

FREQUENCY AND SEVERITY OF ANEMIA IN CHILDREN LESS THAN 15 YEARS OF AGE AT GWADAR DEVELOPMENT AUTHORITY HOSPITAL, GWADAR, BALUCHISTAN

Majid Latif, Saeed Bin Ayaz, Muneeba Manzoor*, Mansoor Ishaq

Combined Military Hospital Quetta/National University of Medical Sciences (NUMS) Pakistan, *Government Hospital Ghaziabad Lahore Pakistan

ABSTRACT

Objective: To determine the frequency and severity of anemia in children <15 years of age and find association of anemia with age and gender at Gwadar Development Authority (GDA) Hospital, Gwadar, Baluchistan.

Study Design: Cross sectional study.

Place and Duration of Study: GDA Hospital Gwadar, from June 2016 to June 2017.

Material and Methods: Through consecutive sampling, 483 children reporting to the pathology department for hemoglobin estimation were sampled. The samples were taken through antecubital veins using aseptic technique and the hemoglobin was analyzed using Medonic M-series M32 Hematology Analyzer. The sample was divided into three groups based on age i.e. group-1 (age 6-59 months), group-2 (age: 5-11 years), and group-3 (age: 11-14 years). We used definitions of anemia given by the World Health Organization. The data were analyzed using SPSS version 20.

Results: The mean age was 7.3 ± 4.3 years (range: 1-14 years). The frequency of anemia was 64.6% (n=312). Considering gender, the percentage of anemic children among male gender was 62.9% (n=132) and among females was 65.9% (n=180). The percentage of anemic children was highest (74.5%) in group-1 ($p<0.001$). The gender could not find an association with anemia ($p=0.483$).

Conclusion: Anemia had a frequency of 64.6% in children under 15 years of age at GDA Hospital, Gwadar. Age-group of 1-59 months had the highest percentage of anemic children. The gender did not have any association with anemia.

Keywords: Age, Anemia, Frequency, Gender, Gwadar, Hemoglobin, Severity.

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INTRODUCTION

Anemia is a condition in which the number of red blood cells are insufficient to meet physiologic needs of the body¹. Globally, anemia is a public health problem affecting people in both developed and developing countries with adverse effects on human health as well as on social and economic development². Anemia is a critical health concern as it adversely affects growth and energy levels³. According to the statistics of World Health Organization (WHO), worldwide, there are two billion people living with anemia⁴.

In developing countries, the estimated prevalence of anemia is 39% in children less

than 5 years of age and 48% in children 5-14 years of age⁴. In children, anemia affects motor and cognitive development and increases susceptibility to infections⁵. Lack of awareness among mothers, poor nutrition, unhealthy food habits, and parasitic infestations are the factors associated with lower hemoglobin levels in children⁶.

Although anemia remains a widespread public health problem in Pakistan, there are few studies on the prevalence and severity of anemia among children especially from Baluchistan. This was the first study carried out in Gwadar. The aim of this study was to describe the frequency and severity of anemia among pediatric patients under 15 years of age who underwent evaluation of their blood samples for hemoglobin levels in GDA Hospital, Gwadar. The association of anemia with the age and gender were secondary

Correspondence: Dr Majid Latif, Classified Pathologist, CMH Quetta Pakistan (Email: majidlatif33@hotmail.com)

Received: 06 Oct 2017; revised received: 29 Oct 2017; accepted: 27 Nov 2017

goals. The results of this study can be used by public health programmers to design target interventions aimed at reducing the huge burden of anemia in Gwadar.

MATERIAL AND METHODS

This was a cross-sectional study conducted at the pathology department, GDA Hospital Gwadar, from June 2016 to June 2017 after taking permission from the hospital ethical committee. A sample size of 366 was estimated via Epi Tools Epidemiological calculator⁷ while keeping level of significance 5%, confidence level 95%, estimated true proportion 0.61%⁸, and 5% of absolute precision. Through consecutive sampling, we included 483 individuals who reported to the pathology department for hemoglobin estimation during the said time period.

