



Study of Perinatal & Environmental Factors Associated with Anemia in Preschool Children in Rural Field Practice Area of Medical College, Mumbai, Maharashtra

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ABSTRACT

Background: Despite various measures implemented over the years anemia continues to remain a public health challenge. To reduce anemia in preschool children, targeted interventions are needed that take into account the local factors responsible for anemia at an early age. The study was conducted to assess the environmental and perinatal factors associated with of anemia in preschool children in rural area.

Methods: A community based cross-sectional study was conducted amongst 280 preschool children in the field practice area of Dept. of Community Medicine of T. N. Medical College, Mumbai during the period of May 2016 to April 2017. Hemoglobin colour scale indicator was used to grade the anemia.

Results: Prevalence of anemia was 31.1% among the preschool children. Birth order, anemia in mother, home delivery, preterm birth, lack of exclusive breast feeding, immunization status, anthropometry, source of water, open defecation, and worm infestation showed significant association with presence of anemia.

Conclusion: anemia still remains a public health problem in the rural area. Early and targeted interventions with regular follow up need to be undertaken at grass root level to reduce its prevalence in the population.

Key words: Anemia, Preschool children, Perinatal factors, Environmental factors

INTRODUCTION

Reduction below normal level in volume of packed red cells as measured by the hematocrit or reduction in Hb concentration of blood is defined as anemia. Iron deficiency is one of the most common, but not the only cause of anemia. Other causes of anemia include hereditary hemoglobinopathies, chronic infections, and folic acid deficiency. Multiple causes of anemia may coexist in an individual or in a population and contribute to the severity of the anemia.¹

Iron deficiency is frequently reported to be the major cause of anemia with an estimate that 50% of

anemia worldwide is attributable to iron deficiency. However, the frequency of wide-ranging risk factors for anemia in developing countries, including iron deficiency, vitamin A deficiency, infection, and genetic risk factors, are not routinely measured in a single population. In sub-Saharan Africa, where undernutrition, HIV, malaria, helminthiasis, and hemoglobinopathies are prevalent, an iron supplementation intervention alone may not adequately address anemia.²

At birth, and up to 4 months of age in a full term baby, the infant is in a state of 'ironfeast'. This is the result of the generous neonatal reserves of

storage iron and the iron replenished from hemoglobin breakdown as the concentration of haemoglobin declines. The rapidly expanding blood volume from 4 to 12 months of age increases vulnerability to iron deficiency. The problem is compounded by a diet which is often either poor in iron or rich in non-bioavailable iron.³ India has a high prevalence of severe acute malnutrition (SAM). Severe anemia is one of the co-morbidities responsible for increased mortality in severely malnourished children.⁴ It is estimated that roughly 43% (corresponding to 273 million) children have anemia globally.⁵

According to National Family Health Survey 4 (NFHS-4) children age 6-59 months who are anemic in urban area is 55.9% and in rural area is 59.4%.⁶ anemia prevalence shows reducing trend compared to NFHS-3 which is 69.4%.⁷ To further reduce anemia in preschool children targeted interventions are needed that take into account the local factors responsible for anemia at an early age. Hence the present study aims to identify the perinatal and environmental factors associated with anemia in the rural field practice area of Dept. of Community Medicine of T. N. Medical College, Mumbai, Maharashtra, India.

MATERIALS AND METHODS

A community based cross-sectional study was carried out amongst 280 preschool children (aged 1-4 years) during the period of May 2016 to April 2017 at rural field practice area of Dept. of Community Medicine of T. N. Medical College, Mumbai, Maharashtra, India after obtaining the administrative and ethical committee approval from the institute. Preschool children (aged 1-4 years), residing in the area for at least 6 months and whose parents assented to participate were included in the study, whereas children with acute illness or known hemoglobinopathies were excluded from the study. Based on previous studies, the prevalence of anemia in preschool children was taken as 59.2% and with an admissible error of 10%, the sample size was calculated to be 280.⁸

Sampling method -Total population of rural field practice area of Dept. of Community Medicine of T. N. Medical College, Mumbai was 23,434. The number of children of age between 1 to 4 years of age enumerated by PHC was 2,543. List was prepared of these children. From list, first child will be selected by simple random sampling method and after that with help of systemic random sampling method every 9th child will be selected for study till sample size of 280 is met. If house is locked or the child does not meet the inclusion criteria then the next child in the list will be selected for study

purpose.

Anemia status among the study population was assessed by reading level of hemoglobin on instrument called Hemoglobin Colour Scale (HCS) indicator. As per WHO, Hemoglobin Colour Scale has a sensitivity and specificity of 95% and 99.5% respectively.⁹ The scale is inexpensive, portable and an easy method to screen anemia in the field.

