

Iron Deficiency Anemia in Children Under One Year of Age

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ABSTRACT

Objective: To determine the association of Iron Deficiency Anemia with demographic factors in children under one year of age.

Study design: Cross-sectional study.

Place and Duration of Study: Pak Emirates Medical Hospital, Rawalpindi Pakistan from Jan to Oct 2020.

Methodology: All children of less than one year of age, of either gender who attended Out Patient Department with the complaint of acute illness like upper respiratory tract infections were consecutively enrolled. The detailed analysis for haematological parameters, means corpuscular volume <70 fl, serum ferritin <30 mcg/L, and transferrin saturation <16% were performed.

Results: Of three hundred and fifty-four children, the frequency of Iron Deficiency Anemia was found to be in 200(56.5%). The frequency of Iron Deficiency Anemia in children more than 8 months of age was higher (70.6%) in comparison to children less than 8 months of age (29.4%). Multiple variables were found to significantly contribute to Iron Deficiency Anemia, the father's educational status, the mother's educational status and socioeconomic status. At the same time, Iron Deficiency Anemia was significantly lower among children with first or second childbirth orders and in breastfed infants.

Conclusion: A higher proportion of Iron Deficiency Anemia was noted among children under one-year-old who complained of acute illness.

Keywords: Acute illness, Infants, Iron deficiency anaemia.

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INTRODUCTION

Iron Deficiency Anaemia (IDA) is one of the most common nutritional deficiencies worldwide.¹ The World Health Organization (WHO) estimates that the IDA burden is more than 2 billion worldwide.² Various studies have reported that IDA in children of the developing world varied from 0.5-15%.^{3,4} However, in underdeveloped countries, the situation is alarming. As per an estimate reported in an Indian study, IDA prevalence in children is 69.5%.⁵ In another study, among all anaemic children, IDA among pre-school going children is reported as 85.4%.⁶ In Pakistan, the reported IDA prevalence is reported as 64%.⁷

It is stated that children under one year of age are at higher risk of developing IDA due to the increased requirement of iron during growth and pregnancy.^{8,9}

Though studies are being conducted to monitor the burden of IDA worldwide, rigorous and strong workings are required in our part of the world. The scarcity of the current local estimate also worsens the situation.¹⁰ So, to combat the increasing prevalence of

IDA in children in Pakistan, there is a dire need for a study that not only determines the burden of the problem in this at-risk population but also assesses the factors contributing to the high prevalence of the disease. Moreover, due to the silent nature of the disease, screening children under one year is of utmost importance. The findings will help health care providers understand the at-risk population in children one year. In addition to this, the study outcome will also be helpful for policymakers in the development of effective strategies to halt the increasing disease prevalence.

METHODOLOGY

The cross-sectional study was conducted at Pak Emirates Medical Hospital, Rawalpindi Pakistan, from January to October 2020. Ethical approval was obtained from the Institutional Review Board. The Epi Info sample size calculator was used to estimate sample size, using reported prevalence of IDA in children under one year of age 64%.⁷

Inclusion Criteria: All children of age less than one year who attended the Outpatient Department with complaints of upper respiratory tract infections and mild gastroenteritis were included in the study.

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Exclusion Criteria: Children are already taking any iron supplementation, suffering from any chronic illness, and those who had recent blood transfusions were excluded.

Informed consent was obtained from the parent/guardian of the children. Non-probability consecutive sampling technique was used. A detailed history was taken from parents of eligible children regarding baseline characteristics. The baseline characteristics include demographic and household characteristics, including age, gender, residence, father’s educational status, mother’s educational status, socioeconomic status, mother’s job status, number of children in the family, childbirth order, mode of delivery, breastfeeding feeding status, and anthropometric measures that are stunting and wasting. In addition, haematological parameters like haemoglobin level, hematocrit level, mean corpuscular volume, mean corpuscular haemoglobin level, transferrin saturation, and ferritin levels of the patients were observed.

Anthropometric measures were defined using WHO criteria. The presence of weight for age less than -2 standard deviations (SD) on WHO child growth standards was labelled as underweight. Height for age less than -2 standard deviations (SD) on WHO child growth standards were labelled as stunting.¹¹

Statistical analysis was performed using a Statistical Package for Social Sciences (SPSS) version 24. Mean was calculated for quantitative variables, whereas frequency and percentages were calculated for qualitative variables. The chi-square test was applied. The *p*-value of ≤0.05 was considered statistically significant.

RESULTS

A total of 354 children were included in the study during eight months, of which 180(50.8%) were male and 174(49.2%) were female. Patients with ≤8 months were 109(29.4%), and with age >8 months were 250 (70.6%). 168(47.5%) children were exclusively breastfed. IDA was documented in 200/354(56.5%) patients. The number of children in the family showed that the incidence of IDA in families with a single child was reported to be 112(31.6%), having two children 136(38.4%), and three or more by 106(29.9%). A significant association of IDA was observed with age (*p*-value <0.001), residence (*p*-value <0.001), father’s educational status (*p*-value 0.001), mother’s educational status (*p*-value <0.001), and socioeconomic status (*p*-value <0.001) (Table-I). Anthropometric characteristics showed that 88(24.9%) stunting was observed while

117(33.1%) children were underweight. A significant association of IDA was observed with the mode of delivery (*p*-value <0.012), childbirth order (*p*-value <0.001), exclusive breastfeeding (*p*-value<0.033) and underweight (*p*-value<0.024) (Table-I). The Comparison of Iron Deficiency Anemia with childhood characteristics (Table-II).