After verbal informed consent, the samples were taken from the individuals through ante-cubital veins using aseptic technique. The samples were taken in potassium EDTA tube uniformly mixed before analysis by blood tube mixer. The hemoglobin was analyzed using Medonic M-series M32 Hematology Analyzer (Boule Medical AB, Spanga, Sweden).

The sample was divided into three groups based on age i.e. group-1 (age 6-59 months), group-2 (age: 5-11 years), and group-3 (age: 11-14 years). We used definitions of anemia provided by WHO and given in table-I⁸.

The data were analyzed using SPSS version 20. The frequencies and percentages, means, and standard deviations were calculated for categorical and numerical data respectively. The mean hemoglobin levels among different genders and age-groups were compared using student t-tests and one-way analysis of variance with Games-Howell post-hoc analysis. The association of anemia with gender and age-group was analyzed using Pearson's Chi-square analysis. A *p*-value <0.05 was considered significant.

RESULTS

The mean age was 7.3 ± 4.3 years with a median age of 8 years and a range of 1-14

years. Of 483 children finally included, 210 (43.5%) were male while 273 (56.5%) were female. There were 165 (34.2%) children in group-1 (age: 6-59 months), 201 (41.6%) children in group-2, and 117 (24.2%) children in group-3. The mean hemoglobin level in males was 10.6 ± 2.2 g/dl and in females was 10.6 ± 2 g/dl thus showing no significant difference (*p*=1). However, the eldest age-group had the highest mean level of hemoglobin (*p*<0.001). Using post-hoc analysis, the mean hemoglobin level in group-3 was significantly greater than group-1 and group-2 (*p*<0.001 and *p*=0.031 respectively). The mean hemoglobin level in group-2 was significantly greater than that of group-1 (*p*<0.001) (table-II).

The frequency of anemia in the whole sample was 64.6% (n=312). Considering gender, the percentage of anemic children among male gender was 62.9% (n=132) and among females was 65.9% (n=180) (*p*=0.483). The percentage of anemic children was 74.5% (n=123) in group-1, 64.2% (n=129) in group-2, and 51.3% (n=60) in group-3 (*p*<0.001) (table-II).

DISCUSSION

Measurement of hemoglobin level is an important hematological parameter that helps to diagnose the extent and severity of anemia⁴. Numerous studies have demonstrated that even moderate anemia is associated with depressed mental and motor development in children and may not be reversible⁹. Pakistan has a developing menace of anemia, as most children, especially belonging to the low socioeconomic group are primarily anemic¹⁰. Numerous Pakistani studies have reported a prevalence of 61-78.7% in children¹⁰. The frequency observed by us (64.6%) also falls in the same range. Available data related to the prevalence of anemia in Pakistan reveal that iron deficiency is the leading cause of anemia in children¹⁰. The contributing factors of anemia have been identified as poverty, consumption of low iron diets, inappropriate dietary habits, poor personal hygiene, and lack of sanitation¹¹.

The results of our study revealed that the frequency of anemia was highest in the age-group of 6-59 months. Our findings are consistent with the National Health survey for Pakistan conducted from 1990 to 1994, in which the prevalence of anemia was significantly associated with the child's age, so that the youngest children had the highest odds of developing anemia¹². Similarly, a survey at Lahore had found highest

anemia¹⁵. As children are exclusive breastfed during initial months, and the breast milk lacks adequate iron content, the increased prevalence of anemia in younger children is logical. At higher age, children start eating weaning foods such as meat, fish, or eggs¹⁵ that are rich in haem iron²², thus improving anemia. Secondly, since first two years of life are characterized by rapid growth demanding increased iron utilization, the

Table-I: Hemoglobin levels to diagnose anemia according to the World Health Organization guidelines.

