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Association of Iron Deficiency Anaemia in children of 1-2 years of age with low birth weight, recurrent Diarrhoea or recurrent Respiratory Tract Infection - a myth or fact?

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Introduction

The global prevalence of iron deficiency anaemia in young children is 43%1 and children between ages of 1-2 years are at highest risk.2-5 It is estimated that among 12-18 month old infants, of economically deprived families in America, the incidence of iron deficiency is approximately 40%.6 Several surveys of infants in various urban areas of the United States have also reported prevalence rates between 17% and 44%, the highest being among infants of lower socio-economic status.7 Katzman et al reported that 17.5% of inner-city community children aged 1 to 3 years in United States had a hemoglobin level below 9.8 gm/dl2 and Haddy et al reported a prevalence of 50% among children less than 2 years of age.8 However, Czajka et al using a standard cutoff for hemoglobin of 11.0 gm/dl, reported a prevalence rate of 44%.9 The prevalence of iron deficiency anaemia among 1 year old children in Montreal was found to be 25%10 and in Glasgow it was 59% in children between the ages of 6-24 months.11 According to the Pakistan National Nutrition survey, 65% of children (7-60 months) were found to be anaemic.12 In another study on children aged 6-60 months in three urban squatter settlements of Karachi 70% children were found to be anaemic13, later in 1994, the prevalence of anaemia was found to be 78% in the same age group.14

In addition to low socio-economic status, low birth weight and recurrent infections have long been considered important pre-disposing risk factors for the development of iron deficiency anaemia in children less than two years of age.11,15 The commonest recurrent infections in children are respiratory tract infections and diarrhoea.16 To our knowledge no study in Pakistan so far, has looked into these variables to identify any relationship with iron deficiency anaemia. This study aims to look for any association between low birth weight or recurrent infections with the outcome of anaemia.

Patients and Methods

A case control study, with 50 cases and 100 controls, was conducted over a 2 year period at the Family Medicine clinic of The Aga Khan University, Karachi, Pakistan. Children of 1 - 2 years of age presenting at the clinic for any reason (an illness, a routine check-up or an immunization, etc.) and whose mothers' were willing to have a blood test of their children were included in the study. Informed consent was taken from mothers for their children's blood tests, and a questionnaire was administered to them, focusing on the weight of the child at birth and presence or absence of recurrent diarrhoea or respiratory

infections over the preceding 3 months. A short 3 months recall period was deliberately kept as this period has been used in other studies and decreases recall bias .17,18 Recurrent diarrhoea was defined as more than three episodes of acute diarrhoea in the last three months17 and acute diarrhoea as stool frequency of more than 5 times per day and decrease in stool consistency lasting for more than 2 days.17 Recurrent acute respiratory infection was defined as more than two episodes of acute respiratory infections in the last three months.18 Hemoglobin level of less than 11gm/dl13 together with a serum ferritin level of 10ng/ml or less19-21 was taken as iron deficiency anaemia in 1-2 years of age. Low birth weight was defined as a birth weight of 2500g or less.22

Children with proven haemoglobin of less than 11 gm/dl, and serum ferritin levels of 10 ng/ml or less, were included in the study as cases.19-21 The children who were found to have Haemoglobins of 11 gm/dl or more, and serum ferritin levels of 10 ng/ml or more19-21 were included in the study as controls. Children who had a Haemoglobin of 11 g/dl or less and had serum ferritin levels of more than 10 ng/dl were excluded from the study. Several other groups of children were also excluded from such as pre-term babies, known haemoglobinopathies (including alpha and beta thalassemia), congenital anomalies like cleft palate, congenital heart disease, etc. as well as children taking iron supplements. Acute febrile illnesses, acute gastroenteritis, acute or chronic blood loss, by accident or injury, or due to rectal polyps, etc. were also excluded.

Chi-square test with Odds Ratio was used to investigate the association between iron deficiency anaemia and recurrent diarrhoea, recurrent respiratory tract infection or low birth weight. Independent samples Z - test with 95% confidence interval was used to examine any difference in means in the current ages of the children among cases and controls.

Results

Table shows the comparison of the current age of the children, history of low birth weight, recurrent diarrhoea, recurrent respiratory infection in cases and controls. Low birth weight (less than 2.5 kg) was documented in 6% of the cases and 8% of the controls (odds ratio=0.73). This difference was not, however, statistically significant. The odds of having recurrent diarrhoea among cases were 1.71 times those of having recurrent diarrhoea among controls (with 95% confidence interval between 0.75 and 5.15). This difference was also not statistically significant. Further more, the odds of having recurrent respiratory tract infections among cases was 1.48 times the odds of having recurrent respiratory tract infections among controls (with 95% confidence interval between 0.38 and 5.57). This difference was also not statistically significant.

Discussion

IThe association of low birth weight with iron deficiency anaemia has been a commonly held belief among general physicians for a long time, and various studies have been conducted to try and document this association. Lehmann reported that low birth weight had been weakly associated with iron deficiency anaemia in children.11 His study showed that 38% of the low birth weight infants and 23% of the normal-weight-at-birth

infants had iron deficiency anaemia (p = 0.089). This result cannot be considered statistically significant. The analysis of the data in our study showed that there was no association of birth weight and iron deficiency anaemia at the age of 1-2 years, as the incidence of low birth weight was not significantly different between cases and controls (p = 0.712). Grindulis et al also found that the group of children, who had anaemia at the age of twenty-two months, were not low birth weight but were heavier at birth than the group without anaemia.23

Regarding the association between upper respiratory infections and iron deficiency anaemia in young children, Reeves et al reported that upper respiratory and other mild infections commonly predispose children to a drop in the Haemoglobin (not to the extent of producing iron deficiency anaemia) because of a decrease in iron absorption.15 This study documents a decrease in iron absorption during infections, but not a significant difference in the mean Haemoglobins among the children who had been well or who had recurrent infections in the last three months. Neither group had iron deficiency anaemia. In addition, Grindulis et al found no evidence to support that children with anaemia had suffered more ill health.23 Our study supports the work done by Grindulis et al, who also found no association between recurrent diarrhoea or recurrent respiratory tract infection with iron deficiency anaemia in children of 1-2 years of age. The incidence of recurrent diarrhoea or recurrent respiratory infections were not significantly different among cases and controls. Other parameters, for example a poor dietary intake, are likely to have a far stronger role in the development of iron deficiency anaemia in children of this age group. Negative or no associations are as important to document as positive associations, in order to sift out the myths from the facts by using hard data to build evidence either for or against an association. More studies with larger sample sizes and from different countries may be needed to put this debate to rest once and for all.

Our study suggests that the commonly held belief that low birth weight, recurrent diarrhoea or recurrent respiratory infections have a positive association with iron deficiency anaemia in children of one to two years of age, is not based on evidence, and is likely to be a myth.

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