Original Research Article

Relationship between Iron Deficiency Anemia and Acute Bronchiolitis in Children below 2 years of Age

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Abstract:

Background and Aim: Bronchiolitis is the leading cause of respiratory distress in small children and one of the main causes of hospitalization in children <2 years of age. This study was conducted in order to determine whether or not there is a connection between anemia and bronchiolitis. This is because both of these conditions are prevalent in our nation.

Material and Methods: A hospital-based prospective study was carried out in paediatrics wards at both the medical institute and the hospital for the current scientific investigation. The research was conducted on a total of 300 children, including 150 cases and 150 controls, ranging in age from one month to five years old and attending either the outpatient department or the hospital. The control group consisted of children of the same age and gender who did not have any respiratory issues. Hemoglobin level, RBC indices, TWBC count, serum iron, TIBC level, Transferrin saturation, and PBF were investigated and compared in all children with bronchiolitis and control. The chemiluminescence immunoassay was utilized in order to determine the serum ferritin levels.

Results: Fever, loose stools, and poor feeding were the primary symptoms observed in 86% of the controls, 46% of the cases, and 29% of the controls, respectively. Cough, fever, and rapid breathing were the primary symptoms observed in 100% of the cases, 81% of the cases, and 74% of the cases, respectively. The presence of chest indrawing was observed in 66% of the cases, while cyanosis was observed in 9% of the cases. All of the clinical parameters of anemia were found to be statistically significant for ALRTI, with a P value of less than 0.01.

Conclusion: Anemia caused by a lack of iron has been linked to acute bronchiolitis in children between the ages of one month and two years old, according to the findings of the study. As an additional point of interest, children who suffer from iron deficiency anemia are five times more likely to experience acute bronchiolitis when compared to healthy control children.

Keywords: Bronchiolitis, Children, Iron deficiency anemia, Hemoglobin.

Introduction

On a global scale, anemia is a significant nutritional issue that has enormous implications for public health. It is a problem that affects people of all ages, genders, and socioeconomic backgrounds. Around thirty percent of the world's population, or approximately one billion and five hundred million people, are affected by this condition, making it the most prevalent chronic illness in the human population. [1,2] It is between the ages of six months and three years that children are most likely to suffer from iron deficiency anemia.

This is the age range in which repeated infections are most likely to occur. Children younger than five years old experience approximately five to six episodes of acute lower respiratory tract infections (ALRTI) each year on average. [3,4] Multifaceted

factors are responsible for the occurrence of anemia in countries with low and middle incomes. Dietary iron deficiency is typically the most significant factor that contributes to the condition, despite the fact that there may be many causes. There are a number of other significant nutritional deficiencies and infectious diseases that could also be contributing factors to angina.

Children who suffer from anemia in childhood are more likely to experience irreversible negative effects on their health, growth, and development. [5,6] There will be multiple instances of infection in a child who has anaemia, and there is a correlation between the occurrence of infection episodes and the risk of morbidity and mortality. Children who suffer from iron deficiency anemia (IDA) also have slower

cognitive development, poor school performance, and a reduced capacity to work in later years. This not only reduces the earning potential of individuals, but it also has a negative impact on the overall growth of the national economy. [7,8]

The presence of anemia has been identified as a risk factor for infections of the lower respiratory tract. Because iron deficiency is considered to be the most common cause of anemia in developing countries, anemia is one of the most common nutritional problems in the world. It is also associated with an increased risk for morbidity and mortality, particularly among children under the age of five. Irregular dietary intake is typically cited as the cause of IDA levels that are higher than fifty percent in developing countries. [9] This study was conducted in order to determine whether or not there is a connection between anemia and bronchiolitis. This is because both of these conditions are prevalent in our nation.

Materials & Methods

A hospital-based prospective study was carried out in paediatrics wards at both the medical institute and the hospital for the current scientific investigation. The research was conducted over the course of a time span of one year. The research was conducted on a total of 300 children, including 150 cases and 150 controls, ranging in age from one month to five years old and attending either the outpatient department or the hospital. The control group consisted of children of the same age and gender who did not have any respiratory issues. An explanation was given to the parents or guardians regarding the purpose of the study. After that, the consent of the parents or guardians was obtained before the individuals in question were subjected to investigations.

The following are the criteria that were used to determine who was included and who was excluded in the study:

Children with fever, cough, and a rapid respiratory rate were considered to be eligible for inclusion in the study. Additionally, chest indrawing according to WHO criteria and ronchi or crepitations on auscultation were also required. It was determined that children who were suffering from other systemic illnesses, such as congenital heart disease, tuberculosis, and protein energy malnutrition, were not eligible for participation. In addition, children who had previously been treated with antibiotics from a third party were not included in the study. Interviews, as well as findings from clinical and laboratory investigations, were used to collect information. Information was gathered through the use of a structured questionnaire. Hb, RBC count, RBC Indices, PBF, Serum Iron, TIBC, and Transferrin Saturation were all measured and analyzed simultaneously for both the study case and the control group members. For the purpose of determining transferrin saturation, the formula using iron level/TIBC was utilized. According to the World Health Organization's definition, the threshold for a low hemoglobin level is 11 gm/dl.

A phlebotomist who had received medical training extracted a sample of blood from the antecubital vein of each child. Use of sterile, disposable syringes and needles, as well as the appropriate tubes, was carried out. The cyanmeth method was utilized by an automatic blood cell analyzer in order to determine the amounts of hemoglobin present in the blood samples. Utilizing a fully automatic complete analyzer, the CBC was measured and quantified. Using the ferrozine method, which did not involve deproteinization, we were able to determine the serum iron level as well as the TIBC. The chemiluminescence immunoassay was utilized in order to determine the serum ferritin levels.

