ORIGINAL ARTICLE

AETIOLOGICAL PROFILE OF ACQUIRED ANAEMIA IN A PAEDIATRIC TERTIARY CARE SETTING

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Background: Anaemia is the commonest haematological disorder frequently faced by clinicians worldwide. The multi-factorial aetiology of the disorder warrants a comprehensive search for the different causes as management plans differ for different disorders. The objective of this study was to identify the different acquired causes of anaemia in our paediatric population. **Methods:** The study was conducted at the Department of Paediatrics, Ayub Teaching Hospital from April 2009 to April 2010. It was a cross-sectional study. A total of 110 patients were included in the study who presented with anaemia secondary to acquired aetiologies and were assessed clinically using general physical and systemic examination. The salient clinical and laboratory data was retrieved in designed protocol. **Results:** Out of a total of 110 patients, 61 (55.5%) were male and 49 (44.5%) were female. Mean age of the participants was 48 months. Nutritional anaemia comprising iron deficiency anaemia and megaloblastic anaemia was the leading cause being present in 49 (44.5%) patients followed by Visceral Leishmaniasis in 28 (25.5%) patients. Mean haemoglobin was 4.36 g/dl. **Conclusion:** Anaemia secondary to acquired causes is a disorder with grave consequences ranging from cognitive and psychomotor dysfunction to mortality in severe cases. Identification of the different acquired causes is important in preventing the disorder by guiding appropriate interventions.
Keywords: Anaemia, nutritional, iron deficiency, megaloblastic, Visceral Leishmaniasis

INTRODUCTION

Anaemia remains one of the most common and treatable morbidities suffered by individuals in the developing world and are a critical comorbid factor contributing to the excess mortality in this regions.[1] The aetiology of anaemia is multi-factorial involving different factors including nutritional deficiencies, genetic red blood cells disorders and infectious disorders.[2]

Anaemia is a major health problem worldwide. According to a recent World Health Organization report approximately 43% of the world's population is anemic.[3] Anaemia is estimated to affect 2.2 billion individuals worldwide, half of whom are estimated to have iron deficiency. The effects of anaemia include retardation of physical and mental development, fatigue and low productivity at work, and impairment of reproductive functions.[4] The IDA has also been recognized as a potential risk factor for stroke in otherwise healthy children.[5] In pre-school children malnutrition is a common cause of iron deficiency anaemia.[6] As the disease is highly prevalent with associated serious adverse outcomes, it is imperative not only to implement prevention strategies like food fortification but also to make efforts for early diagnosis and adequate replacement therapy.[6]

Vitamin B_{12} and/or folic acid deficiency are the commonest causes of megaloblastic anaemia.[7] Neurological deficits are also associated with vitamin B_{12} deficiency. Children with neurological deficits and neuro-developmental retardation should be thoroughly evaluated to prevent persistent neurological damage because of this deficiency.[8]

Visceral leishmaniasis (VL), also called Indian Kala-azar, is parasitic disease caused by *Leishmania donovani* and transmitted by the bite of the sand fly vector *Phlebotomus argentipes*.[9] This is a potentially fatal infection causing anaemia, fever, cachexia, hepatosplenomegaly and pancytopenia.[10]

Infectious diseases including malaria have an adverse impact on haemoglobin levels especially in infants.[11] Impaired erythropoiesis has an important pathogenetic role in the causation of malarial anaemia, and may exacerbate anaemia due to malaria-induced hemolysis.[12]

Anaemia is a common presentation in patients with newly diagnosed childhood acute lymphoblastic leukaemia (ALL).[13] Being the most common paediatric malignancy, ALL represents 25% of all childhood malignancies and approximately 75% of all cases of childhood leukaemia.[14]

Acquired aplastic anaemia usually has an autoimmune basis. In some cases radiation, medical drugs and chemicals, and viruses cause depletion of hematopoietic stem cells by direct toxicity.[15] Anaemia of chronic disorder is a mild to moderate anaemia that occurs in many infections and inflammatory disorders.[16] It is a frequent finding in chronic kidney insufficiency (CKI), dialysis patients, congestive heart failure (CHF), and renal transplantation.[17]

Anaemia adversely affects the health of the children and can cause impaired psychomotor development, poor cognitive performance and mental retardation.[18] The main purpose of assessing anaemia is to inform decision-makers on the type of measures to be

taken to prevent and control anaemia. Thus it is imperative that in addition to the measurement of Hb concentration, the causes of anaemia need to be identified considering that they may vary according to the population.[19]

