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Original Research Article

Nutritional and haematological status of human immunodeficiency virus infected children

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ABSTRACT

Background: Under nutrition and anaemia are among the commonest presenting signs in human immunodeficiency virus (HIV) infected children. Cause could be multi factorial. HIV infection itself may produce this situation. Opportunistic infections, nutritional deficiencies and bone marrow suppression due to various factors could be the other reasons. To study the nutritional and haematological status in HIV infected children this study was undertaken.
Methods: 140 children of both sexes, between the age 18 months to 15 years, who were diagnosed HIV positive as per guide lines of national AIDS control organization of India, were included in this study. Their anthropometric, general and systemic examinations were done. Haematological investigations including complete blood count (CBC), general blood picture (GBP), CD4 count was done in all cases. They were classified in clinical and immunological staging according to WHO classification criteria. Bone marrow aspiration was performed in 43 children. They were investigated for suspected opportunistic infections as well.
Results: Out of 140 chidren, 91 were male and 49 were female. 47 children were orphan and 111 children were in low socioeconomic status. 101 children were significantly under nourished. No child was nutritionally normal. Clinical signs of vitamin A and D deficiency was seen in 21 and seven children respectively. 85% children were anaemic and most common morphology was normocytic normochromic blood picture. Lymphopenia was seen in 43.57%, granulocytopenia in 48.57% and thrombocytopenia in 30.71% children. There was no significant finding in bone marrow examination.
Conclusions: This study concludes that in children, commonest route of infection was vertical transmission. Mean age of presentation was 7.67 years. Varying degree of mal nutrition and anaemia was noted in more than 85% HIV infected children. No child was nutritionally normal.

Keywords: Children, Haematological status, HIV infection, Nutritional status

INTRODUCTION

Children are innocent victim of HIV infection. Majority of children get infected through vertical transmission.[1] About 1200 children under 15 years of age are contracting HIV infection everyday world over.[2] Perinatally infected children become symptomatic usually by 5 years of age. Clinical course and presentation in children are different than adults. Most of the children present with failure to thrive and anaemia.[3-6] Severe malnutrition, chronic diarrhoea, anaemia, serious pyogenic infections, disseminated tuberculosis and oral candidiasis are associated with increased risk of being HIV positive.[7] Apart from other reasons, chronic diarrhoea is a major cause of malnutrition in HIV infected children. Isospora belli and cryptosporidium parvum are common causes of chronic diarrhoea in Indian studies.[8] *E. histolytica, Giardia lamblia, E. coli*

and campylobacter are other causative agents. Associated vitamin deficiencies are also common. Anaemia is one of the commonest haematological manifestation in HIV infected children.[5,6] Cause of anaemia and under nutrition could be multi factorial. HIV infection itself, directly or indirectly, can produce this condition. Other chronic infections, poor nutritional intake, lack of proper supervision and negligence in care are also important contributing factors. To study the nutritional and haematological status in HIV infected children this study was conducted at S. N. Children Hospital, Department of Paediatrics, M. L. N. Medical College Allahabad, Uttar Pradesh, India during the period April 2005 to October 2012.

METHODS

140 children between the age of 18 months to 15 years who were HIV positive as per national AIDS control organization (NACO) India, HIV testing guide lines were included in this study. Using a pre-designed proforma, these children were enrolled in the study. Care takers were counselled by qualified counsellors and informed written consent was taken from guardians.

Detailed history was taken and full clinical examination was done in all children. Socio economic status (SE status) was decided on the basis of modified Prasad's criteria. Weight was recorded on electronic weighing machine. Nutritional status was assessed and children were classified in different grades of malnutrition according to IAP classification.

Clinical signs of vitamin deficiency, presence or absence of pallor, hepato-splenomegsly, lymphadenopathy were noted. Every child was assessed and clinical and immunological staging was done on the basis of WHO staging criteria. All children were investigated for CBC, GBP, ESR, and CD4 count.

