Original Article

Study of Prevalence of Iron Deficiency Anaemia in Children with Chronic Diarrhoea

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ABSTRACT

Objective: To find out the prevalence of iron deficiency anaemia (IDA) in children, coming to hospital with chronic diarrhoea and to see risk factors in these children, like age, gender, socioeconomic status, education of mother, feeding habits and nutritional status.

Study Design: Analytical / cross-sectional study

Place and Duration of Study: This study was conducted at Department of Paediatrics, Islam Medical & Dental College, Sialkot from February 2009 to March 2010.

Materials and Methods: One hundred children were included on the basis of systemic random sampling method. Children with chronic diarrhoea (>14 days), both OPD and admitted patients, up to five years of age and either sex were included. The demographic profile was obtained like age, sex, detailed nutritional history, socioeconomic status, educational status of parents. Height and weight was recorded. Clinical assessment of hydration status, pallor and signs of malnutrition as well as other signs of systemic illness were recorded. The blood samples were taken for Hb and TIBC.

Results: There were 52 males and 48 females. Female children were having higher ratio of anaemia as compared to males (38/48 –79.2% versus 30/52–57.7%). Majority of children with lower socioeconomic status (45/56 – 80.4%) were anaemic. 83.3% of children of mothers with under primary or primary to middle education, were anaemic. The mothers who had better education (above middle class), 86.4% of their children were non anaemic. It was found that 20% of children of both genders were well nourished and among these, only 2 children were anaemic. The other 20 children (20%) had First degree malnutrition and among this group, 11 children (55%) were anaemic. Among the second degree malnutrition children (35), 30 children (85.7%) were anaemic. Another group of patients having 3rd degree malnutrition (25) of both genders, all children (100%) were anaemic. Only 15 children were on exclusive breast feeding (2 anaemic {13.3%}), 30 children on mixed (15 anaemic {50%}) and 55 children were on bottle feeding (51 anaemic {92.7%}). The difference for Hb level and TIBC were significant (<0.001).

Conclusion: Iron deficiency anaemia was a constant feature in all children having chronic diarrhea. Improving maternal education (literacy rate in general), socioeconomic status of the people, and promoting exclusive breast-feeding can dramatically improve the nutritional status and general well-being of children under 5 years of age in Pakistan.

Key Words: Prevalence, Iron deficiency anaemia, Children, Chronic diarrhoea

INTRODUCTION

Chronic diarrhoea is one of the major causes of malnutrition in children and this leads to great mortality and morbidity in developing countries.[1] Dietary iron intake, socioeconomic status, education and poor

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hygiene have effect of prevalence of IDA among children in addition to impaired absorption of iron in chronic diarrhea.[2] Sialkot district has population of more than 3.5 million and this study was designed to measure magnitude of problem of IDA in children with chronic diarrhea. Some factors responsible for morbidity and mortality among the children with chronic diarrhoea are nutritional status of child, late weaning, no vaccination, nature of infection, no oral hydration therapy with ORS and presence of associated complications due to diarrhoea. The incidence of diarrhoea in Pakistani children under five years of age is 3 to 4 episodes per child per year maximum in first year. Among these children 90% children has acute watery diarrhoea and 10% children has persistent (chronic) diarrhoea.[3] Non-infective chronic diarrhoea is uncommon in Pakistan except in severe protein calorie

malnutrition.[4] In Pakistan, IDA is the most prevalent nutritional deficiency among infants and children accounting for 83% of all anaemias. Prevalence rates vary from 60-80% among infants and children.[3]

The iron deficiency anaemia is secondary to many causes. However, in this study, the aim was to find out the incidence of IDA in children less than five years of age, coming to hospital with chronic diarrhea and to see risk factors in these children, like age, gender, socioeconomic status, education of mother, feeding habits and nutritional status.

MATERIALS AND METHODS

This study was conducted at Department of Paediatrics, Islam Medical & Dental College, Sialkot from February 2009 to March 2010. Patients taken from three hospitals; THQ Civil Hospital, Daska, Ali Hospital, Daska and City Hospital, Sialkot. One hundred children were included on the basis of systemic random sampling method. Children with chronic diarrhea (>14 days), both out-patient and admitted patients, up to five years age and either sex were included. Those having history of blood loss, serious co-morbid conditions like cardiac, respiratory, renal etc, and with haemolytic anaemia e.g. thalassemia and others, were excluded. Informed consent was taken from parents of children. All mothers/ attendants of 100 children were interviewed. The demographic profile was obtained like age, sex. Detailed nutritional history, socioeconomic status, educational status of parents, was obtained. The anthropometric measurements like height and weight of the children were taken. Clinical assessment of hydration status, pallor and signs of malnutrition as well as other signs of systemic illness were recorded. The blood samples for lab investigations were taken for Hb and TIBC. Nutritional status of children was assessed according to Modified Gomez Classification. The hydration status was reported using WHO classification and graphically presented. The mode of feeding was also studied and mentioned as exclusive breast feeding, mixed breast and bottle feeding and only bottle feeding. All the collected information were entered into SPSS and analyzed accordingly. The outcome variables were tested for significance by applying chi square test on qualitative variables and t-test on quantitative variables. P value <0.05 was considered significant.