| Age-group | Normal hemoglobin levels in g/dL | Anemia | | |
|-----------------------------|----------------------------------|--------------------|----------|----------------|
| | | Mild | Moderate | Severe |
| | | Hemoglobin in g/dL | | |
| Children 6-59 months of age | 11.0 or higher | 10.0-10.9 | 7.0-9.9 | lower than 7.0 |
| Children 5-11 years of age | 11.5 or higher | 11.0-11.4 | 8.0-10.9 | lower than 8.0 |
| Children 11-14 years of age | 12.0 or higher | 11.0-11.9 | 8.0-10.9 | lower than 8.0 |

Table-II: Frequency and severity of anemia in different age groups.

| | Groups based on age | | |
|--|---------------------------|----------------------|-----------------------|
| | Group 1 (6-59 months) | Group 2 (5-11 years) | Group 3 (11-14 years) |
| Mean hemoglobin levels in g/dl | Mean ± standard deviation | | |
| | 9.7 ± 1.9 | 10.7 ± 1.7 | 11.3 ± 2.3 |
| Sample groups based on hemoglobin levels | n (%) | | |
| Normal value | 42 (25.5) | 72 (35.8) | 57 (48.7) |
| Mild Anemia | 39 (23.6) | 33 (16.4) | 27 (23.1) |
| Moderate anemia | 66 (40) | 78 (38.8) | 21 (17.9) |
| Severe anemia | 18 (10.9) | 18 (9) | 12 (10.3) |

percentage of anemic children in age-group of 1-4 years¹³. Contrary to this, a Pakistani study from Khyber Pakhtunkhwa has found highest percentage of anemia in the eldest age-group of 10-12 years among the sampled children¹⁴.

In India, highest prevalence of anemia has been observed in children below 5 years of age¹⁵. Studies from Brazil, Nepal, Bangladesh, Iran, India, Philippines, and Ethiopia have also endorsed younger age as an important risk factor associated with anemia¹⁶⁻²¹. The reason for increased prevalence in younger children can be related to the higher incidence of anemia during pregnancy and lactation. Anemic mothers usually give birth to children with moderate to severe

risk of anemia particularly iron deficiency anemia is increased.

We did not find association of anemia with gender of the sampled children. Similar findings were observed by *Kishwar et al* in a study conducted at Lahore²³. However, other studies for Pakistan have found an association of anemia with gender with some reporting higher incidence in female children^{14,24} and others, a higher incidence in male children^{12,13}. There are conflicting evidences in the international data with regard to the relationship between gender and anemia in children. Studies from Yemen and India found a higher prevalence of anemia in girls than boys^{25,26} and studies from Kenya and

Haiti, and some from India found boys to be more at risk²⁷⁻²⁹.

The data in our study and other studies conducted in Pakistan may provide valuable insight into the prevalence of anemia in children. Considering the burden of anemia in Pakistani children, it is essential that interventions such as iron supplementation and food fortification should be used at mass scale. Currently wheat flour fortification and iron supplementation are successful strategies being used worldwide³⁰. Furthermore, recent studies in Central Asia, Venezuela, and Iran suggest that wheat flour fortification can significantly improve iron status at the population level³¹. In Pakistan, unfortunately, there is a dearth of such supplementation programs. High frequency of anemia in children needs due emphasis so as to bring down the total prevalence of anemia. Among school-age children and adolescent boys, those who have a history of iron deficiency anemia, special health-care needs, or low iron intake should periodically be screened for anemia and appropriate measures be taken³⁰.

It was a cross-sectional study so the temporal relationship between anemia and the associated factors could not be established. Moreover, the study lacked detailed investigation of the morphological appearance of red blood cells to differentiate various types of anemia.

CONCLUSION

The frequency of anemia in the sampled children under 15 years of age in GDA Hospital, Gwadar was 64.6%. Age-group of 1-59 months had the highest percentage of anemic children. The gender did not have any association with anemia.

CONFLICT OF INTEREST

This study has no conflict of interest to declare by any author.

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