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**A CASE CONTROL STUDY ON ROLE OF IRON LEVELS A RISK
FACTOR FOR ACUTE LOWER RESPIRATORY TRACT INFECTION
(ALRI) IN CHILDRENS**

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ABSTRACT

Acute lower respiratory tract infection is a major cause of death in less than five years of age, and anemia is the commonest co-factor in pediatric patients seeking medical advice especially in developing countries. In the present study to analyze whether a low hemoglobin level is a risk factor for acute lower respiratory tract infections (ALRTI) in children. Prospective case control study on 200 children (100 cases and controls each) was carried out in S.V Medical college and general hospital pediatric department. All patients between the age of 6 month to 5 years of age who fulfilled the inclusion criteria were included. We used WHO criteria to diagnose ALRTI among the cases, and age and sex matched patients who did not have respiratory complaints were kept as controls. Patients who had congenital heart diseases, tuberculosis, malignancies, or dysmorphic features were excluded from the study. All patients were subjected to detailed history and through clinical examination followed by investigations like complete blood count (CBC), peripheral blood film (PBF) smear, blood culture and sensitivity test, X-ray chest, serum iron and iron binding capacity were done in all cases. Our study had slightly male preponderance 64% in study group and 68 % in control group. Maximum number of children were between 5 months and 25 months both in the study (80%) as well as in the control (89%) group. Anemia, predominantly iron deficiency anemia, was significantly found in ALRTI patients, and these patients were found to be 4.6 times more susceptible to ALRTI. Early and accurate diagnosis of anemia in children suffering from various ailments in particular to ALRTI will serve the mankind in a better.

Key words: Acute Lower Tract Infection, Haemoglobin, Serum Iron, Blood Culture.

INTRODUCTION

Lower Respiratory Tract Infections (LRTI) includes all infections of the lungs and the airways below the larynx [1]. Acute lower respiratory tract infections are the leading cause of death in children below 5 years of age. On an average child below 5 years of age suffer about 5 to 6 episodes of LRTI per year. ALRTI includes croup syndromes, bronchitis, bronchiolitis and pneumonia.

Pneumonia is the biggest single cause of childhood death under the age of 5 years in developing countries.6 Approximately 150 million episodes of childhood pneumonia are reported every year from the

world out of which 95 percent are from developing countries. Fifteen countries account for nearly 75 percent and six countries including India account for 50 percent. India alone bears the brunt of 40 percent disease burden [2].

Haemoglobin (Hb) level is the most reliable indicator of anemia among all individuals. Anemia is a major public health problem that can occur at any stage of the life cycle, but is more prevalent in pregnant women and young children having iron deficiency [1]. Various risk factors have been proposed to increase the chances of

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development of lower respiratory infections some of them are definite some are likely and few are possible [3]. Since infections of the lower respiratory tract are the major morbidity and mortality indicators among the children, gaining control over the risk factors will have a promising effect on the wholesome growth and development of children. Our study was conducted with the objective to know the association of low Hb levels among the children with LRTI.

Since infections of the lower respiratory tract are the major morbidity and mortality indicators among the children, attempts to control the risk factors would have a great effect on the wholesome growth and development of children. The present study was designed with the objective to know the association of iron status (and subsequently hemoglobin) levels among the children with Acute lower respiratory infections.

PATIENTS AND METHODS

The present study was a hospital based prospective study conducted over a period of one year from March 2014 to April 2015, in the Department of Paediatrics, S.V Medical college and general Hospital. A total number of two hundred infants and children aged six months to five years were included; One hundred cases were hospitalized for lower respiratory tract infection in Department of Pediatrics, S.V Medical college and General Hospital, and one hundred healthy, age and sex matched controls, were selected from outpatient

department. Complete blood count, iron level, ferritin level, and total iron binding capacity were taken if haemoglobin level less than eleven gram per deci-liter. In addition peripheral blood smear, chest radiograph and C-reactive protein were done to hospitalized cases. Definition of iron deficiency anemia and normal laboratory values were predetermined.

STATISTICAL ANALYSIS

Data was described as mean ± SD/SE and percentages. Least significant difference for intergroup variance was measured at 95% confidence interval.

In the study group, anemia (haemoglobin g%) was present in 69 (69 %) cases while in the control group anemia was found in 28 (28 %). The p-value is 0.001, which is significant.

In peripheral blood film, hypochromic microcytic picture was seen in 52 (52 %) cases in the study group and 12(30.3%) cases in the control group while as normocytic normochromic picture was seen in 13 (20.1%) cases in the study group and 22(70.7%) cases in the control group.

