

Association of Respiratory Tract Infection among Children Presented with or without Anaemia: A Retrospective Study

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ABSTRACT

Introduction: Children have the highest rate of prevalence of anaemia and hence face major health problems. Both economic and social development is adversely affected by anaemia. Children below 5 year of age suffer 4 – 5 episodes of RTI (Respiratory Tract Infection) per year. This study was aimed to find the association of RTI with anaemia.

Material and Methods: This retrospective study was conducted among children of age group 1-14 years presented with upper and lower RTI. The results were analyzed on the basis of clinical findings, results of laboratory investigations and data was statistically analyzed to find out the association.

Results: Total of 50 children (age 1 to 14 years) were included. Male to female ratio was 1.08:1. Among the total cases, 14 (28%) cases were anaemic and remaining 36 (72%) cases were non-anaemic. Among the anaemic cases, 5 cases (10%) were presented with upper RTI and remaining 9 cases (18%) were with lower RTI. A statistically significant difference ($p=0.0247$) could be evidenced between the RTI in anaemic children when compared to non-anaemic cases. Furthermore, the relative risk of incidence for RTI among the anaemic children was 0.4945 (95% CI= 0.2379-1.028) compared to the non-anaemic cases.

Conclusion: Association of relative risk for RTI among the children with anaemia was statistically significant when compared to those without anaemia.

Keywords: Anaemia, Laryngitis, Pharyngitis, Pneumonia, Respiratory Tract Infections

INTRODUCTION

Anaemia is a condition in which the number and size of red blood cells or the hemoglobin concentration of red blood cells falls below an established cut off value. Consequently impairing the capacity of the blood to transport oxygen around the body.¹ Anaemia is defined as blood haemoglobin concentration less than 11 g/dl in children and pregnant woman and less than 12 g/dl in non-pregnant woman.¹ Anaemia affects around 800 million children and women as per 2011 WHO estimate.² Children had the highest rate of prevalence of anaemia in 2011 which was reported as 42.6% (95% CI: 37—47) worldwide. Economic and social development is adversely affected by anaemia.³ Iron deficiency is the most common and wide spread disorders in the world. It is estimated that 30% of the global population has iron deficiency anaemia and most of them live in developing countries. Children below 5 year of age suffer 4 – 5 episodes of Respiratory Tract Infection (RTI) per year. Previous report indicated that anaemia is a significant risk factor for lower RTI in Children with an odds ratio of 3.59

and the risk will be reduced significantly in those who were exclusively breast fed.⁴

A full term newborn infant contains about 0.5 g of iron compared to 5 g of iron in adults. It is necessary to absorb approximately 1mg of iron daily to maintain positive iron balance in childhood. Because less than 10% of dietary iron usually is absorbed, a dietary intake of 8-10 mg of iron daily is necessary maintain iron levels. Breast fed infants have an advantage because they absorb iron 2-3 times more effectively than infants fed on cow's milk. It is well established that infection causes anaemia and several mechanism have been proposed to explain the basis of anaemia in infection.⁴ Despite the relationship known, the association of RTI with anaemia in various societies are needed for a timely management of infection as well as to provide the necessary awareness about the importance of balanced diet. This retrospective study was done to establish association between RTI and anaemia.

MATERIAL AND METHODS

This retrospective study was conducted in 50 children of age group 1-14 years, who attended the Paediatrics outpatient clinic of Central Kerala, during a period of one year from January 2018 to December 2018. Children with genetic disorders, severe systemic illness and Protein Energy Malnutrition (grade > III as per Indian Academy of Paediatrics classification) and children who were immunocompromised were exempted from the study. The study design was approved by the Institutional Ethics Committee, Amala Institute of Medical Sciences, Amala Nagar, Thrissur, Kerala, India.

Study procedure

Children presented with upper (common cold, pharyngitis and laryngitis) and lower (bronchitis, pneumonia and bronchiolitis) RTI were clinically observed for the signs

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of anaemia. The subjects were advised for the laboratory blood routine examination. Investigations included complete haemogram, C Reactive Protein (CRP), Mantoux test and peripheral blood smear. Complete haemogram was done by Abbott Cell – Dyn 1700 fully automatic analyzer and CRP was done by Latex enhanced Nephelometry. Diagnosis of pneumonia was made from the symptoms and clinical signs. X ray chest was done in cases indicated. Nutritional status was assessed from the height and weight recorded for all children.

STATISTICAL ANALYSIS

Data expressed as percentage of incidence and the significant difference between the anaemic and non-anaemic groups was analyzed by Fisher's exact test using SPSS software package, (v 16, IBM, IL, USA). $P < 0.01$ was considered as significant

RESULTS

Total 50 patients presented with RTI were included in the study. The age of patients was in a range of 1-14 years with male to female ratio of 1.08:1 (Figure 1). Among the total cases, 14 (28%) cases were anaemic and remaining 36 (72%) cases were non-anaemic (Table 1). Among the anaemic cases, 5 cases (10%) were presented with upper RTI and remaining 9 cases (18%) were with lower RTI. A statistically significant difference ($p=0.0247$) could be evidenced between the upper and lower RTI. Furthermore, the relative risk of incidence for RTI among the anaemic patients was 0.4945 (95% CI= 0.2379-1.028) compared to the non-anaemic cases. Among the patients with upper RTI, common cold and acute pharyngitis were prevalent while among the lower RTI group, pneumonia was found as the major clinical presentation. Among the total anaemic cases, 8 (57.14%) cases were normochromic normocytic and