Statistical Analysis: The data was entered in Microsoft Office Excel Sheet. The quantitative data was analyzed by using percentages, mean and standard deviation and the association between various qualitative data was analysed by using chi-square test and p value of <0.05 was considered as level of significance.

RESULTS

It was found that the birth order, anemia in mother, type of delivery, birth weight, lack of exclusive breast feeding, and height for age are significantly associated with high prevalence of anemia in preschool children (**Table 1**). However the place of delivery, period of pregnancy and immunization status are not significantly associated with presence of anemia.

It was seen from **Table 2** that the most household had tap water however those who had well or tube well water showed significantly high prevalence of anemia. Open defecation was still practiced by 129(46.1%) children and these children had significantly high prevalence of anemia. Presence of worm infestation and history of malaria were also associated with presence of anemia.

DISCUSSION

Peri-natal factors associated with anemia in preschool children

Globally, 1.62 billion people and an estimated 293 million children of preschool age are affected by anemia. anemia is mainly found in Southeast Asia. Although anemia has a variety of causes, it is generally assumed that 50% of cases are caused by iron deficiency. The main risk factors for iron deficiency among young children are low intake and the high requirement of iron during child growth.¹⁰

In the present study, majority of children were of birth order lower than two as consistent with smaller family norm. However, children above birth order of 2 had significantly higher proportion of moderate to severe anemia. The association between birth order and anemia is statistically significant. This has been corroborated by others studies as well.¹¹

Table 1: Association between Perinatal Factors and Grades of anemia

Perinatal Factors	Children (%)		Total	χ^2 -value (p-value)	Odds Ratio	95% CL
	Non-anemic	anemia (Mild to Severe)				
Age						
12-17 months	12(28.6)	31(17.9)	43(15.36)	14.93 (0.005)	--	--
18-23 months	06(14.3)	11(2.4)	17(6.07)			
24-29 months	09(21.4)	63 (26)	72(25.71)			
36-41 months	07(16.7)	80 (34.1)	87(31.07)			
42-48 months	08(19.0)	53(19.5)	61(21.79)			
Birth Order						
Upto 2	37(88.1)	175(80.5)	212(75.7)	4.12 (0.042)	2.66	1.00-7.08
More than 2	05 (11.9)	63 (19.5)	68(24.3)			
Mother Anemic						
Yes	35(83.3)	126(95.9)	161(57.5)	13.49 (<0.001)	4.44	1.99-10.40
No	07(16.7)	112(4.1)	119(42.5)			
Place of Delivery						
Home	06(14.3)	42(4.9)	48(17.1)	0.28 (0.594)	0.78	0.31-1.96
Hospital	36(85.7)	196(95.1)	232(82.9)			
Type of Delivery						
LSCS	85(11.9)	44(13.8)	129(17.5)	91.90 (<0.001)	10.13	6.11-16.80
Normal	37(88.1)	194(86.2)	231(82.5)			
Period of Pregnancy						
Pre term	09(21.4)	48(2.4)	57(20.4)	0.03 (0.852)	1.08	0.48-2.41
Full Term	33(78.6)	190(97.6)	223(79.6)			
Birth Weight						
Low Birth Weight	03(7.1)	113(32.5)	116(41.4)	23.937 (<0.001)	0.085	0.026-0.283
Normal	39(92.9)	125(67.5)	164(58.6)			
Exclusive Breast Feeding						
No	07(16.7)	116(4.9)	123(43.9)	14.909 (<0.001)	0.21	0.090-0.492
Yes	35(83.3)	122(95.1)	157(56.1)			
Height for age						
Impaired	16(38.1)	211(81.3)	227(81.1)	59.47 (<0.001)	0.079	0.038-0.165
Normal	26(61.9)	27(18.7)	53(18.9)			
Weight for Age						
Impaired	08(19)	105(34.1)	113(40.4)	9.322 (0.002)	0.298	0.132-0.671
Normal	34(81)	133(65.9)	167(59.6))			
Immunization Status						
Complete immunized	38(90.5)	215(95.1)	253(90.4)	0.001 (0.977)	1.016	0.333-3.104
Partial immunized	04(9.5)	23(4.9)	27(9.6)			

P value <0.05 indicate significant and <0.001 is highly significant.

