Nutritional assessment of children infected with HIV on Pre-ART & on ART

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Abstract

Introduction: PEM is one of the commonest manifestations of HIV in India. Malnutrition has a major impact on the outcome of HIV as it not only increases mortality but also results in an impaired response to ART. Nutritional status of children in HIV may affect the outcome of patients taking ART, hence this study was planned. In India there are very less studies to compare various anthropometrical measurements in children on ART and without ART. In this study nutrition of children on ART was compared with those without ART. **Methods:** All children who were confirmed HIV seropositive were included in this study. Nutritional assessment was done as per WHO classification and categorize as normal, stunting, wasting and under nutrition. Data was obtained and difference in proportion of wasting, stunting and underweight between ART and pre-ART group were analyzed by using SPSS software. It was Prospective case-control study. 1) Total 600 children below 12 years were registered in ART centre, out of which 125 pre-ART and 125 children on ART which came for follow up in ART OPD were enrolled in the study. **Results:** Underweight was most common type of malnutrition in both group, prevalence of   underweight and wasting were more common in ART group as compared to pre–ART group. No difference in prevalence of stunting in both groups. **Conclusion:** There was statistically significant improvement in nutritional status (underweight and wasting) in ART group at the end of one year with no significant effect on stunting.

Key words: HIV, ART (Anti-Retroviral Therapy), Malnutrition

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Introduction

Human immunodeficiency virus (HIV), a human retrovirus that belongs to lentivirus family, causes the AIDS. India harbours world's second highest number of HIV infected people. Presently 2,02,000 children are living with HIV/AIDS in India [1]. The global impact of HIV epidemic has been so dramatic and devastating that it has been described as the "epidemic of current century" [2].

The first case of HIV infection in India was diagnosed among sex workers in Chennai, Tamil Nadu in 1986 [4]. Unlike adults where more than 90% of the time HIV infection occurs through sexual route, in the developing countries 95% of cases in children occurs due to vertical transmission from infected parents.

Vertical transmission is the most common means of transmission and accounts for over 85% of pediatric infection [5]. HIV infection affects nutrition through increase in resting energy expenditure, reductions in food intake, nutrient mal-absorption and complex metabolic alterations that culminate in weight loss and wasting common in AIDS. The effect of HIV on nutrition begins early in the course of the disease, even before an individual may be aware that he or she is infected with the virus. Asymptomatic HIV positive individuals require 10% more energy and symptomatic HIV-positive individuals require 20%- 30% more energy than HIV-negative individuals of the same age, sex and physical activity level [6].

Nutritional status has been associated with immune status and function, including cytokine levels, as well as with the risk of opportunistic infections, all of which

tend to lead to a more rapid HIV disease progression. Studies of the nutritional status of HIV infected patients have shown a substantial weight loss during the course of HIV infection. Weight loss plays a predictive role in HIV disease progression to AIDS, independently of powerful indicators, such as low CD4 cell count [7]. Malnutrition has a major impact on the outcome of HIV disease as it not only increases mortality but also results in an impaired response to antiretroviral therapy [8].

Material and Methods

The study was carried out in ART centre and pediatric ward during the period of January 2009 to October 2010. It was Prospective case-control study. All children below 12 yrs and HIV reactive attending ART OPD or IPD were included in the study. Children who were HIV reactive and on ART were included in cases and Children who were HIV reactive and not on ART were considered as control.

Written and informed consent of all parents and caretakers was taken before performing the tests and examination. All children who were thus confirmed HIV seropositive using Three Rapid Tests (Tridot, Coombed, and Immunochromatography) were included in this study. Anthropometric assessment with regards to weight, Length, Height and Mid-arm circumference was done in all cases. Nutritional assessment was done as per WHO classification and categorize as normal, stunting, wasting and under nutrition. Weight was measured by using electronic weighing machine, length by infantometer, height by wall mounted stadiometer and mid arm circumference by non stretchable measuring tape and values were plotted on WHO Chart according to age, sex and categorize.

Prevalence of underweight, wasting and stunting was calculated for the different age group and both sexes using Epi (info) nutritional software version 3.4.3 and severity was classified based on Z score. Each subject were followed every 6 monthly for anthropometrical assessment.

Statistical Analysis: The data was obtained and differences in proportion of wasting, stunting and underweight between ART and pre-ART group were analysed by using SPSS software and chi-square test, unpaired 't' test, multiple logistic regression was applied for significance.

Results

All children with HIV/AIDS on ART/PRE-ART attending OPD or admitted in ward during study period were screened, out of which 125 cases were enrolled in study on ART and compared with 125 cases of PRE-ART as controls.

