Original Article

Iron Deficiency Anemia in Children

Frequency of Iron Deficiency Anemia in Children from 6 Months to 5 Years of Age Presented with Pallor in Tertiary Care Hospital

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ABSTRACT

Objective: To assess the frequency of iron deficiency anemia amongst children from 6 months to 5 years aged group presenting with pallor.

Study Design: Cross sectional descriptive study

Place and Duration of Study: This study was conducted at the Department of Pediatrics, Abbas Institute of Medical Sciences Muzaffarabad Azad Jammu & Kashmir from January 2025 to June 2025.

Methods: A cross sectional descriptive was conducted over a period of six months in the Department of Pediatrics. The study involved 200 children presented with pallor of aged 6 months to 5 years. After informed consent a structural proforma was obtained from parents or legal guardian of the patients. Hemoglobin <11.0g/dL was considered IDA based on Who criteria. Data were analyzed using SPSS 23.0 version. P value <0.05 was considered statistically significant.

Results: In total of 200 children presented with pallor, n= 42 (21.0%) were diagnosed with iron deficiency anemia. Overall, the highest frequency was seen in 37-48 months aged group n=49. Amongst IDA group the most prevalent age group was 49-60 months aged group with n=12. The most dominant gender was female n=104 than male n=96. A statistically significant difference was found between IDA and non-IDA group (p=0.0062). There was no significant association seen between IDA group and age and gender.

Conclusion: This study concluded that high frequency of iron deficiency anemia was seen in children with pallor and most of them in the late 60 months.

Key Words: Iron deficiency anemia, children, pallor, nutritional deficiency, hemoglobin.

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INTRODUCTION

The most prevalent form of nutritional anemia across the globe is iron deficiency anemia (IDA). IDA is considered as a major public health issue by WHO.[1,2] Approximately 43% of children less than five years of age worldwide are suffering from anemia in which 50% of cases having iron deficiency.[3] The burden is very high in lower middle income countries and the reason may be due to poor nutrition intake, frequent illness, parasitic infections and lack of public health interventions. The consequences lead to impairment of physical growth, cognitive development, behavior and immunity.[4,5]

Anemia could be defined as the reduction of hemoglobin concentration, hematocrit or red blood cell count below specific age ranges. The anemia diagnosed in children below 5 years old is having hemoglobin concentration less than 11.0g/dL.[6] The causes of anemia vary but the iron deficiency is the most prevalent cause of anemia contributing 60-70% of all pediatric anemia patients. The reason could be due to inadequate intake of iron during the period of rapid growth and increased iron requirements and particularly required in early childhood and infancy. The iron deficiency risk increases exactly after the age of 6 months as the infant now totally dependent on dietary sources while the maternal iron stores are depleted.[5,7,8]

Pallor is one of the most common and first clinical presentation of anemia in children. The pallor can be examined in the palms, conjunctiva, nail beds or oral mucosa. The pallor may or may not be correlated with hemoglobin as it is a subjective sign which are not

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specific therefore further investigations are mandatory. The other clinical presentation includes poor feeding, fatigue, development delay, irritability and tachycardia. Severe cases of anemia lead to congestive heart failure, growth retardation and poor physical endurance.[9,10]

The diagnostic dilemma of iron deficiency includes a combination of clinical examination as well as laboratory investigations.[9] The standard methods of investigations are completed blood count, serum ferritin levels, serum iron,total iron binding capacity, transferrin saturation and peripheral blood smear. Serum ferritin is considered one of the most reliable investigations amongst these which show the iron stores however, it can be seen elevated in the presence of infection or inflammation. The WHO has emphasized the need for early detection and prevention of IDA.[11,12]

The prevalence of anemia in countries like Pakistan, India, Bangladesh and other LMICs are unacceptably high and exceeding 60-70% in some rural areas.[4,8] The significant contributors to anemia in these countries are malnutrition, high birth rates, suboptimal breastfeeding, diarrheal diseases and limited to fortified food access.[8,9] Despite the magnitude of problem, there is a limited data published from hospital based or community level study focusing on children with palor and its correlation with iron status. Therefore, the current study may bridge this gap by determining the frequency of iron deficiency anemia among children aged 6 months to 5 years who present with palor and will help in early diagnosis and treatment while avoiding delayed interventions.