Table-I: Comparison of Iron Deficiency Anemia with Demographic Characteristics of the Patients (n=354)

	Iron Deficiency Anemia		<i>p</i> -value
	n (%)	n (%)	
Residence			
Rural	103(68.7)	47(31.3)	<0.001
Urban	97(47.5)	107(52.5)	
Father’s Educational Status			
Illiterate	95(63.3)	55(36.7)	0.001
Lower and equal tomatric	90(60.4)	59(39.6)	
More than Intermediate	15(27.3)	40(72.7)	
Mother’s Educational Status			
Illiterate	108(76.6)	33(23.4)	<0.001
Lower and equal tomatric	59(50.9)	57(49.1)	
More than Intermediate	33(34.0)	64(66.0)	
Mother's Job			
Employed Mother	89(53.3)	78(46.7)	0.251
Housewife	111(59.4)	76(40.6)	
Socioeconomic Status			
Poor	121(73.8)	43(26.2)	<0.001
Lower middle	26(38.2)	42(61.8)	
Upper middle	53(43.4)	69(56.6)	
Number of Children in Family			
One	56(50.0)	56(50.0)	0.107
Two	76(55.9)	60(44.1)	
Three or more	68(64.2)	38(35.8)	

Table-II: Comparison of Iron Deficiency Anemia with Childhood Characteristics (n=354)

	Iron Deficiency Anemia		<i>p</i> -value
	Yes	No	
	n=200 n (%)	n=154 n (%)	
Mode of Delivery			
Cesarean	123(62.4)	74(37.6)	0.012
Natural Childbirth	77(49.0)	80(51.0)	
Childbirth order			
One	114(55.9)	90(44.1)	<0.001
Two	62(49.6)	63(50.4)	
Three or more	24(96.0)	1(4.0)	
Exclusive Breastfed			
Yes	85(50.6)	83(49.4)	0.033
No	115(61.8)	71(38.2)	
Anthropometric measures			
Stunting	48(54.5)	40(45.5)	0.670
Underweight	76(65.0)	41(35.0)	0.024

DISCUSSION

IDA is one of the important factors in the global burden of the disease. It is reported, in developing countries, more than half of the pre-school children are affected by IDA.^{12,13} This is evident from the findings of the current study. The current study's findings have reported that the frequency of IDA was 56.5%. However, comprehensive studies are not available from Pakistan. However, estimates reported by countries with genetic, clinical, and environmental characteristics, like Pakistan, have shown an alarmingly high prevalence of IDA in younger children. Studies from Egypt, Jordan, and India report a higher prevalence.¹⁴⁻¹⁶ In a study by Al Ghwass *et al.* in Egypt, IDA prevalence is reported as 64%.¹⁴ Kilbride *et al.* have reported IDA prevalence in children as 72%.¹⁵ Karkar *et al.* have reported a 69% prevalence in India.¹⁶ Surprisingly, various studies from the developing country Iran have reported a relatively low burden of IDA in children.^{17,18} In a study conducted among hospitalized infants in Iran, IDA was observed in 31.5% of infants.¹⁷ Another study from Iran has reported IDA among infants aged 12-15 years as 26.2%.¹⁸

In the current study, anthropometric measures like wasting and stunting were significant contributing factors. The higher proportion of IDA in these individuals may be due to the reason that all these factors are related to the maternal education and socioeconomic condition, which are reported as the significant cause of IDA in the current study and previous studies as well.^{6,14,15,18}

According to the current study's findings, a considerably higher relation of IDA was observed with parents' age, residence, socioeconomic status, and educational status. Somewhat similar findings were reported by previous studies which showed significantly higher proportion of IDA in children of the illiterate mother, rural residents, and low socio-economic class.¹⁹ Whereas socioeconomic status as the significant risk factor is also reported by El-Kishawi *et al.* in their study.²⁰

The findings of this study could be highlighted in light of the limitation that the sample included in the current study is small. Moreover, this study was conducted in a single centre in Pakistan. Lastly, certain important variables, laboratory and clinical parameters, are not included in the current study. Despite these limitations, this study is one of the unique of this

kind from our country Pakistan that has reported the burden of IDA among children under one year of age. Therefore, further multicenter large-scale studies are recommended to preclude the findings of this study. Most importantly, the current study's findings and other published studies from neighbouring countries should be disseminated to higher authorities and policymakers so that policies can be devised that can cater for the need for iron supplementation in risk populations. In this regard, the maternal factors should not be ignored; future studies could also be conducted relating the maternal factors to the infant status of IDA.

CONCLUSION

A higher proportion of IDA was noted among children less than one year of age attending the Outpatient Department of the Pakistan Emirates Military Hospital of Rawalpindi with the complaint of acute illness.

Conflict of Interest: None.

Authors Contribution

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

SA & FI: Data acquisition, critical review, approval of the final version to be published.

AA & AA: Study design, drafting the manuscript, data interpretation, approval of the final version to be published.

RN & AR: Concept, critical review, data analysis, drafting the manuscript, approval of the final version to be published.

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

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