Anemia and risk factors among children 6 months to 59 months old: a hospital-based prospective study

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ABSTRACT

Introduction: Anemia is a major public health problem and the most common nutritional issue in many parts of the world, especially in developing countries. The objective of the study was to determine the prevalence of anemia and factors associated with anemia among children 6 to 59 months old admitted in Pediatric ward of National Referral Hospital, Thimphu. **Methods:** A hospital-based descriptive cross-sectional study. All children 6 months to 59 months old admitted in Pediatric ward of National Referral Hospital, Thimphu were included in the study. A total of 353 children were included in the study. Data was analyzed using STATA 12. **Results:** The prevalence of anemia was 58.4%. Mild, moderate and severe anemia was 65%, 22.8% and 12.2% respectively. Anemia was more common in children less than 2 years old. The majority of the children had microcytic hypochromic anemia with low serum iron. The risk factors associated with moderate to severe anemia were malnutrition [*p*-value 0.001, OR 32.1, 95% CI (9.10-118.8)], low education level of caregiver [*p*-value 0.0019, OR 5.10, 95% CI (1.66-15.68), monthly family income less than 5000/month [*p*-value 0.0004, OR 4.6 , 95% CI (1.89-11.54)] and chronic illness [*p*-value 0.030, OR 2.43, 95% CI (1.08-5.47)]. **Conclusion:** This study found a high prevalence of anemia in under-5 children, with iron deficiency accounting for the majority of the cases. Children under 2 years were affected more.

Keywords: Anemia ; Anthropometric assessment; Risk factor.

INTRODUCTION

Anemia is a major public health problem and the most common nutritional issue in many parts of the world, especially in developing countries[1]. The global estimate of childhood anemia indicates that 293.1 million children under five, approximately 43%, are anemic worldwide[2]. Southeast Asia has the world's highest prevalence of anemia[3]. According to WHO, anemia in children is defined as a hemoglobin level of less than 11.0 gm/dL; severe anemia is hemoglobin level of less than 7.0 gm/dL, hemoglobin between 7.0 and 8.9 gm/dL is moderate anemia, and hemoglobin between 9.0 and 10.9 gm/dL is mild anemia[1]. Anemia can lead to a number of problems such as increased perinatal mortality, impaired cognitive development, weakened immune system and decrease workplace performance in children[4]. There are multiple causes of anemia, with iron deficiency being the commonest cause in developing countries. Other causes of anemia are chronic infections, hemoglobinopathies, vitamin deficiency such as folic acid and vitamin B12, bleeding disorders and malignancies[5].

A study done by Sood and Sharma (1986) in Bhutan indicated that the prevalence of anemia was 58% in preschool children and 36% in school children[6]. As per the national anemia study of 2003, the prevalence of anemia in children 6 months to 60 months is 80.6 %[7]. The national nutritional survey of Bhutan, 2015 estimates the anemia prevalence in children age 6 months to 59 months at 43.8% with the majority of children having mild anemia[8]. A study of anemia in Pediatric patients in a tertiary care hospital at Rajkot in India reported a prevalence of 67.8%, which is a severe public health problem[9]. A similar hospital-based study among children 6 to 36 months old in Dhaka, Bangladesh estimated a prevalence of 61%[10].

This study was conducted to determine the prevalence of anemia among hospitalized children and the common factors associated with moderate to severe anemia in this age group.

METHODS

This hospital-based descriptive cross sectional study was carried out at the Pediatric ward of JDWNRH for a period of one year from 1st January 2016 to 31st December 2016. All children aged 6 to 59 months were included in the study. JDWNRH is the apex institute of Bhutan, with 350 beds. The Pediatric ward has 33 beds. Children whose parents refused to consent and participate in the study, children with a history of blood transfusion in last 2 months, children with a history of any major surgeries in last 2 months, children with active bleeding and children readmitted within the study period were excluded from the study.

Anemia was the dependent variable and independent variables included age, gender, gestational age, birth weight, immunization status, dietary habit, habit of taking tea with meal, history of any chronic illness, religion of the family, family type, number of children less than 5 years in the family, education level

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of the mother/caretaker, and availability of health services (time taken to reach nearest health centre from home).

Data collection

Data pertaining to gender, age, hemoglobin level and admission diagnosis were collected from the patient admission chart. The admission Complete Blood Count (CBC) was reviewed for anemia. An additional 2ml sample was collected from anemic children whose parents/guardian consented for the study to analyze serum iron, serum ferritin, and Peripheral Blood Smear (PBS) to study the type and cause of anemia. CBC were tested on automated cell counter. Serum ferritin and serum iron were measured using an automated machine. Morphological types of anemia were characterized based on the PBS. A data collecting proforma was used to collect and record information such as age of the child, gender, gestational age at birth, birth weight, duration of exclusive breastfeeding, education of caretaker, family type, religion of family, number of children <5 years in the family, immunization status, availability of health services (time taken to travel to nearest health centre from home), history of taking tea with meal, history of any chronic illness and dietary habit of the child.