Bone Marrow aspiration was done in 43 children. In seven children, who had clinical signs of rickets, were investigated for serum calcium, phosphorus, alkaline phosphatise, vitamin D3 levels and x-ray of wrist joints. Other required investigations were done according to need. CD4 count was done with Partec CyFlow® counter flow cytometer. Percentage of CD4 cells were calculated on the basis of absolute CD4 count by using following formula;

$$\%CD4\ Counts = \frac{\text{Absolute CD4 counts}}{\text{Total lymphocyte count}}\ X\ 100$$

Total lymphocyte counts were obtained by cell counter or by using following formula;

$$\text{Total lymphocyte count} = \frac{\%\ \text{of lymphocyte on DLC}}{100}\ X\ TLC$$

Analysis of data

To describe nominal data, simple percentages were used. Mean and standard deviations were used to describe normally distributed data.

RESULTS

Out of 140 children, 91 (65%) were male and 49 (35%) were female with over all male to female ratio 1.86 : 1. Maximum number of children 61 (43.58%) were in age group 5 - 10 years. The mean age of children was 7.67 years (SD±3.50) ranging from 1.5 to 15 years. 137 (97.86%) children contracted infection through vertical route. 47 children (33.57%) lost their mother, father or both. 29 (20.71%) children were in upper socio economic status while 121 (79.29%) in lower socio economic status. Nutritional status of these children is shown in (Table 1).

No child was nutritionally normal. 101 (72.14%) children had significant under nutrition. 21 (15%) children had clinical signs of vitamin A deficiency in the form of bitot's spot, conjunctival, corneal xerosis and night blindness. Seven children demonstrated clinical signs of vitamin D deficiency in the form of vitamin D deficiency rickets. On the basis of WHO criteria, maximum number of children, 72 (51.42%) were in clinical stage II and 50 (35.72%) children were in immunological stage I.

Anaemia was demonstrated in 119 (85%) children. 107 (76.43%) had some anaemia (Hb% < 07-11.5 gm/dl) and 12 (8.37%) had severe anaemia (Hb% < 07gm/dl and less). (Table 2 and 3) show co-relation with anaemia and clinical and immunological stage of disease respectively in which we observe that in most of the children, with increasing severity of disease degree of anaemia also increasing.

Table 1: Distribution of cases according to nutritional status (n = 140).

Nutritional status	Number	Percent (%)
Normal	0	0
Grade I	39	27.86
Grade II	66	47.14
Grade III	29	20.71
Grade IV	06	04.29
Total	**140**	**100.00**

In (Table 4) we see cytopenia in relation to clinical stage of disease and we notice that with increasing severity of disease, granulocytopenia and thrombocytopenia is increasing. Lymphopenia is also increasing up to clinical stage III, but in stage IV, it has decreased. Bone marrow aspiration was done in 43 children.

33 (76.74%) children showed normocellular bone marrow while eight (18.60%) had hypercellular bone marrow. Co-relation between bone marrow findings and clinical and immunological staging was not significant.

Table 2: Anaemia and clinical staging.

Severity of anaemia	Clinical staging				Total
	1 (n-17)	2 (n-72)	3 (n-43)	4 (n-8)	
No anaemia (HB>11.50 gm/dl)	5 (29.41%)	13 (18.06%)	3 (6.98%)	0 (0.0%)	21 (15.00%)
Some anaemia (Hb>07-11.5gm/dl)	12 (70.59%)	56 (77.78%)	35(81.40%)	4 (50.00%)	107 (76.43%)
Severe anaemia (Hb<07.00gm/dl or less)	0(00.00%)	3 (4.16%)	5 (11.62%)	4 (50.00%)	12 (08.37%)
Total	**17 (100.00%)**	**72 (100.00%)**	**43 (100.00%)**	**8 (100.00%)**	**140 (100.00%)**

Table 3: Anaemia and immune staging.