In the study group, the mean serum iron level was 32.15 mg/dl in the anemic cases and 47.12 mcg/dl in the non-anemic cases. p-value was (0.000) which is significant. In the control group, the mean serum iron level was 55.15 mcg/dl in the anemic cases and 62.623 mg/dl in the non-anemic cases. P-value was (0.005) which is significant.

Table 1. Age distribution of the study subjects

Age in months	Study group (100)		Control (100)	
	no	%	no	%
<4	12	12	11	11
5-25	80	80	89	89
26-60	8	8	10	10

Table 2. Gender distribution of the study subjects

Gender	Study group (100)		Control group	
	no	%	no	%
Male	64	64%	68	68
Female	36	36%	32	32

Table 3. Peripheral Blood film results of Anemia subjects

		Study group (100)		Control group (100)	
		NO	%	NO	%
	Anemia	69	69%	28	28
P.B Smear	Hypochromic Microcytic	52	52%	12	12
P.B Smear	Normocytic (Sig) Normochromic	13	13%	22	22

Table 4. Clinical features in the study subjects

	Study group (100)		Control group (100)	
	no	%	no	%
Fever	96	96	92	92

Cough	100	100	10	10
Fast Respiratory Rate	68	68	00	00
Chest in-drawing	90	90	00	00
Ronchi or Crepitation on Auscultation	62	62	00	00
Vomiting	25	25	58	58
Diahorrea	7	7	40	40
Pain Abdomen	4	4	34	34
Dehydration	7	7	32	32
Convulsions	10	10	30	30
Other Non-respiratory Symptoms(Poor Feeding, Irritability,Sore Throat)	70	70	65	65

Table 5. Anemia in the studied subjects

Anemia	Study group (100)		Control (100)	
	no	%	no	%
	72	72	30	30

Table 6. Serum iron level in the studied subjects

Study group	Anemia (serum iron in mg/dl)	Normal (serum iron in mg/dl)
Study group	32.15±15.5	47.12±13.4
control	55.15±15.1	63.23±12.3

DISCUSSION

Anemia is the commonest ailment affecting human's the health, socio-economic development and overall betterment of the mankind. Most common cause for anemia is nutritional deprivation in particular, iron deficiency [8]. In Southeast Asia, the proportion of anemic population is the highest in the world, with 616 million people at risk [4, 5]. In children, major health consequences include impaired cognitive and physical development and increased mortality and morbidity related to occurrence of infections [4]

The present study was a hospital based prospective study conducted over a period of one year from March 2014 to April 2015, in the Department of Pediatrics, S.V Medical College and General Hospital. Acute Lower Respiratory Tract Infection (ALRTI) is a leading cause of mortality in children below 5 years of age in developing countries [5]. Hence it is important to control the risk factors to prevent deaths from ALRTI. Along with many risk factors like low birth weight, lack of breastfeeding, severe malnutrition, smoke, cooking fuel, low haemoglobin is also be a risk factor. Present study was carried out to study the correlation between serum iron levels and acute lower respiratory tract infection in children [6].

Anemia was found in 72 (72%) cases in the study group and in 30 (30%) cases in the control group. In Malla et al[23], anemia was found in 96 (68.6%) cases in the study

group and 30 (21.42%) cases in the control group. In Ramakrishnan et al 25 anemia was found in 74 (74%) cases in the study group and 33 (33%) cases in the control group [7,8].

Anemic patients were found to be 4.6 times more susceptible to ALRTI in our study. Ramkrishnan et al found that anemic children were 5.75 times more susceptible to ALRTI [9]. Mourad et al 27 found that anemic children are twice more susceptible to lower respiratory tract infections as compared to nonanemic children [10].

The role of low Hb level per se, as a risk factor for developing ALRTI is reported only in few literatures. They had found that reduced Hb level due to whatever etiology was a significant risk factor for developing ALRTI [11]. Here in this study low haemoglobin due to iron deficiency was found the main cause of ALRTI. It seems noteworthy that oxygen O₂ and carbon-dioxide (CO₂) transport is primarily facilitated by Hb, besides Hb acts as buffer for nitric oxide (NO) and other body derangements [11]. Therefore quantitative and/or qualitative reduction in Hb, may adversely affect the normal functions. Alveolar macrophages obtain iron primarily from the RBC metabolism and plasma pool, and their function is may be hampered in iron deficient states, and hence could be possible explanation for association of ALRTI and deficient iron state and consequently iron deficiency anemia.

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