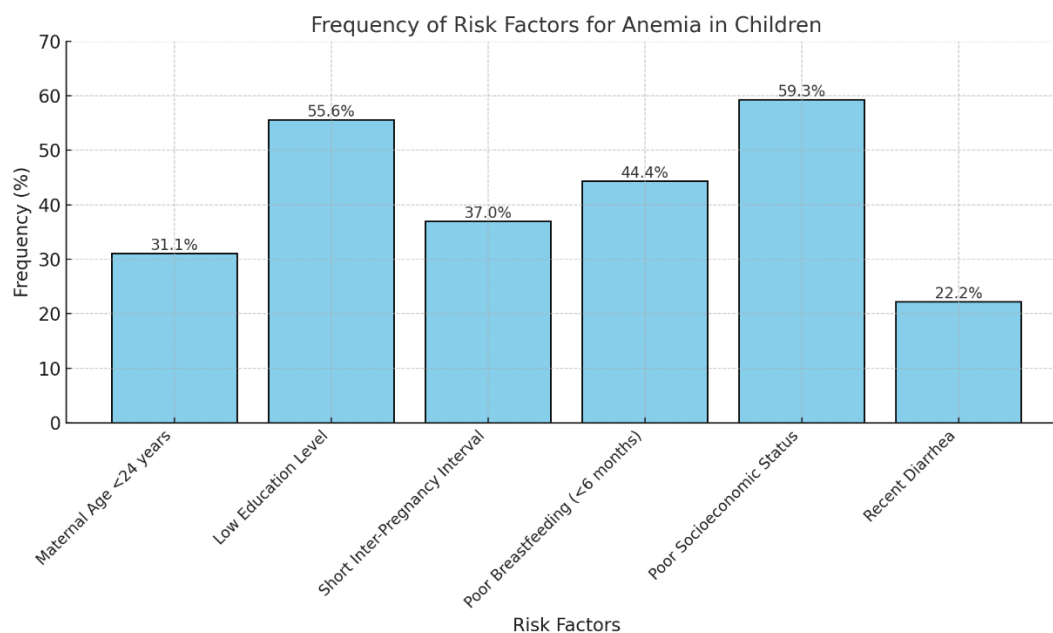


Figure 1: The bar chart highlights the frequency of risk factors for anemia in children. Poor socioeconomic status (59.3%) and low maternal education (55.6%) were the most prevalent factors, indicating financial and educational limitations significantly contribute to anemia.

Poor breastfeeding practices (44.4%) and short inter-pregnancy intervals (37.0%) further emphasize the importance of proper maternal and childcare. Younger maternal age (<24 years, 31.1%) and recent diarrhea episodes (22.2%) also play critical roles, reflecting the impact of maternal inexperience and child infections on anemia.

The graph underscores the multifaceted nature of anemia, pointing to socioeconomic, maternal, and health-related factors as key targets for intervention.

DISCUSSION

This study aimed to identify the risk factors associated with anemia in children aged 6 months to 5 years presenting to Qazi Hussain Ahmad Medical Complex, Nowshera. The findings highlighted the significant role of socioeconomic, maternal, and child-related factors in the prevalence and severity of anemia, aligning with previous research conducted in similar findings [7-9].

One of the most prominent risk factors observed was poor socioeconomic status, present in 59.3% of the study population. This finding corroborates studies conducted in Ethiopia and India, where low income was strongly associated with anemia due to limited access to nutrient-rich foods and healthcare services [9-11]. Families from lower socioeconomic backgrounds often struggle to provide iron-rich diets, increasing the risk of iron deficiency anemia in children.

Low maternal education was another critical factor, affecting 55.6% of the participants. Mothers with less education are less likely to be aware of proper nutrition, breastfeeding practices, and the importance of timely healthcare interventions. Similar findings were reported in studies, which emphasized the role of maternal education in improving child health outcomes and reducing anemia prevalence [12-14].

Poor breastfeeding practices, specifically exclusive breastfeeding for less than six months, were noted in 44.4% of cases. Breastfeeding provides essential nutrients, including iron, during the critical early months of life. Inadequate breastfeeding has been linked to anemia in numerous studies, including those from South Asia, which highlight the protective effects of exclusive breastfeeding against iron deficiency [7, 15, 16].

Short inter-pregnancy intervals (<2 years) were reported in 37% of cases, suggesting that insufficient time between pregnancies depletes maternal nutrient reserves, increasing the likelihood of anemia in subsequent children. This observation was consistent with findings from studies in developing

countries, where short intervals between pregnancies were linked to poor maternal and child health outcomes[17, 18].

Younger maternal age (<24 years) was a significant contributor to anemia, seen in 31.1% of the participants. Young mothers may lack the experience, resources, or physical maturity required to ensure optimal child nutrition. This finding aligns with studies which have shown that maternal age plays a crucial role in determining child health[19, 20].

Recent diarrhea episodes, reported in 22.2% of children, were significantly associated with anemia. Diarrhea leads to nutrient loss and impaired absorption, exacerbating iron deficiency in vulnerable children. Studies have also demonstrated a strong link between recurrent diarrhea and anemia in children under five years of age[21, 22].

Overall, the findings of this study align with global research highlighting the multifaceted nature of anemia in children. The significant associations between anemia and factors such as low socioeconomic status, maternal education, breastfeeding practices, and morbidity underscore the need for comprehensive interventions. Strategies should include community-based education programs to improve maternal knowledge, promotion of exclusive breastfeeding, and addressing underlying socioeconomic challenges.

Strengths and Limitations

This study provides valuable insights into the risk factors of anemia in a specific population, contributing to the growing body of evidence on the subject. However, the cross-sectional design limits the ability to establish causation. Future longitudinal studies are recommended to better understand the causal relationships between these risk factors and anemia.

CONCLUSION

This study highlights the significant risk factors contributing to anemia in children aged 6 months to 5 years. Poor socioeconomic status, low maternal education, inadequate breastfeeding practices, short inter-pregnancy intervals, younger maternal age, and recent episodes of diarrhea emerged as key contributors. These findings underscore the multifactorial nature of childhood anemia, with both maternal and environmental factors playing critical roles.

Addressing these risk factors requires a comprehensive approach, including improved maternal education, promotion of exclusive breastfeeding, addressing food insecurity, and enhancing access to healthcare services. Targeted interventions focusing on public health awareness and nutritional support can significantly reduce the prevalence and severity of anemia. By implementing these strategies, the growth, development, and survival outcomes of children in vulnerable populations can be substantially improved, contributing to broader societal and economic benefits.

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