Epidemiologico-Etiological Profile of Anemia in Children Aged 5-16 Years Attending a Tertiary Care Centre

By Bansi Jitendra Seta, Mohmad Uvesh Chauhan, Priya Marwah & Munish Kumar Kakkar

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Material and Methods: In this hospital based observational study, data were on epidemiology, clinical characteristics and laboratory findings of our study population from the medical records and filled up the pre-designed proforma. We categorized our study subjects into Rural and Urban on the basis of addresses they provided in their hospital records (as per aim of the study). Based on investigations findings, we further categorized the etiological factors into Nutritional and Non-nutritional causes.

Keywords: anemia, nutritional, non-nutritional.

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EPIDEMIOLOGICOETIOLOGICALPROFILEOFANEMIAINCHILDRENAGED516YEARSATTENDINGATERTIARYCARECENTRE

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Results: 66.3% of participants were aged 5-11 years, and 33.7% were aged 12-16 years. Moderate anemia was most prevalent among younger children (5-11 years), while severe anemia was more common in older children (12-16 years). A statistically significant association was found between age group and gender, and between severity of anemia and age groups.

Conclusion: The high prevalence of non-nutritional anemia underscores the necessity for public health strategies that go beyond dietary interventions. Addressing environmental, genetic, and chronic disease factors is crucial.

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I. Introduction

Anemia is a sign which is present when the blood hemoglobin level is two standard deviations below the mean for particular age and sex.

Anemia leads to decreased oxygen-carrying capacity of blood. It, thus, leads to compensatory physiological adaptations in form of increase in plasma volume and redistribution of blood flow to maintain the volume of blood; increase in cardiac output as a consequence of increased stroke volume, to increase the oxygen delivery to tissues by increasing blood flow. [1,2]

Anemia, a *worldwide public health problem*, is affecting both the developing and developed countries[3]. Globally, it affects 22.8 % of the world's population i.e. 1.74 billion people of which 25.4 % i.e. 305 million people are the school going aged children [4].

In the one-fourth of global population estimated to be anemic, cases are rapidly increasing for children younger than 5 years of age, young girls, expectant mothers and women. Studies showed increase of 420 million cases of anemia globally over three decades with total 1.92 billion people being affected with anemia in 2021 [5,6].

In *India*, nearly one-fourth of the children i.e. 23.5% of age 5-9 years had anemia. The prevalence of anemia among children was *highest in Tripura* i.e. 41.1% and was *lowest in Kerala* i.e. 3.1% [7].

The aim of our study was to assess the status of anemia in Rural and Urban children aged 5-16 years and compare the prevalence of anemia in Rural and Urban children aged 5-16 years and further to evaluate the etiological profile of anemia in children aged 5-16 years.

II. Methodology

The Hospital based Observational Study was conducted at Mahatma and Medical College & Hospital, Jaipur, Rajasthan We included Children of age group: 5-16 your both boys and girls, who came to our Tertiary Care Centre during August 2022- December 2023 (for observational study).

We collected data on epidemiology, clinical characteristics and laboratory findings of our study population from the medical records and filled up the predesigned proforma Relevant history taking was done in form of dietary history, menstrual history (if applicable).

Laboratory workup was done in all patients which included routine Investigations like CBC and Peripheral Blood Film. Further workup in form of Reticulocyte count, Coombs test, Ferritin levels and High Performance Liquid Chromatography (HPLC), was done as per requirement to look for etiology.

We categorized our study subjects into Rural and Urban on the basis of addresses they provided in

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their hospital records (as per aim of the study). Based on investigations findings, we further categorized the etiological factors into Nutritional and Non- nutritional causes.

III. Statistical Analysis

The data collected were entered into MS Office Excel Worksheet Appropriate statistical test were wed to find the Significant Association. P value < 0.05 was considered to be statistically significant. The data collected was analysed using SPSS Software version 25. The data were expressed in terms of frequency and percentage. Mean and Standard Deviation (50) were calculated fat various parameters.