Anthropometric assessment

Weight-for-Height/ Length indicator was used to evaluate the nutritional status of the child in accordance with WHO recommendation and to categorize them with mild malnutrition (Z score ≤1SD to ≥2SD), moderate malnutrition (Z score ≤2SD to ≥3 SD) and severe malnutrition (Z score ≤ 3SD).

Data analysis

Data were double entered using Microsoft Excel 2007, cleaned and analyzed using STATA version 12. To study the factors associated with moderate to severe anemia, first a univariate analysis was performed and those variables which were significant (*p*-value <0.25) were subsequently included in multivariate logistic regression analysis. Manual stepwise backward elimination method was used for multivariable logistic model building. Final model was evaluated using Pearson goodness-of-fit test. The strength of the statistical association was measured by adjusted odds ratio (AOR), and a 95% confidence interval (95% CI) and *p*-value of <0.05 was considered significant.

The study protocol was reviewed and approved by the Research Ethics Board of Health, Ministry of Health (letter no. REBH/Approval/2015/027). Informed written consent was taken from parents/guardians of the participants after explaining the objectives and purpose of the study.

RESULTS

A total of 353 children were included in the study. Of 353 children, 206 were anemic, so the prevalence of anemia in children aged 6 months to 59 months was 58.4%, of which 58.7% were male and 41.3% were female. The distribution of mild, moderate and severe anemia among the study group was as depicted in Figure 1. Anemia distribution in different age group is as shown in Figure 2. Four different morphological types of anemia were observed in the PBS as shown in Figure 3. The relation between different morphological types of anemia and serum iron level is shown in the Figure 4. The significant risk factors for moderate to severe anemia are shown in Table 1.

