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Anemia as a Risk Factor for Lower Respiratory Tract Infection in Children of 6 Months to 5 Years of Age

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Abstract
Background: *Acute lower respiratory tract infections associated with anemia occur more commonly in children than in adults. But anemia due to whatever aetiology per se, as a risk factor for developing ALRTI, has not been fully evaluated. Hence this observational case control study shall be conducted for assessing anemia, as a risk factor for developing ALRTI in children.*
Material & Methods: *An observational case control study done on 270 with acute lower respiratory tract infection admitted in Pacific Institute of Medical Sciences, Udaipur were included in the study group and 270 age and sex-matched children selected on outpatient basis were included under the control group. The primary outcome was comparing the presence or absence of anemia in cases of acute lower respiratory tract infection and healthy control group. Secondary outcome were correlated the severity of anemia with severity of respiratory tract infection, if any.*
Results: *Our study showed that the age distribution of 270 cases and 270 controls, maximum children that is 41.85% were in the age group of 9 to 23 months. Male preponderance was found in our study (1.4:1). 184 (68.14%) out of 270 cases in the study group were found anemic while only 97 (35.92%) out of 270 control group were found anemic. For lower respiratory tract infection anemia looks like a significant risk factor with p value < 0.001 and odds ratio of 3.49.*
Conclusion: *Iron deficiency anemia is a significant risk factor for Lower Respiratory Tract Infection. Prevention and early diagnosis of anemia is important to reduce the prevalence of LRTI.*
Keywords: *ALRTI, Iron deficiency anemia, Hemoglobin, Risk factors.*

Introduction

Acute lower respiratory tract infections (ALRTI) include all infections of the lungs and the large airways below the larynx. On an average, children below 5 years of age suffer about 5-6 episodes of ALRI per year.[1]

Pneumonia is the biggest single cause of childhood death under the age of 5 years in developing Countries[2].

It is estimated that approximately 156 million cases of pneumonia occur annually in young children, resulting in approximately 1.4 million deaths.[3,4]

Anemia is the most common ailment affecting human's health, socio-economic development and the overall betterment of mankind. Nutritional deficiency particularly, iron deprivation is the commonest cause of anemia[5].

Globally, anemia affects 1.62 billion people (confidence interval: 1.50–1.74), representing 24.8% of the population. It affects 305 million school-age children with the prevalence of 25.4%, (CI: 19.9–30.9)[6]

In this study, we aimed to assess the quality of available evidence and present summary estimates of the strength of association between anemia and ALRI in children using statistical analysis.

Various risk factors have been proposed to increase the chances of developing pneumonia, some of them are definite some are likely and few are possible.[7]

Material & Methods

An observational case control study done on 270 with acute lower respiratory tract infection admitted in Pacific Institute of Medical Sciences, Udaipur were included in the study group and 270 age and sex-matched children selected on outpatient basis were included under the control group.

Inclusion Criteria

- Children in the age group 6months-5 years of either sex.
- Children with the clinical diagnosis of acute lower respiratory tract infection.

Exclusion Criteria

Patients having any of the following conditions:

- Protein Energy Malnutrition (PEM) ≥ Grade III as per Indian Academy of Pediatrics (IAP) Classification
- Bronchial Asthma
- Lung Abscess
- Chronic diseases – Diabetes mellitus, hepatitis, liver failure
- Children who are already on oral or injectable antibiotics / iron therapy.
- Parents / guardians not providing consent for the study

Method of collection of data

Specimen

Blood samples (5cc) were obtained by vein-puncture. Each sample was divided into 2 parts; one part was put in an Ethylene-diamine-tetra-acetic acid (EDTA) tube for complete blood counting and the other part was put in a plain vaccutainer for serum iron, total iron binding capacity, serum ferritin and CRP.

Test procedure

The sample was analyzed by cynmethemoglobin method in automated analyser. PBF were analyzed under the microscope.

Results

Our study showed that the age distribution of 270 cases and 270 controls, maximum children that is 41.85% were in the age group of 9 to 23 months, followed by 37.03% in the 24 to 35 months age group, 12.96% in the age group of 36 to 47 months and 8.14% in the age group of 48 to 60 months. Male preponderance was found in our study (1.4:1) (table 1).

184 (68.14%) out of 270 cases in the study group were found anemic while only 97 (35.92%) out of 270 control group were found anemic. For lower respiratory tract infection anemia looks like a significant risk factor with p value < 0.001 and odds ratio of 3.49 [Table 2].

Mean hemoglobin level was 9.72 mg/dl and 11.93 mg/dl in cases and controls respectively. Most of the anemic patients had hypochromic microcytic anemia. [Table 3]

Discussion

Anemia is seen in all ages but it is more prevalent iron deficiency anemia in children of 1-5 years.[8,9]

Our study showed that the age distribution of 270 cases and 270 controls, maximum children that is 41.85% were in the age group of 9 to 23 months. Similar finding done with Mohd Ashraf et al found maximum incidence in the age group of 3 months to 23 months.[10] Around 80% of the children were in above age group. Malla et al they found maximum children in infantile age group.[11]

Another study done by Ramkrishnan et al found maximum incidence in the children below 6 years.[12] This signifies that the prevalence of LRTI decreases with age. Younger children are more susceptible to anemia and subsequently LRTI. Lower respiratory tract infection is associated with various risk factors.[13] Anemia was significantly found in LRTI patients, and these patients were found to be 3.49 times more susceptible to LRTI.

Our study showed that the 184 (68.14%) out of 270 cases in the study group were found anemic while only 97 (35.92%) out of 270 control group were found anemic. Mohd Ashraf et al found 64.5% of the cases anemic while only 28.2% of the controls were anemic.[10] While another study done by Ramkrishnan et al found 74% of the cases anemic while only 33% of the controls were anemic.[12] Malla et al found 68.6% of the cases having anemia while only 38.6% of the controls were having anemia.[11] Mourad et al found prevalence of anemia was 32% in hospitalized cases and 16% in healthy controls.[14]

Conclusion

Iron deficiency anemia is a significant risk factor for Lower Respiratory Tract Infection. Prevention and early diagnosis of anemia is important to reduce the prevalence of LRTI.

Table 1: Age wise distribution of patients

Age of children (Months)	Overall Number	Percentage
9-23 months	226	41.85%
24-35 months	200	37.03%
36-47 months	70	12.96%
48-60 months	44	8.14%
Total	540	100%
Male: Female	1.4:1	

Table-2: Multivariate Logistic Regression Analysis Showing Anemia as a Risk factor of LRTI

Risk factor	Adjusted OR	95% CI		P-value
		Upper	Lower	
Anemia	3.4932	6.372	2.184	<0.001

Hemoglobin (mg/dl)	Case	Control
Mean	9.72	11.93

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