IV. Results

Anemia is a critical global health issue that affects growth and development especially in children. The present study investigates the prevalence of anemia among children aged 5-16 years in rural and urban areas, utilizing data from Mahatma Gandhi Medical College & Hospital, Jaipur, Rajasthan.

66.3% of participants were aged 5-11 years, and 33.7% were aged 12-16 years.

Moderate anemia was most prevalent among younger children (5-11 years), while severe anemia was more common in older children (12-16 years).

No significant association between gender and locality was observed.

A statistically significant association was found between age group and gender as depicted in Table 1, and between severity of anemia and age groups as depicted in Table 2.

V. Discussion

Anemia is a significant global health problem affecting children and reproductive age women. This Hospital based observational study was conducted at Mahatma Gandhi Medical College & Hospital, Jaipur, Rajasthan, with the aim to study the prevalence of anemia in rural and urban areas, of children aged 5-16 years, and also to study the epidemiological and etliological profile of anemia in the pediatric patients. A total 101 cases of anemic pediatric patients, aged 5-16 years who gave consent, were included.

In our study, out of total 101 cases, 46 i.e. 45.5% were female and 55 (54.4%) were male. Out of these total 101 cases, 41(40.8%) reside in rural areas, while 60 (59.4%) reside in urban areas. Distributing gender according to the locality, the present study shows that of the 46 females, 14 (34.14%) are from rural areas and 32 (53.33%) are from urban areas. Among the 55 males, 27 (65.85%) are from rural areas and 28 (46.66%) are from urban areas. No significant association was found between gender and locality.

Shikha Sharma et al (2018)[8] observed in her study that out of 210 school-going children. 56.66% were boys and 43.33% were girls. Out of 210 cases, 110 were from rural areas of Jammu district and 100 were from urban areas. Out of the 110 children from rural areas 55.45% were males and 44.54% were females. Out of 100 children from urban areas 58% were males and 42% were females.

Mathew AC et al (2023)[9] published a study which showed that the prevalence of anemia was higher among female children compared to male children.

We observed that out of total 101 cases, nutritional anemia affected 15 individuals (14.85%) whereas non-nutritional anaemia affected 86 individuals (85.14%) Distributing between genders, among females, 6 (13.04%) had nutritional anemia and 40 (86.95%) had non-nutritional anaemia. Among males, 9 (16.36%) had nutritional 46 (83.63%) had non-nutritional anaemia. In rural areas, & individuals (1463%) nutritional anaemia and 35 (85.36%) have non- nutritional anaemia. In urban areas, 9 (15%) base nutritional anaemia and 51 185%) have non-nutritional anaemia.

Kokku P K et al (2021)[10] showed in his study, that majority of the children 80.14% were diagnosed to have iron deficiency anemia, 4.97% children had features suggestive of megaloblastic anemia, 2.9% children had Thalassemia major.

Aradhana Kankane et al (2023)[11] included 100 patients of ages 10-19 years in her study, out of which maximum cases (48%) belonged to 10-12 years of age, followed by 40% of cases of 13-15 years and 12% of cases of 16-19 years. 33% of participants were male and 67% were female. The majority of adolescents enrolled in this study were found to have IDA comprising 36% of cases. Vitamin B12 deficiency was found to be the second-most common cause. 30% of cases, had non-nutritional anaemia.

In our study, we categorized the sample population in to two age groups one group comprising 5-11 years aged children and other group comprising 12-16 years aged children Among the 101 individuals, 67 (i.e. 66.3%) are aged between 5 and 11 years, while 34 tie 17%) are aged between 12 and 16 years Among those aged 5 to 11 years, there are 31 males and 36 females, out of total 67 individuals. Among those aged 12 to 16 years, there are 24 males and 10 females, out of total 34 individuals p-value: 0.041 Significant association between age group and gender was found in our study. Further, distribution of types of anaemia across different age groups showed that among those aged 5 to 11 years, 11 individuals have nutritional anaemia and 56 have non-nutritional anaemia. Among those aged 12 to 16 years, 4 individuals have nutritional anaemia and 30 have non-nutritional anaemia.