Statistical Analysis: Both the data entry and analysis were carried out using the statistical package for social sciences (SPSS 20 version), with the former being carried out in Microsoft Excel 2010.

Results

For the purpose of the study, a total of 300 children, ranging in age from six months to five years, were recruited. There were 150 cases and 150 controls. On the other hand, among the controls, there were 45% males and 55% females, while among the cases, there were 60% males and 40% females. A total of 150 cases were examined, with 110 (71 males and 39 females) falling within the age range of 7 to 24 months, 30 (19 males and 11 females) falling within the age range of 25 to 42 months, and 10 (three males and seven females) falling within the age range of 43 to 60 months. In a similar manner, the age distribution of the control group consisted of 105 individuals, composed of 59 males and 46 females, 25 individuals, consisting of 12 males and 13 females, and 20 individuals, consisting of 14 males and 6 females, in the age range of 7 to 24 months, 25 to 42 months, and 43 to 60 months, respectively. Age and gender were not statistically significant variables for ALRTI ($P > 0.05$), which means that neither of these demographic factors was a significant factor.

Table 1: Age wise distribution of children in study and control group

Age groups	Study group	Control group
7 to 24 months	110	105
25 to 42 months	30	25
43 to 60 months	10	20

Fever, loose stools, and poor feeding were the primary symptoms observed in 86% of the controls, 46% of the cases, and 29% of the controls, respectively. Cough, fever, and rapid breathing were the primary symptoms observed in 100% of the cases, 81% of the cases, and 74% of the cases, respectively. The presence of chest indrawing was observed in 66% of the cases, while cyanosis was observed in 9% of the cases. During the auscultatory examination of the chest, it was discovered that 39% of patients had crepitations, 32% had rhonchi, and 16% of patients had both crepitations and rhonchi. As the primary symptom, dehydration was discovered in 22% of the controls.

Sixty-two percent of the patients tested positive for radiological evidence of pneumonia, twenty-one percent of the patients had hyperinflated lungs that were suggestive of bronchiolitis, and seventeen percent of the patients had chest radiographs that were normal.

Within the study group, the average hemoglobin level was 8.9 grams, while within the control group, it was 12.5 grams. Anemia was present in 77% of the study group and 29% of the control group overall. The categorical variable anemia was found to be statistically significant, with an odds ratio (OR) of 5.06 and a 94% confidence interval (CI) ranging from 2.73 to 9.1. This indicates that the presence of anemia is associated with an increased risk of acute lower respiratory tract infections (ALRTI) by 5.06 times when compared to patients who do not have anemia.

The majority of the children who were anemic were between the ages of seven and twenty-four months, and this was true for both groups of children. All of the clinical parameters of anemia, such as hemoglobin, mean corpuscular volume, mean corpuscular hemoglobin, mean corpuscular hemoglobin, mean corpuscular hemoglobin, mean corpuscular hemoglobin, relative dilution, serum iron, serum ferritin, and total iron in the blood, were found to be statistically significant for ALRTI, with a P value of less than 0.01.

Discussion

Anaemia is the most common disease that has a negative impact on people's health, as well as on the advances in socioeconomic conditions and the overall improvement of humanity. The most common reason for anemia is nutritional malnutrition, specifically a lack of iron in the body. Southeast Asia has the highest percentage of people all over the world who are at risk for anemia, with 616 million people in vulnerable situations. Acute lower respiratory tract infection, also known as ALRTI, is the leading cause of death among children under the age of five in developing countries [5]. Controlling the risk factors is therefore essential in

order to reduce the number of deaths caused by ALRTI. [10]

There were a number of risk factors that were discovered, such as a low birth weight, a low socioeconomic level, living conditions that were not hygienic, nutrition that was below par, and the absence of exclusive breastfeeding. Anaemia, also known as low haemoglobin levels, has been recognised as one of the risk factors that can be considered. [10,11]

In the participants of our study, a hemoglobin level that was lower than 11 g% was considered to be low. There was no significant difference between males and females in the anemic group in the current study, which is quite comparable to the study that was carried out by Sheikh et al (2014) and Malla et al (2010). The majority of the anemic group in this study represented children under the age of two. Due to the fact that inadequate and inappropriate supplementary and complementary feeding practices are practiced and advocated widely in this age group, the common involvement of this age group could be caused by the fact that hemoglobin could touch the nadir as a result of these practices.

The mean serum iron level in the anemic ALTRI cases was 31 μg/dL, while the non-anemic ALTRI cases had a serum iron level of 76 μg/dL (P value < 0.01). This indicates that there is a correlation between low serum iron and ALTRI. However, the hypothesis needs to be strengthened by the research that has been conducted in the past. The early prospective interventional studies that were conducted provided support from the value of iron supplements in reducing the rates of respiratory infections in infants. The odds ratio (OR) for developing acute lower respiratory tract infections (ALTRI) was 5.06 in our study, while it was 3.6, 6.02, and 2.58 in patients who were anemic. This result demonstrates that there is a consistent strength of association between anemia and ALTRI.

Conclusion

Anemia caused by a lack of iron has been linked to acute bronchiolitis in children between the ages of one month and two years old, according to the findings of the study. As an additional point of interest, children who suffer from iron deficiency anemia are five times more likely to experience acute bronchiolitis when compared to healthy control children. Because of this, prevention of acute lower respiratory tract infections (ALRTI) in children of this age group may be aided by the early detection and timely correction of anemia.

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