

# Prevalence and Associated Factors of Anemia among Children Age 6 To 59 Months of Age

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## ABSTRACT

**Objective:** To know the prevalence of anemia and associated factors among children age 6-59 months.

**Study Design:** Cross-sectional study design.

**Place and Duration of Study:** This study was conducted at Bolan Medical Complex Hospital Quetta, Pediatric Unit-2 in collaboration with Department of Medical Entomology and Parasitology, Institute of Public Health, Lahore over a period of six months from 1<sup>st</sup> January 2016 to 30<sup>th</sup> June 2016.

**Materials and Methods:** Children age 6 to 59 months of age who presented with palmar pallor along with hemoglobin levels less than 11 g/dl were included in the study for associated factors of anemia.

**Results:** The anemia was found in 395 (78.27%) children. Among 395 children, 210 (82.4%) were males and 185 (74%) were females. Important risk factors associated with anemia were gender, age, malnutrition, illiteracy and unemployment of caregivers.

**Conclusion:** Factors most strongly associated with anemia included malaria, parasitaemia, unemployment among caregivers, habit of taking tea with meals, malnutrition, low level of education and iron deficiency anemia.

**Key Words:** Prevalence, Associated factors, Anemia

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## INTRODUCTION

Anemia is one of the major public health problems worldwide. It affects 1.62 billion people worldwide and preschool children are affected most, with a prevalence of 47.4%.<sup>1</sup> The global data about the prevalence of anemia during childhood indicates that 293.7 millions of children are under five years of age, out of which 43% are anemic all over the world while 28.5% of these anemic children are from the Sub-Saharan Africa.<sup>2</sup> Another study showed the prevalence of anemia as 43% in the developing countries and of 9% in the developed nations.<sup>3</sup> Anemia is one of the largest killers of children admitted to hospitals in Sub-Saharan Africa. Even where blood transfusions are available there is a significant case fatality rate of 6-18%.<sup>4</sup>

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• Anemia is a multi-factorial health problem in which the risk factors could be nutritional (iron, folate and vitamin B12 deficiencies), clinical (infectious diseases such as malaria, helminthes infections, tuberculosis and general inflammatory disorders), socioeconomic factors (educational levels of parents and low household income), and demographic factors (age, gender, and family size).<sup>5-7</sup> In another study important risk factors of anemia were a large family size and number of children per family, when more than 3 children in a family have been positively associated with anemia and moderately to severely stunted children were 2.3 times more prone to be anemic than normal children.<sup>8</sup> In another study the overall prevalence of anemia was 66.6% and important factors associated were male sex, 9-11 months of age, poor dietary diversity, stunting, diarrhea, no formal education, early initiation of complementary food and lowest wealth quartile were significantly associated with anemia.<sup>9</sup>

Anemia is an important cause of morbidity and mortality in many parts of the world. At Paediatric department of Bolan Medical College Hospital Quetta there is an increased number of admissions due to anemia. The presence of infections, haemoglobinopathies, malnutrition and poverty increase the number of cases of anemia, but the disease burden and its associated factors have never been documented in this region. The results of this study will help to determine the prevalence of anemia and frequency of associated factors of anemia in the region. Findings of this study will help us to set prevention

programs against those factors, update the treatment protocols for proper management, follow up and care of children with anemia. Also results can be used to make public awareness regarding anemia in this population and its factors.

## MATERIALS AND METHODS

This cross-sectional study was carried out among children age 6-59 months at Paeds Unit-2, Bolan Medical College Hospital, Quetta in collaboration with Department of Medical Entomology and Parasitology, Institute of Public Health, Lahore from 1<sup>st</sup> January 2016 to 30<sup>th</sup> June 2016. Children age 6 to 59 months of age who presented with palmar pallor along with hemoglobin levels less than 11 g/dl were included. Patients with any bleeding disorder such as Hemophilia, VonWillebrand disease, idiopathic thrombocytopenic purpura, leukemia), history of blood transfusion within two months prior to admission and history of surgery in last two months were excluded. In selected participants the data was obtained by interviewing parents/guardians, according to specifically designed questionnaire. Data was collected about study subject's age, gender, area of residence, any history of blood transfusion and history of treatment for anemia in the past, history of child's breast feeding including its duration, age at introduction of other type of food, any type of complementary foods intake during the first year of life along with the habit of tea intake, history of being treated for malaria or given malaria prophylaxis were obtained from parent/guardian. Additional information on caretaker occupation family information,