RESULTS

There were 52 males and 48 females (Table 1). In order to measure the prevalence of IDA in the sample group, it was found that among 52 male children, 30 (57.7%) were anaemic. Similarly among 48 females, 38 children (79.2%) had IDA. The female children had higher ratio of anaemia as compared to males with p value 0.037 (Table 2). It was found that percentage of anaemia rose with increasing age with chi square value 14.77 and p

value 0.003. Only 5 patients of both genders were of age group 37-60 months and all these were anaemic (Table 3). Regarding nutritional status of children in this study, it was found that 20% of children of both genders were well nourished and among these well nourished children, only 2 children were anaemic and 18 were not anaemic. The other 20 children (20%) had 1st degree malnutrition and among this group, 11 children (55%) were anaemic. Among the second degree malnutrition children (35), 30 children (85.7%) were anaemic. Another group of patients having 3rd degree malnutrition (25) of both genders, all (100%) were anaemic. The prevalence of IDA was observed more in malnourished children as compared to well nourished children and was significant with chi square value 49.28 and p value of <0.001 (Table 4).

The data collected about feeding pattern of mothers showed 15 children were on exclusive breast feeding, 30 were having mixed breast and bottle feeding and 55 children were on bottle feeding only. Among these, 2 (13.3%), 15 (50%) and 51 (92.7%) respectively were anaemic. The association of IDA with feeding habits was strongly associated with chi square value 43.34 and p value <0.001 (Table 5).

Table No.1: Distribution of children with chronic/ persistent diarrhea by age and sex (n = 100)

Age (months)	Male (n=52)		Female (n=48)	
	No.	%	No.	%
0 – 6	4	7.7	6	12.5
7 – 12	18	34.6	17	35.4
13 – 24	23	44.3	17	35.4
25 – 36	4	7.7	6	12.5
37 – 60	3	5.7	2	4.2

Chi square value = 1.77   **P value 0.778**

Table No.2: Distribution of children with chronic/ persistent diarrhea by sex and anaemia status

Sex	IDA (n=68)		Normal (n=32)	
	No.	%	No.	%
Male	30	44.2	22	68.7
Female	38	45.8	10	31.3

Chi square value = 4.35   **P value 0.037**

Table No.3: Distribution of children with chronic/ persistent diarrhea by age and anaemia status

Age (months)	IDA (n=68)		Normal (n=32)	
	No.	%	No.	%
0 – 6	3	4.4	7	21.8
7 – 12	22	32.4	13	40.7
13 – 24	33	48.6	7	21.8
25 – 36	5	7.3	5	15.7
37 – 60	5	7.3	-	-

Chi square value = 14.77   **P value 0.003**

In order to measure the prevalence of IDA in the sample group, the standard value of Hb was fixed below 12 g/dl and for TIBC above 450. The average Hb level for anaemic children was 8.34±1.03 g/dl and for

those who were not anaemic, the average Hb level was recorded 12.35±0.42 g/dl (Table 6).

The average TIBC level was recorded 657.7±81.2 mg/dl and for those who were not anaemic, the average TIBC level was 309.42_+ 61.13 mg/dl. The difference for Hb level and TIBC were significantly different, both with p value <0.001. All children who were anaemic with Hb below 12 g/dl were having there TIBC level above 450 mg/dl (Table 7).

Table No.4: Distribution of children with chronic/ persistent diarrhea by nutritional status as per modified Gomez classification and anaemia status

Nutritional status (%)	IDA (n = 68)		Normal (n=32)	
	No.	%	No.	%
≥ 80	2	2.9	18	56.3
70 – 80	11	16.2	9	28.1
60 – 70	30	44.2	5	15.6
<60	25	36.7	-	-

Chi square value = 49.28   P value 0.001

Table No.5: Distribution of children with chronic/ persistent diarrhea by feeding habits and anaemia status (n = 100)

Feeding habits	IDA (n = 68)		Normal (n=32)	
	No.	%	No.	%
Breast feeding	2	2.9	13	40.6
Bottle & breast feeding	15	22.1	15	46.9
Bottle feeding	51	75.0	4	12.5

Chi square value = 43.34   P value 0.001

Table No.6: Distribution of children with chronic/ persistent diarrhea by haemoglobin level

Haemoglobin level	IDA (8.34±1.03)	Normal (12.35±0.42)	Total
6.0 – 7.5	16	-	16
7.6 – 9.0	37	-	37
9.1 – 10.5	10	-	10
10.6 – 12.0	5	-	5
> 12	-	32	32
Total	68	32	100

Table No.7: Distribution of children with chronic/ persistent diarrhea by TIBC level