The objective of this study was to determine the frequency of iron deficiency anemia among children aged 6 months to 5 years presenting with palor.

METHODS

A descriptive cross sectional study was carried out in the Department of Pediatrics, Abbas Institute of Medical Sciences Muzaffarabad Azad Jammu & Kashmir from January 2025 to June 2025. Ethical approval was taken from ethical committee of the hospital. The children included in this study were from 5 months to 6 years, clinical pallor which was examined and observed by trained pediatrician and parents or legal guardians who give informed consents. Known or suspected cases of hemolytic anemia, thalassemia, leukemia or chronic systemic disease, recent blood transfusion, children with acute infections or inflammatory conditions and those having congenital anomalies or syndromes which indirectly affect hematological parameters were excluded from this study. The sample size was calculated using the WHO formula for sample size in which the estimated prevalence of 60% children having iron deficiency anemia with pallor was taken.[13] The confidence level was kept at 95% and margin of error was 7 %. The total sample size came with 188 children, to account for non-response or dropouts a final sample size of 200 children was selected through non-probability consecutive sampling technique. Children were diagnosed with IDA if they had hemoglobin < 11.0g/dL.[14] A structural proforma was taken from and informed consent was obtained from parents or guardians of all children. Confidentiality of data was maintained using patients ID.

The data was analyzed using SPSS 23.0 version. Means and standard deviations were calculated for quantitative variables. Frequencies and percentages were obtained for categorical variables. Chi-square was applied to determine association between IDA and categorical variables like age group and gender. Independent t-test was used to compare mean hemoglobin levels between IDA and on-IDA groups. P value of <0.05 was considered statistically significant.

RESULTS

All participants in this study had a clinical pallor were confirmed by a trained pediatrician. The mean age presentation was 32.4±14.7months. Females (n=104) were more than males (n=96) as shown in figure 1.

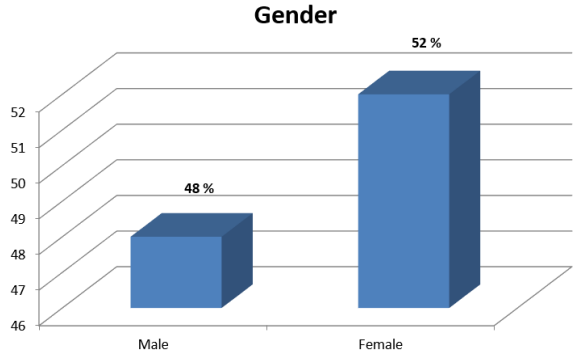

Figure No.1: Percentage of gender distribution.

Table No.1: Distribution of IDA by age.

Age group (months	No IDA group	IDA group	Total	*p*-value
6-12	35	8	43	0.012
13-24	25	10	35	
25-36	33	4	37	
37-48	41	8	49	
49-60	24	12	36	

The iron deficiency anemia was found in 42 children (21.0%) while 158 children were having hemoglobin levels more than 11.0g/dL. Among 104 female 24(57.1%) had IDA while 18(42.9%) males were anemic. Table 1 is showing both groups distribution by age. The chi square statistics revealed that the difference in IDA frequency among age group was not statistically significant (p=0.106). The most prevalent age group 49-60 months (n=12) in IDA group while in

no IDA group 37-48 (n=41) was the most common age group. The chi square statistics showed that there was no association exist between IDA and gender (p=0.45) as shown in table 2.

Table No.2. Association between gender and iron deficiency anemia.