MATERIAL AND METHODS

The study was conducted at the Department of Paediatrics, Ayub Teaching Hospital from April 2009 to April 2010. It was a descriptive cross sectional study. A total of 110 patients were included in the study who presented with anaemia secondary to acquired aetiologies and were assessed clinically using general physical and systemic examination. Confounding variables were controlled by excluding patients with hereditary blood disorders and patients with history of recent blood transfusion. Personal details of patients like name, age, gender, hospital registration no., were recorded. General physical examination and systemic examination was done for all patients. Weight was noted. Complete blood count, peripheral smear and reticulocyte count was done for all patients from the same laboratory. Other investigations like bone marrow examination was done where indicated. Approval of ethical committee was taken.

The data was entered in SPSS-10. Descriptive statistics were used to calculate mean and standard deviation for age, weight, haemoglobin levels, MCV and haematocrit. Student's *t*-test was used for significance testing in case of continuous variables. Significance testing in case of categorical variables was done using Chi-square test. The $p<0.05$ was considered significant.

RESULTS

A total of 110 patients were enrolled in this study. Among the total study population, 61 (55.5%) patients were male and 49 (44.5%) were female. Patients were divided into three age groups; 1–36 months, 37–72 months and 73–120 months. Sixty-one 61 (55.5%) patients were aged 1 month to 36 months, 25 (22.7%) were aged 37–72 months and 24 (21.8%) were aged 73–120 months.

Mean age of the participants was 48±35.31 month. Mean MCV was 75.73±16.26 fl. Mean Hb was 4.36±1.45 g/dl. Mean haematocrit was 16.01±4.76%.

Majority of the patients had a haemoglobin value of 3.1–6 g/dl. This group comprised 74 (67.3%) patients followed by 19 (17.3%) patients having haemoglobin value of less than 3 g/dl and 17 (15.5%) patients having haemoglobin of more than 6 g/dl.

Nutritional anaemia was the leading acquired cause of anaemia being present in 49 (44.5%) patients. Of these 25 (22.7%) were diagnosed as having megaloblastic anaemia and 24 (21.8%) were diagnosed as cases of iron deficiency anaemia. Visceral

leishmaniasis was the second commonest aetiology with 28 (25.5%) patients having this disorder. Haematological malignancies accounted for 15 (13.6%) patients. Malaria was the diagnosis in 7 (6.4%) anaemic patients. Acquired aplastic anaemia was the cause of anaemia in 6 (5.5%) patients. Anaemia of chronic disorder (ACD) secondary to chronic renal failure was present in 5 (4.5%) patients.

Table-1: Gender distribution of the participants

Gender	Number of Cases	Percentage
Male	61	55.5
Female	49	44.5
Total	110	100

Table-2: Age distribution of the participants (n=110)

Gender	Age Groups (Months)			Total
	1–36	37–72	73 and Above	
Male	33 (54.1%)	16 (64%)	12 (50%)	61 (55.5%)
Female	28 (45.9%)	9 (36%)	12 (50%)	49 (44.5%)
Total	61 (100%)	25 (100%)	24 (100%)	110 (100%)

Table-3: Aetiological profile of the patients (n=110)

Diagnosis	Number of Cases	%
Nutritional Anaemia	49	44.5%
Iron Deficiency Anaemia	24	21.8%
Megaloblastic Anaemia	25	22.7%
Visceral Leishmaniasis	28	25.5%
Haematological Malignancies	15	13.6%
Malaria	7	6.4%
Aplastic Anaemia	6	5.5%
Anaemia of Chronic Disorder	5	4.5%
Total	110	100%