TIBC level	IDA (657.7±81.2)	Normal (309.42±61.13)	Total
700-900	16	-	16
600–700	37	-	37
450-600	15	-	15
<450	-	32	32
Total	68	32	100

DISCUSSION

Diarrhea accounted for 8% of death in children less than 5 years of age in 2016 worldwide.[5] Chronic diarrhoea is one of the major causes of malnutrition in children under two years of age and this leads to great morbidity and mortality in developing countries. It is responsible for more than 30% of diarrhoeal deaths in 1 to 11 months old infants in Pakistan.[6] The outcome of acute diarrhoea has improved significantly worldwide with use of oral rehydration solution (ORS). However, chronic diarrhoea is still harmful, because less than five years of age, 10% of acute episodes of diarrhoea turn into prolonged diarrhoea (chronic/persistent) in developing countries like Pakistan.[7] The incidence and mortality is especially high in infancy and more so in the presence of malnutrition and lack of breast feeding. Iron deficiency anaemia is very common among children with chronic and/or persistent diarrhoea due to malabsorption as well as inadequate dietary intake during diarrhoeal episodes. The socioeconomic status is contributory to IDA.[8]

Majority of the patients in our study (85%) were below 2 years of age. Majority of patients were below two years of age as seen in a Pakistani and Indonesian study.[9,10] There was no significant importance of sex regarding the prevalence of IDA among the children who have chronic or persistent diarrhoea. In current study 52% children are male and 48% children are female. The male to female ratio in our study is consistent with previous studies. The study by KCC foundation had male to female ratio of 52:48.[11] In a study by Lutter and reported that male to female ratio was 62.7% to 33.3%.[12] Our study showed majority of the patients (80%) having malnutrition with severe malnutrition in 25% of the patients. In a study by Akinbami et al[13] reported that 61% patients were malnourished while 80% of children in a study done by KCC Foundation were suffering from some degree of malnutrition. 64% of patients suffering from persistent diarrhea had PCM grade 3.[11] Stunted children are more likely to be suffering from anemia as seen in Pakistan and Nepal.[22]

From the data collection, the findings which were collected regarding socioeconomic status and education level, it was observed that poverty and maternal illiteracy were leading factors for promoting diarrhoea in under five years of age. Mode of feeding and food practices during diarrhoea, were directly related to level of maternal education. Almost half of the mothers were illiterate and only 22% of the mothers had middle or secondary school education. Ninety percent of the patients were coming from lower and middle class socio-economic status. In other studies done by Ali & Zuberi.[14] and Community Health Center, Agha Khan University Karachi also showed significant correlation with maternal education and low socio-economic status. Lower socioeconomic status and lower education was also associated with increased chances of anaemia in

rural area of Yemen[15] and also in Indonesia.[16] These factors were mainly responsible for increasing susceptibility to diarrhoea in developing countries like Pakistan.

In this research work, it was found that all patients who had persistent/ chronic diarrhoea had mild to moderate anaemia. Sixty seven percent of the patients had haemoglobin levels between 8-10 gm/dl while no patients had severe anaemia. A cross sectional case control study was done in Kinder Garten children of Gaza suffering from acute diarrhoea revealed that 21.8% had iron deficiency anaemia as compared to 14.8% of controls.[17] Children living in urban slums of Indonesia had increased chances of anaemia if suffering from diarrhoea.[10] The BRINDA Project also revealed that inflammation in the high and very high infection group isassociated with anaemia.[18] In a Nepalese study anaemia was present in 52% of children suffering from acute diarrhoea.[19] However a case control study in Karachi did not show significant effects of recurrent diarrhoea and respiratory infections on anaemia in children.[20]

The outcome of acute diarrhoea has improved significantly worldwide with use of oral rehydration solution. Chronic diarrhoea causes malnutrition which is a negative indicator for mortality.[21] To reduce the incidence of chronic diarrhoea and iron deficiency anaemia, it is recommended to improve education level of mothers (improved literacy rate), promoting exclusive breast feeding, and improving socioeconomic conditions of the people. This can dramatically affect the outcome and improvement of the general well being of the children under five years of age in Pakistan.

CONCLUSION

Persistent or chronic diarrhoea is becoming recognized as an important child health problem in developing countries like Pakistan. The incidence is much higher among the children age less than two years. In our study, iron deficiency anaemia was a constant feature in all children having chronic/persistent diarrhoea while TIBC was high in all patients. Male to female ratio remained 1:1 in almost all instances. Majority of the patients (85%) were below 2 years of age and 90% of the children were coming from lower and middle socio-economic status. Almost half of the mothers / attendants were illiterate and 22% had education level of middle and higher secondary school. Many of the patients (80%) had some degree of malnutrition, with 25% having severe malnutrition. Only 15% of the children had exclusive breast feeding while 55% had bottle feeding. Thirty percent of the patients had received mixed breast and bottle feeding.

Author's Contribution:
Concept & Design of Study: Abid Ali
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