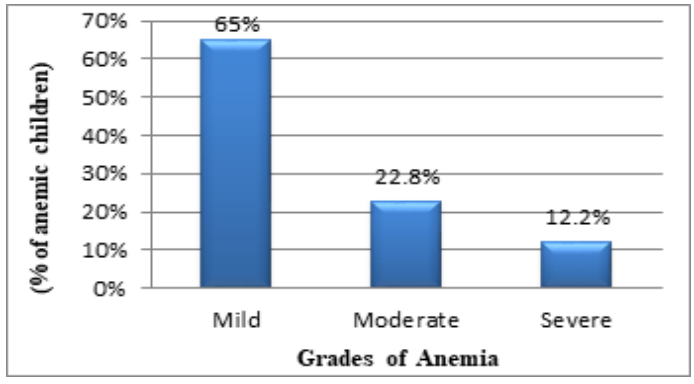

Figure 1. Distribution of anemia by severity among anemic children

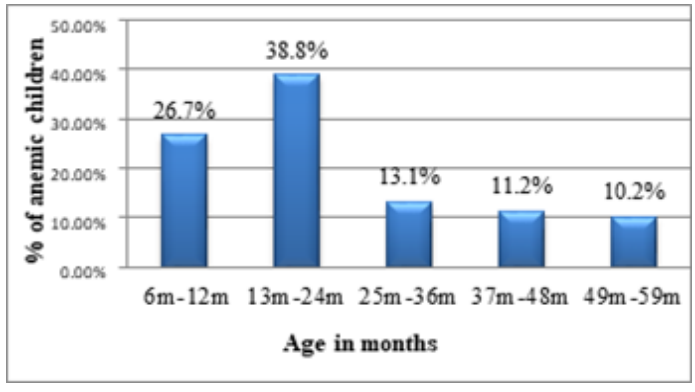

Figure 2. Distribution of anemia according to age group among anemic children

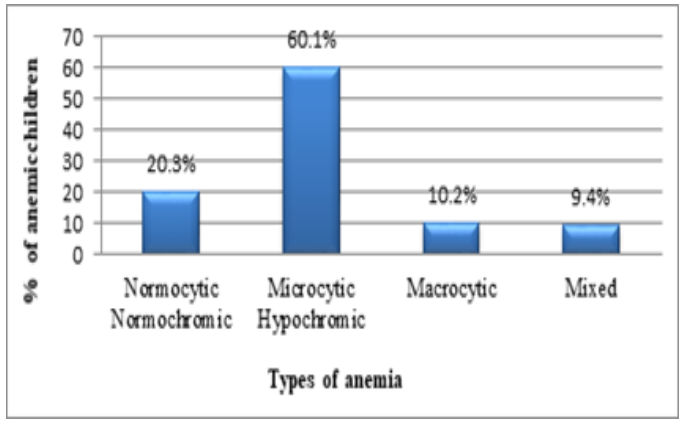

Figure 3. Morphological types of anemia

Table 1. Risk factors associated with moderate to severe anemia

RISK FACTORS	AOR	P VALUE	95%CI
Chronic illness	2.435	0.030	1.08 - 5.47
Malnutrition			
Mild	4.96	0.001	1.95 - 12.6
Moderate	32.8	0.011	9.1 - 118.8
severe	12.9	0.003	2.34 - 71.85
Uneducated C/taker	5.10	0.001	1.66 -15.68
Monthly family income			
<5000/month	4.67	0.0004	1.89 -11.54

AOR: Adjusted odds ratio; CI; confidence interval; C/taker: caretaker

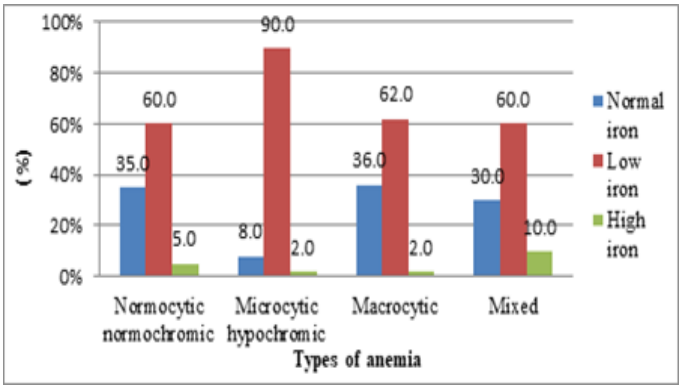

Figure 4. Types of anemia and serum iron level

DISCUSSION

Prevalence of anemia among children 6 to 59 months old admitted to Pediatric ward of JDWNRH was 58.4%. The distribution of mild, moderate and severe anemia was 65%, 22.8%, and 12.2% respectively. A study of anemia in pediatric patients in a Tertiary Care Hospital at Rajkot, India showed a prevalence of 67.8%, higher than what was observed in our study[9]. A study done among hospitalized children in a tertiary care teaching hospital in Pondicherry, India among children under 5 years old reported an anemia prevalence of 63.3%, which was almost similar to our study[11]. Malnutrition was a significant risk factor for anemia[12,13]. In malnourished children, the diminished nutrient absorption caused by the changes in the gastrointestinal epithelium contributes towards development of anemia. Children with uneducated caretakers were more anemic compared to children who had educated caretakers. This finding was consistent with some of the previous studies done in other countries[12,14]. Parents' level of education constitutes a well-documented determinant of anemia in children. Education plays an important role, as educated parents are more likely to adopt healthier dietary behaviors[12,14]. Numerous studies reported that the children from families with low income were more anemic compared to other categories[12,15]. Limited access to food and poor sanitation are often correlated to low income, and to some extent explain the higher risk of anemia among these children. Children with chronic illness were 2.4 times more at risk for developing anemia. Chronic disease is the second most common cause of anemia after iron deficiency, as reported in many literatures. Microcytic hypochromic anemia with iron deficiency was the most predominant type of anemia in our study. A past study in Bhutan showed similar results[6].

This being a cross-sectional study, it makes it impossible to understand the cause and effect association of anemia in our study. It was also beyond the scope of study to look for other causes of anemia like folate and vitamin B_{12} deficiency due to lack of facilities at JDWNRH.

CONCLUSIONS

This study highlights a very high prevalence of anemia of 58.4% among hospitalized children 6 to 59 months old. Children less than 2 years were affected more. The risk factors associated with moderate to severe anemia include malnutrition, low education level of the caregiver, low monthly family income and chronic illness of the child.

RECOMMENDATIONS

Children with chronic illnesses need close follow up to detect anemia and intervene early. Providing iron supplementation and dietary advice may help to reduce the prevalence of anemia in children with chronic illness.

Screening all admitted children for anemia can help in early detection and timely management and hence prevent the long term complications of anemia.

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AUTHORS CONTRIBUTION

Following authors have made substantial contributions to the manuscript as under:

KC: Concept, design, data collection and analysis, manuscript writing and review.

MLM: Concept, design, data collection and analysis, manuscript review.

KP: Concept, design, data collection and analysis, manuscript review

Author agree to be accountable for all respects of the work in ensuring that questions related to the accuracy and integrity of any part of the work are appropriately investigated and resolved.

CONFLICT OF INTEREST

None

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