about family size, main source of income, education level of the parents. A detailed history and thorough physical examination of these children was performed. Anthropometric measurements including weight and mid upper arm circumference were taken for assessing nutritional status which was classified into mild, moderate and severe malnutrition according to modified Gomez classification. All of our study subjects with hemoglobin equal to or less than 11g/dl by haemocue were further investigated for complete blood count test using an automated machine of MS 9-5H or CELL DYN 3700. Serum ferritin (Ferritin Elisa Genwa) was done in all children with anemia to detect iron deficiency. Study participant's blood smears for malaria parasite were also carried out using Giemsa Stain and the number of asexual parasite using 100X magnification under oil immersion lens were counted. Stool analysis was done by microscopic examination to find out parasites, ova or other forms of intestinal helminthes. Data was entered to SPSS version 20.0 for analysis. To determine factors associated with anemia univariate followed by binary logistic regression analyses was done. Risk factors with p-value of  $\leq 0.1$  were subjected to binary logistic regression analysis and its corresponding 95% confidence interval was determined as a risk factor with p-value less than 0.05 was statistically significant.

## RESULTS

During period of six months a total of 1250 children were admitted in Paediatric Ward.

**Table No.1: Distribution of cases by anemia status and associated risk factors**

Variable	Group					
	Anemic n = 395 (75.2%)		Non-anemic n = 110 (21.8%)		Total n=506 (100%)	
	No.	%	No.	%	No.	%
<b>Gender</b>						
Male	210	82.4	45	17.6	255	100.0
Female	185	74.0	65	26.0	250	100.0
<b>Age (years)</b>						
<24 months	225	79.8	57	20.2	282	100.0
>24 months	170	76.2	53	23.8	223	100.0
<b>Caregiver occupation</b>						
Unemployed	235	83.9	45	16.1	280	100.0
Employed	160	71.1	65	28.9	225	100.0
<b>Weaning period</b>						
Before 6 months	285	82.8	59	17.2	344	100.0
At or after 6 months	110	68.3	51	31.7	161	100.0
<b>Education</b>						
Illiterate	176	98.3	3	1.7	179	100.0
Literate	219	67.2	107	32.8	326	100.0
<b>Nutrition</b>						
Malnourished	330	84.8	59	15.2	389	100.0
Normal	65	56.0	51	44.0	116	100.0

**Table No.2: Comparison of Effect of various risk factors on anemia, when considered independent and in presence of other confounding factors**

	Un-adjusted Odds ratio	95% CI	P-value	Adjusted odds ratio	95% CI	P-value
Gender (male)	1.64	1.07 – 2.52	0.030	0.20	0.07-0.53	0.001
Age <24 years	1.23	0.81 – 1.88	0.394	0.17	0.06-0.50	0.001
Unemployed	2.12	1.38 – 3.26	0.001	10.36	2.98-36.03	0.000
Weaning <6 months	2.24	1.45 – 3.46	<0.001	1.00	0.47-2.13	0.998
Malnutrition	4.39	2.77 – 6.95	<0.001	580.266	60.47-5567.93	0.000
Un-educated	28.66	8.95 – 91.84	<0.001	6288.444	498.27-79363.02	0.000

Of these 715 were out of age limit and 531 children aged 6 to 59 months were eligible. Among these 531, 18 had blood transfusion prior to admission, 3 underwent surgery, 4 diagnosed as having leukemia and 5 had active bleeding, so overall 30 cases were excluded. Out of 506 children male to female ratio was almost 1:1 (255 males and 256 females). Amongst the mentioned group 395 (78.2%) children were anemic and 210 (82.4%) were males and 185 (74.0%) were females. In the children aged <24 months 225 (79.8%) and those aged >24 months 170 (76.2%) had anemia. Among caregivers being employed, 235 (83.9%) were unemployed and 160 (71.1%) were employed, while 285 (82.8%) of those who were weaned before six months were anemic and 110 (68.3%) who were weaned after 6 months were anemic. Illiterate parents were almost all (98.3%) had anemic children and among those who were malnourished (84.8%) had anemia (Table 1).