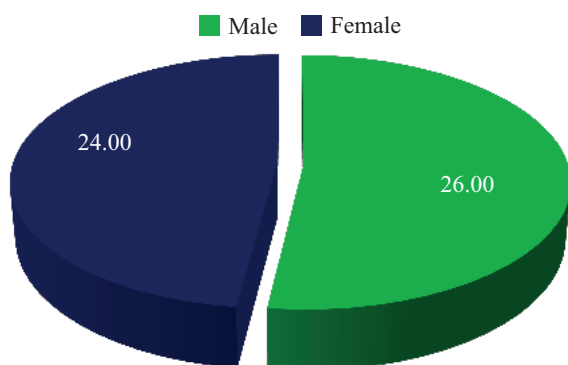


Figure-1: Distribution of gender

Condition	URI	LRI	Total
Anaemic	5 (10%)	9 (18%)	14 (28%)
Non-anemic	26 (52%)	10 (20%)	36 (72%)
Total	31	19	50

URI: Upper respiratory tract infection and LRI: Lower respiratory tract infection, Fisher's exact test $p=0.0247$.

Table-1: Prevalence of Upper respiratory tract infection (URI) and Lower respiratory tract infection (LRI) among the patients with or without anaemia

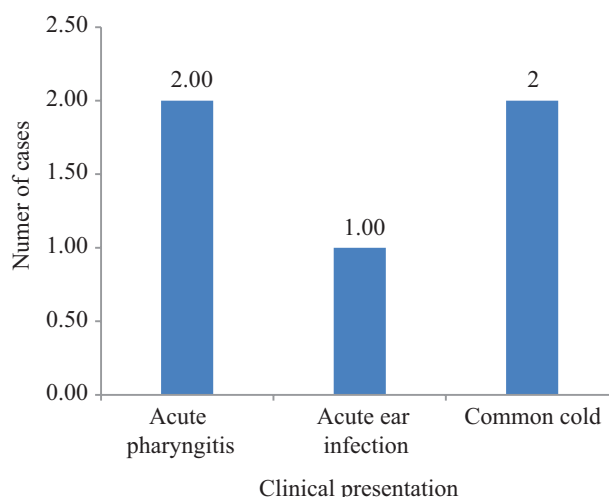


Figure-2: Clinical presentation of anaemic patients with upper respiratory tract infection.

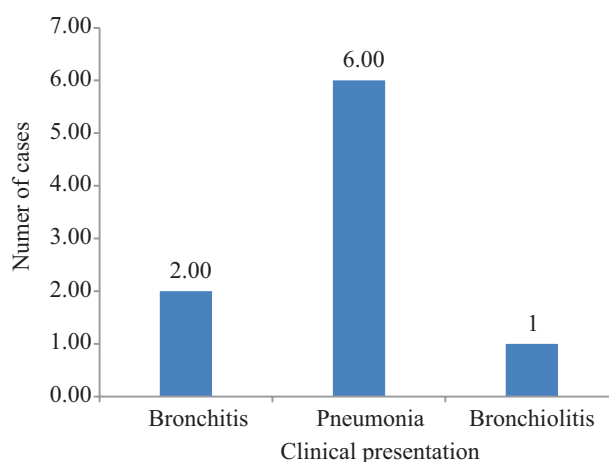


Figure-3: Clinical presentation of anaemic patients with lower respiratory tract infection.

remaining 6 (42.85%) cases were microcytic hypochromic.

DISCUSSION

Result of the study revealed male to female ratio of 1.08:1. The incidence of anaemia was only 28% (14/50). The relative risk for RTI among the anaemic patients was 0.4945 compared to the non-anaemic cases. Different studies report several risk factors for developing acute RTI among the 2- 5 year old day care babies. Hemoglobin level is a decisive factor in causation of RTI among children. Severity of infection is inversely proportional to the haemoglobin concentration of blood. In other words more anaemic the patient, the morbidity is higher. Bhaskaram et al. found pneumonia among 83% of children in the 3 -5 years group where the Hb was < 11 g/dl.⁵ De silva et al. found that 52.6% incidence of acute RTI in children with iron deficiency anaemia.⁶ Furthermore, the iron supplementation could very much reduce the morbidity of upper RTI in anaemic children. However, several factors in addition to anaemia can contribute to RTI among the children. Koch et al. in a study among 288 children (2-5 years old) reported that male baby maintained in child care, passive smoking, bed sharing (mainly children < 5 years old) is risk for RTI.⁷ It is found that a reduced haemoglobin level

is definitely increasing the risk for lower RTI.⁸ Recent study reported that anaemia may influence the clinical expression of acute viral bronchiolitis in infants and childhood asthma.^{9,10} Every 1g/dl decrement in haemoglobin level increases the risk for severity of bronchiolitis.⁹ Study in Lebanese children demonstrated that anaemic children were two times more susceptible to lower RTI compared to the control group.¹¹ Various factors contributing to anaemia need to be identified and addressed properly in populations. This study did not aim to evaluate such factors.

CONCLUSION

The result of this study concluded that the relative risk of incidence for respiratory tract infection among the anaemic patients was 0.4945 (95% CI= 0.2379-1.028) compared to the non-anaemic cases. Among the patients with upper RTI, common cold and acute pharyngitis were the prevalent while among the lower RTI group, pneumonia was found to be the major clinical presentation. Small sample size and short duration are the main limitation of this study. Therefore a multicentre prospective study among the anemic children in various societies is warranted to establish such association.

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