Gender	IDA Present (n=42)	IDA Absent (n=158)	Total (n=200)	χ^2	df	*p*-value
Male	18 (42.9%)	78 (49.4%)	96 (48.0%)	0.56	1	0.45
Female	24 (57.1%)	80 (50.6%)	104 (52.0%)			
Total	42 (100%)	158 (100%)	200 (100%)			

The mean hemoglobin in IDA group children was 9.1±0.6g/dL however in non-IDA group showed the mean hemoglobin level of 10.3±1.3g/dL. The indepdendent t- test showed that the difference in the group was statistically significant (p=0.0062).

DISCUSSION

This was a hospital based study focusing on the children aged 6months to 5 years presenting with clinical pallor. This study revealed a 21 % patients having iron deficiency anemia. The prevalence found in this study is much lower than that national survey figures from Pakistan. A secondary analysis from National Nutrition Survey 2011-2012 demonstrated a 33.2% frequency of iron deficiency anemia in children aged 5 months to 59 months.[15] The difference may be due to that this study focus on clinical subset, children with pallor while that of the survey was done using combined hemoglobin level <11.0g/dL and ferritin <12ug/L. The study analysis of 2018 National Nutritional Survey showed 28.6% iron deficiency anemia frequency in children below five years. The figure is higher than our findings but these are community based surveys whereas this study is mostly symptom-triggered and hospital based.

In another study by Ahmad et al[16] in which they found the prevalence of iron deficiency anemia of 28.8% using hemoglobin <11.0g/dL and ferritin <30ng/mL in children aged 1-15 years presenting with pallor. Their broader age range and high ferritin level likely contribute to the higher proportion but still this study supports our observed burden among symptomatic children.

The frequency of anemia among children below 5 years age was estimated 43% in which iron deficiency was counted for about 50% of cases.[15] World Health Organization data revealed mild to moderate load of iron deficiency in South Asia, severe load (>40% in sub-Saharan Africa and some parts of Asia.[13] In meta-analysis the frequency of iron deficiency anemia ranges from 5.8% to 41% depending on nutritional status and age.[17] The findings of this study fall on the lower end. These figures showed the heterogeneity in iron deficiency anemia epidemiology.

Pallor is the most commonly presenting symptoms however; the diagnostic sensitivity and specificity vary. This study showed that 1 in 5 children with pallor has confirmed iron deficiency anemia. The results are in aligned with other study but pallor can over or underestimate the iron deficiency in those areas where there is a high prevalence of malnutrition or hemoglobinopathies.[15] The findings of this study suggest that higher frequency of IDA was present in aged 49-60 months which is in contrast to the National survey which revealed that children under 24 months have a higher frequency of IDA.[15] the difference may be due to smaller sample size and narrower age distribution. The national survey also suggest the lower number of IDA in female children which contradict this study.[13,15] The reason could be local population or hospital attendance biasis.

The strength of this study are vulnerable age group, symptom based sampling, objective diagnostic criteria, gender and age stratification and laboratory confirmation. The limitations of this study are cross-sectional design, hospital based sampling, limited diagnostic marker and lack of dietary assessment. The inflammation and parasitic load were not measured and socioeconomic factors were not explored which are the further limitations of this study. Future research should be carried out for multicenter with large sample size. The results emphasize on need for targeted screening, nutritional counseling, iron supplementation and fortified food programs.

CONCLUSION

The findings of this study concluded that less than half of the patients with pallor were having iron deficiency anemia. Therefore, symptom based like pallor helps in guiding the suspicion of IDA in children in those areas where there is resource limitations.

Author's Contribution:

Concept & Design or acquisition of analysis or interpretation of data:	Aalya Farooq, Manzoor Ali Khan, Gulraiz Iqbal
Drafting or Revising Critically:	Sughra Latif, Qurba Batool, Tanveer Hussain
Final Approval of version:	All the above authors
Agreement to accountable for all aspects of work:	All the above authors

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