When gender, age <24 months, employment status, weaning status, nutritional status and education were considered independently as a risk factor for anemia. The male gender had high risk of anemia 1.64 (1.07-2.52) times. Unemployed parents, weaning before six months, malnutrition and being illiterate had significantly higher odds of being anemia with values of 2.12 (1.38-3.26), 2.24 (1.45-3.46), 4.39 (2.77-6.95) and 28.66 (8.95-91.84) respectively. When all factors were linked with anemia by using binary logistic regression analysis. Interestingly, the odds of gender changed to 0.20 (0.07-0.53) of age <24 to 0.17 (0.06-0.50) and both became significant. The odds of unemployment rased to 10.36 (2.98-36.03), malnutrition 480.27 (60.47-587.9) and uneducated to 6288.44 (498.27-79363.02) respectively. The weaning period odds turned insignificant to 1.00 (0.47-2.13) (Table 2).

## DISCUSSION

This is the first study conducted in collaboration between Institute of Public Health and Bolan Medical College to determine prevalence and different factors thought to be associated with anemia. The findings of this study indicate that anemia is a major health

problem among children aged 6 to 59 months admitted at Bolan Medical Complex Hospital Quetta. The prevalence of anemia was found to be 79.4% among children age 6 to 59 months of age. The overall prevalence of anemia in this study was higher than a study that was conducted in industrialized countries such as Austria 10.5%, Belgium 8.7% and South Asian countries such as India 7-13%, Bangladesh 47% and is also high in comparison to other studies in Pakistan which was 50.9%.<sup>1</sup> In our study the prevalence of anemia was higher because in this region the causes are multiple such as nutritional deficiencies, malaria infection, iron deficiency and poor socio-economical conditions with illiteracy as also found in our results. From the results of a study reported that malaria is one of the most important causes of anemia among children aged 6-59 months.<sup>11</sup> Malaria is an important risk factor being the cause of anemia. As in malaria anemia occurs due to red blood cell lysis with spleen sequestration and the destruction of erythrocytes along with the phagocytosis of un-infected and infected red blood cells.<sup>12</sup> In this study malaria was strongly associated with anemia. Unemployment and illiteracy has also been associated with anemia in other studies.<sup>13,14</sup> Same result was also obtained in our study. This is likely to reflect nutritional deficiencies and recurrence of infections due to poor family or low level of education which more likely increases the prevalence of anemia. An important finding from a study reported that the habit of taking tea along with meal came out to be significantly associated risk factor for anemia due to its interferences of absorption in intestine.<sup>15, 16</sup> From the results of our study, the univariate analysis were statistically significantly associated with the habit of tea in take with normal daily routine meals and development of anemia. Nutritional deficiencies, sickle cell disease and multiple blood transfusions in these children could be some of the confounders.

From the results of another study it is evident that children above the age of 2 years were at a higher risk of developing anemia as compared to those below 2 years of age.<sup>11</sup> In the present study we found a significant association between age below two years and anemia in univariate analysis but not in

multivariate. Malnutrition is among the causes of anemia as reported by the researchers.<sup>17,18</sup> In this study, there was significant association between nutrition status and anemia. The Serum ferritin levels were checked among all children and the morphological types of anemia, whereby 85% of study subjects with microcytic hypochromic anemia in their peripheral smears had low serum ferritin level, while more than 72% of our study subjects were also suffering from weaning at the age of less than 6 month. Majority had supplementary feeding with wheat based food that lack both iron which likely contributes to iron deficiency during infancy and childhood.

## CONCLUSION

Prevalence of anemia in children admitted at Bolan Medical Complex Hospital Quetta is high (79.4%). Factors most strongly associated with anemia included malaria parasitic infestation, unemployment among caregivers, habit of taking tea with meals, mal-nutrition, low level of education and iron deficiency anemia. This study has shown that there is high prevalence of anemia in children 6 to 59 months of age. This study also has shown a significant contribution of above mention factors to the prevalence of anemia. Therefore, we suggest that the approach to preventive strategies must be targeted. Routine screening for anemia in all admissions and during attendance should be done by using simple tests for hemoglobin estimation such as haemocue method should be made available. Continuous health education program should be done. Iron supplements to all infants and child, fortification of food, counseling on type of weaning food and intermittent anti-malarial treatment.

**Conflict of Interest:** The study has no conflict of interest to declare by any author.

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