Table 2: Association between Environmental Factors and Grades of anemia

Environmental Factors	Children (%)		Total	χ^2 -value (p-value)	Odds Ratio	95% CL
	Non-anemic	anemia (Mild to Severe)				
Source of Water						
Well	08(19.0)	60(12.2)	68(24.3)	7.777 (0.020)	--	--
Tap	28(66.7)	105 (69.1)	133(47.5)			
Tube well	06(14.3)	73(18.7)	79(28.2)			
Place for defecation						
Latrine	32(76.2)	119(94.3)	151(53.9)	9.856 (0.002)	3.2	1.505-6.803
Open	10(23.8)	119(5.7)	129(46.1)			
Worm Infestation						
No	35(83.3)	122(95.1)	157(56.1)	14.909 (<0.001)	4.754	2.031-11.127
Yes	07(16.7)	116(4.9)	123(43.9)			
H/o Malaria						
No	33(78.6)	123(93.5)	156(55.7)	10.463 (0.001)	3.428	1.572-7.476
Yes	09(21.4)	115(6.5)	124(44.3)			

P value <0.05 indicate significant and <0.001 is highly significant.

According to NFHS-3, children anemia status was as follows - for non anemic, mild anemic, moderate to severe anemic and severe anemic mother 61.5%, 73%, 78% and 81.9% respectively.⁷ Children born at home showed increased anemia prevalence while hospital born show decreased prevalence. The study did not find any significant association between anemia and delivery by caesarian section. Maternal anemia is associated with poor intrauterine growth and increased risk of preterm births and low birth weight rates. This in turn results in higher perinatal morbidity and mortality, and higher infant mortality rate. Early detection and effective management of anemia in pregnancy can lead to substantial reduction in undernutrition in childhood, adolescence and improvement in adult height.¹²

The causes of anemia are multifactorial, inter-linked, and context-specific. Important known risk factors for anemia in developing countries include micronutrient deficiencies (e.g., iron, vitamin A, folate, vitamin B-12), infections (e.g., intestinal parasites, schistosomiasis, malaria, human immunodeficiency virus), and inherited red blood cell disorders (e.g., sickle cell, α -thalassemia).¹³

The children who were not exclusively breast fed for first 6 months showed higher proportion of severe anemia as compared to those who were exclusive breastfeeding until age 6 months and continuation of breastfeeding after this age, combined with qualitatively and quantitatively appropriate feeding may contribute towards an increase in hemoglobin concentration in the first year of life.¹⁴ The present study also shows that children with normal birth weight have lesser prevalence of anemia in preschool age.

In the present study, unimmunized children have increase prevalence of anemia. The children who are vaccinated are less prone to diseases, so the chances of anemia are less in completely immunized children. Height for age is indicator of chronic malnutrition status, in this study children having adequate height for age showed decreased prevalence of anemia. Weight for age is indicator of acute malnutrition status, in this study children having adequate weight for age showed decreased prevalence of anemia. According to NFHS-3, Height for age in age group 12-17 months is 46.9% and in age group 24-35 months it is 55.9%, while anemia prevalence was 84.5% and 74.6% respectively and weight for age in age group 12-17 months is 40.2% and in age group 24-35 months it is 44.9% while anemia prevalence was 84.5% and 74.6% respectively.⁷

Environmental factors associated with anemia in preschool children

The present study shows significant association between water source and anemia. Prevalence is lower in household with tap water. Since tap water is clean and free from contamination while, other water sources may have higher exposure to contamination leading to repeated infections. There was also a clear association between open defecation and increased prevalence of anemia. Open air defecation leads to increase chances of contamination of water and food leading to increased prevalence of worm infestation. Similarly a study done by Kumbhar SK¹⁵ showed that prevalence of anemia among children that lived in those households where there was no facility of toilet was found to be higher than those who had these facilities available. Anemia prevalence is 55% those having toilet facility in their home and 63.9% those having open defecation. The children infested with hookworm show anemia thus showing significant relation. Similarly previous studies identified parasitic infections, especially hookworm infection, as an important predictor of anemia among children.^{16,17,18} Wherever resources are limited, high-risk groups should be targeted and a long-term health education program promoted to modify food habits, promote healthy weaning practices, and encourage consumption of nutritious foods.

CONCLUSION

Prevalence of anemia is around 31.1% among the preschool children. Birth order, anemia in mother, home delivery, preterm birth, lack of exclusive breast feeding, immunization status, anthropometry, source of water, open defecation, and worm infestation showed significant association with presence of anemia. Anemia still remains a public health problem in the rural area. Early and targeted interventions with regular follow up need to be undertaken at grass root level to reduce its prevalence in the population. The challenge ahead is how best to reach preschool children in rural communities.

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