Severity of anaemia	Immuno staging				Total (n-140)
	1 (n-50)	2 (n-27)	3 (n-38)	4 (n-25)	
No anaemia	14 (28.00%)	2 (7.41%)	5 (13.16%)	0 (0.0%)	21 (15%)
Some anaemia	36 (72.00%)	22 (81.48%)	28 (73.68%)	21 (84.0%)	107 (76.43%)
Sever anaemia	0 (0.0%)	3 (11.11%)	5 (13.16%)	4 (16.0%)	12 (08.37%)
Total	50	27	38	25	140

Table 4: Cytopaenias in children according to WHO clinical staging.

Cytopaenias (counts below normal for age)	WHO clinical staging				Total (n - 140)
	Stage I (n - 17)	Stage II (n - 72)	Stage III (n - 43)	Stage IV (n - 08)	
Lymphopaenia	07 (4.12%)	31 (48.05%)	22 (51.16%)	01 (12.50%)	61 (43.57%)
Granulocytopaenia	09 (5.29%)	29 (40.27%)	25 (58.11%)	05 (62.50%)	68 (48.57%)
Thrombocytopaenia	09 (5.29%)	15 (20.83%)	13 (30.23%)	06 (75.00%)	43 (30.71%)

DISCUSSION

In the present study 140 children between the ages 18 months to 15 years were included. 96.86% children were infected through vertical transmission which is similar to the findings of Agarwal D et al who reported vertical transmission in 94% children.[9] Merchant RH et al found it to be 86.66%.[4] Mean age of presentation in present study was 7.67 (SD±3.5) years. Shet A et al has also reported it 7 (SD±3.4) years and Kumarassamy N et al five years.[10,11] In our study majority of children had various grades of malnutrition, no child was nutritionally normal. Significant malnutrition (grade II, III and IV) was present in 72.14% children in present study. Lodha et al found 81.3% had failure to thrive.[12] Anaemia was reported in 85% children in our study. 8.37% children demonstrated severe anaemia. According to Claster S et al anaemia is the most common hematologic manifestation of HIV infection.[6] Adetifa IM et al reported anaemia in 78% children and severe anaemia in 6%, which is close to our study. Mir N et al found anaemia in 92% HIV infected children.[5] In our study we observed that prevalence and severity of anaemia increases with progression of disease. Belperio et al and Shet et al also found higher prevalence of anaemia in advance stage of disease.[13,10] In HIV infection cause of anaemia is multifactorial. Mainly it is due to failure of erythropoiesis secondary to variety of causes. It may also be due to nutritional deficiencies, hemolysis and various socio-cultural factors or combination of these. In our study lymphocytopenia was seen in 43.5%, granulocytopenia in 48.5% and thrombocytopenia in 30.7% children. Increasing trend in cytopenia was noted with increasing severity of disease. Moller et al reported severe granulocytopenia in patients with advance disease.[14] Mir N et al found granulocytopenia in 85% cases in stage IV. He also noted significant co-relation between lymphocytopenia and advancement of disease. Saurez AD et al noted thrombocytopenia in 27% cases and Silva EB et al in 25% of patients.[15,16] These findings are compatible with our findings. Idiopathic thrombocytopenic purpura with immune destruction of platelets is the major cause of thrombocytopenia in HIV infected patients. In our study bone marrow was examined in 43 children. 76% children showed normo

cellular marrow; about 19% hyper cellular and 5% hypo cellular marrow.

Adewuyi J et al reported normal or hyper cellular marrow in 84% cases.[17] Holland and Spivac found half of the bone marrow normo cellular, one third hyper cellular and remainder hypo cellular. Cases of hyper cellular marrow were equally distributed in all stages of.

CONCLUSION

This study concludes that in children, commonest route of infection was vertical transmission. Mean age of presentation was 7.67 years. Varying degree of mal nutrition and anaemia was noted in more than 85% HIV infected children. No child was nutritionally normal. Severe anaemia was noted in 8.37% children. Most common morphology was normocytic normochromic blood picture. In 15% children clinical signs of vitamin A deficiency and in five percent vitamin D deficiency were observed. Low socioeconomic status, orphan status, hypovitaminosis A, severe anaemia and severe malnutrition was associated with increased morbidity and mortality. Cytopenia was directly associated with severity of disease.

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