Harshpal Singh Sachdev et al (2021)[12] showed that their study's haemoglobin cut-offs defined a lower prevalence of anaemia in children and adolescents

throughout the age range of 1-19 years compared with the anaemia prevalence derived from WHO cut-offs. The gap between the two prevalence estimates was 19-2 percentage points, with marked gaps for ages 1- 4 years and 15-19 years, but a lower gap for 5-14 years. The gap in anaemia prevalence was higher for boys than girls aged 1-4 years, almost similar in both sexes for 5-9 years, and substantially higher for girls aged 10 years or older.

In our study, using the WHO standards for defining severity, it was found that among age group 5-11 years, out of total 67 children, 8 (11.9%) had mild anemia, 36 (53.7%) had moderate anemia, and 23 (34.3%) had severe anemia. While among age group 12-16 years, out of total 34 children, 5 had mild anemia, 9 had moderate anemia, and 20 had severe anemia. Thus, it was seen that in the 5-11 years' age group moderate anemia is the most prevalent (53.7%), followed by severe anemia (34.3%), and next mild anemia (11.9%). While in the 12-16 years' age group, severe anemia is the most prevalent (58.8%), followed by moderate anemia (26.5%), and then mild anemia (14.7%). This shows the noticeable increase in proportion of severe anemia from theyounger age group 43% to the older age group (58.8%) {p-value: 0.02} There is statistically significant association between the severity of anemia and age groups.

Scott et al (2021)[13] stated in his study that in terms of severity, 17.6% of adolescents had mild anemia, 10.0% had moderate anaemia and 0.9% had severe anemia.

Singh et al (2022)[14] stated that nearly 60% came in the mild anemic category both in the urban and rural area followed by moderate and severe anemia being least in rural area.

VI. Conclusion

The high prevalence of non-nutritional anemia underscores the necessity for public health strategies that go beyond dietary interventions. Addressing environmental, genetic, and chronic disease factors is crucial, Strengthening the healthcare system to include comprehensive screening and diagnostic services for identifying and managing non-nutritional causes of anemia is vital. There is a need for robust educational programs aimed at raising awareness about the various non-nutritional causes of anemia among parents, teachers, and children. Policies should be developed to include measures that address the non-nutritional causes.

VII. Limitations

Our Study has following limitations

1. *Sample Size:* The sample size of 101 may not be representative of the broader population, limiting the generalizability of the findings.

2. *Cross-Sectional Nature:* The cross-sectional design of the study limits the ability to establish causal relationships between anemia and its determinants.

3. *Geographical Scope:* Our study is confined to a single hospital in Jaipur, Rajasthan which may not reflect the anemia prevalence and factors in other regions.

4. *Data Collection:* Reliance on medical records and self-reported data might introduce biases and inaccuracies.

VIII. Recommendations

These limitations suggest the need for larger, multi-centric studies to validate the findings and develop more effective anemia prevention and treatment strategies. Continued research and policy efforts are essential to mitigate the impact of anemia on children's health and development.

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Table 1: Types of Anaemia According to Age Group

Age Group	Nutritional	Non-Nutritional	Total
5 years - 11 years	11	56	67
12 years - 16 years	4	30	34
Total	15	86	101
Chi square = 0.106, df =1, P = 0.74			

Table 2: Severity of Anaemia According to Age Group

	5-11 Years	12-16 Years
Mild	8 (11.9%)	5 (14.7%)
Moderate	36 (53.7%)	9 (26.5%)
Severe	23 (34.3%)	20 (58.8%)
Total	67 (100%)	34 (100%)
Chi square = 7.074, df = 2, P = 0.02		