Table-4: Aetiological profile in different age groups

Diagnosis	Age Groups (Months)			Total
	1–36	37–72	73 and Above	
Iron Deficiency Anaemia	15 (13.6%)	4 (3.6%)	5 (4.5%)	24 (21.8%)
Megaloblastic Anaemia	11 (10%)	8 (7.3%)	6 (5.5%)	25 (22.7%)
Visceral Leishmaniasis	26 (23.6%)	1 (.9%)	1 (.9%)	28 (25.5%)
Haematological Malignancies	7 (6.4%)	7 (6.4%)	1 (.9%)	15 (13.6%)
Malaria	1 (.9%)	3 (2.7%)	3 (2.7%)	7 (6.4%)
Aplastic Anaemia	0 (0%)	1 (.9%)	5 (4.5%)	6 (5.5%)
AC D	1 (.9%)	1 (.9%)	3 (2.7%)	5 (4.5%)
Total	61 (55.5%)	25 (22.7%)	24 (21.8%)	110 (100%)

p<0.01, significant

Table-5: Aetiological profile in different genders

Diagnosis	Gender		Total
	Male (61)	Female (49)	
Iron Deficiency Anaemia	10 (9.1%)	14 (12.7%)	24 (21.8%)
Megaloblastic Anaemia	14 (12.7%)	11 (10%)	25 (22.7%)
Visceral Leishmaniasis	17 (15.5%)	11 (10%)	28 (25.5%)
Hematological Malignancies	10 (9.1%)	5 (4.5%)	15 (13.6%)
Malaria	5 (4.5%)	2 (1.8%)	7 (6.4%)
Aplastic Anaemia	2 (1.8%)	4 (3.6%)	6 (5.5%)
ACD	3 (2.7%)	2 (1.8%)	5 (4.5%)
Total	61 (55.5%)	49 (45.5%)	110 (100%)

p>0.05, not significant

DISCUSSION

A cross-sectional survey conducted among 200 children of 6–59 months of age from 10 union councils of District Kasur Punjab, showed that 94% children in the study were anaemic. Of these, 59% were male and 41% were female patients, and 64% of 6–12 months children were also anemic.[20] Similar percentages for male and female gender were found in the present study.

In a study conducted in Peshawar on pancytopenic children below 15 years of age, the commonest cause of Pancytopenia was aplastic anaemia followed by iron deficiency and megaloblastic anaemia. Haematological malignancies, Leishmaniasis, and Malaria were found in the descending order.[21] In the present study nutritional anaemia was the commonest aetiology comprising 49 (44.5%) patients of the total study population. Megaloblastic anaemia was present in 25 (22.7%) and iron deficiency in 24 (21.8%) patients. This was followed by VL in 28 (25.5%) patients.

In a study conducted on 230 patients with pancytopenia in Hyderabad, aplastic anaemia accounted for 23.9% cases. This was followed by haematological malignancies in 13.05%, megaloblastic anaemia in 13.04% and malaria in 8.69%.[22] In the present study, similar results were observed. Haematological malignancies were present in 13.6% patients. Malaria accounted for 6.4% of the total cases. However, the frequency of aplastic anaemia was quite lower with only 5.5% of the patients having this disorder.

In a prospective study carried out on 168 anaemic primary school children of Lahore, between the ages of six and twelve years, iron deficiency was the cause of anaemia in 98 (58.3%) of these children while remaining 70 (41.7%) children had aetiologies other than iron deficiency.[23] In Galle, Srilanka, among the anaemic study population, 7.0% of males and 15.0% of females were iron deficient.[24] In the present study, similar figures were observed for iron deficiency in either gender, 9.1% males and 12.7% females were having iron deficiency. In the study in Galle, Srilanka, folate deficiency was found in 41.0% and 33.0% of male and female participants.[24] In the present study, megaloblastic anaemia was slightly more common in males 14 (12.7%) patients as compared to females 11 (10%) patients.

From 1990 to March 2004, a total of 255 cases were diagnosed and treated as VL in Italy. There were 135 males (52.9%) and 120 (47.1%) females. The age range was 4 months to 14 years, but 189 patients (74.1%) were <or =3 years old.[25] Similar results were observed in this study where 17 (60.7%) were male and 11 (39.3%) patients were female. Majority of the patients 26 (92.9%) were in the 1 month to 3 years age group.

CONCLUSION

Frequency of nutritional anaemia comprising IDA and megaloblastic anaemia in this study was significantly high in both genders. Haemoglobin levels in both genders were significantly lower in this study than reported worldwide. Visceral Leishmaniasis accounted for anaemia in a large number of patients necessitating the need for eradication of this disease from our region.

We believe that it is worth considering searching for causes of anaemia as the acquired aetiologies are multi-factorial with different management plans. Increasing awareness of anaemia in the community is imperative since mild to moderate degrees of anaemia may, if unrecognised and untreated, progress to severe life-threatening anaemia.

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