Table No.-1: Demographical profile in children's of HIV/AIDS

Variables	PRE-ART		ART	
	Total (n=125)	Mean+SD	Total (n=125)	Mean+SD
Sex : Male Female	58 (46.4%) 67 (53.6%)		79 (63.2%) 46 (36.8%)	
Age of presentation	M =7.3+2.81 F =6+2.81	7.27 +2.73	M= 8.3+2.85 F= 8.2+2.85	8.2+2.82
Mode of transmission Vertical Blood products	112 (89%) 2 (1.6%)		120 (96%) 3 (2.4%)	
Parents HIV status Father Mother	103 (82.4%) 113 (90.4%)		104 (83.2%) 115 (92%)	
Age at diagnosis		5.8±2.78		6.6±3.03
Duration of ART				1.5±0.6

Females were found to be most commonly in Pre-ART group and Males in ART. Mean Age of presentation in Pre-ART was 7.27 years and 8.2 years in ART.

Table No.-2: Baseline anthropometric parameter in children with HIV/AIDS

Anthropometric Indices	Pre-ART	Mean±SD	ART	Mean±SD
Weight	M=17.0+4.5 F=16.9+4.5	17.3+4.5	M=15.9+4.6 F=16.3+4.64	16.07+4.6
Height	M=111+8.4 F=108+12.3	109.83+8.4	M=115+19.4 F=117+19.4	116+17.4
Body mass index	M=15.2+2.4 F=15.5+2.4	15.4	M=15.7+3.2 F=16.4+3.2	15.9+3.03

Table No.-3: Prevalence of malnutrition among HIV infected Children.

Anthropometric Indices	Pre-ART(n=125)		ART(n=125)	
	Cases	Percentage	Cases	Percentage
Underweight Mod Severe	62 11	73 (58%)*	88 15	103 (82%)*
Wasting Mod Severe	32 08	40 (32%)*	73 20	93 (74.4%)*
Stunting Mod Severe	62 04	64 (51%)	62 02	64 (51%)
Oedema	13	(10.4%)	18	(14.4%)
Wasting and stunting	4	3%	15	(12%)
Normal nutrition	52	41%	22	17.3%

*p=<0.05 compared with both group

In present study in Pre-ART prevalence of underweight was 58% and in ART group was 82% which is statistically significant.

Table No.-4: Prevalence of underweight at baseline, 6-month and 1year in both groups

Nutritional status	PRE-ART			ART		
	Baseline	At 6 Month	At 1 Year	Baseline	At 6 month	At 1 year
Weight for Age Z score	Median (-2.1) Mean (-2.02±0.90)	Median (-2.28) Mean (-2.13±1.02)	Median (-2.3) Mean (-2.23±0.8)	Median (-2.57) Mean (-2.4±0.74)	Median (-2.55) Mean (-2.26±0.97)	Median (-2.1) Mean (-2.13±0.8)
<-3	11(8.8%)*	15(12.5%)	15(13.3%)	15(12%)*	18(15%)	18(15%)*
<-2	62(49.6%)*	66(55%)	64(57.1%)	88(70.4%)*	62(51.6%)	58(48.3%)*
>-2	52(41%)*	39(32.5%)	33(29.4%)	22(17.6%)*	40(33.3%)	44(36.6%)*

*P=<0.05(0.001) compared to baseline

There was statistically significant difference in weight for age Z score at baseline in both groups with statistically significant increase in Z score in ART group.

There was significant difference in weight for height Z score in Pre-ART and ART group at baseline with statistically significant improvement in Z score at 1 year in ART group. Females were found to be most commonly in Pre-ART group

and Males in ART. Mean Age of presentation in Pre-ART was 7.27 years and 8.2 years in ART. In present study in Pre-ART prevalence of underweight was 58% and in ART group was 82% which is statistically significant.

Table No.-5: Prevalence of stunting at baseline, 6month and 1 year

Nutritional status	PRE-ART			ART		
	Baseline	At 6 month	At 1 Year	Baseline	At 6 Month	At 1 year
Height for Age Z score.	Median (-2.1)	Median (-2.1)	Median (-2.2)	Median (-2.1)	Median (-2.1)	Median (-2.1)
	Mean (-1.9±0.7)	Mean (-2.06±o.8)	Mean (-2.0±0.99)	Mean (-2.0±0.67)	Mean (-1.97±0.86)	Mean (-1.93±0.84)
<-3	04(5%)	05(4.1%)	06(5.3%)	02(1.6%)	03 (2.5%)	03(2.5%)
<-2	62(49.6%)	65(54.1%)	61(55%)	62(49.6%)	66(55%)	72(57.5%)
>-2	59(47.2%)	50(41.6%)	45(40.1%)	61(48.8%)	51(42.5%)	45(37.5%)

*$p<0.05$ compared with baseline

There was no significant difference at baseline in height for age z score in both group. With deterioration in score at the end of 1year that is not statistically significant.

Table No. 6: Prevalence of wasting at baseline, 6month and 1 year.

Nutritional status	PRE-ART			ART		
	Baseline	At 6 month	At 1 Year	Baseline	At 6 Month	At 1 year
Weight for Height Z score	Median (-1.7)	Median (-1.8)	Median (-1.6)	Median (-2.5)	Median (-2.1)	Median (-1.9)
	Mean (-1.5±1)	Mean (-1.7±0.9)	Mean (-1.45±1.0)	Mean (-2.25±1.02)	Mean (-2.14±0.9)	Mean (-2.1±0.9)
<-3	08(6.4%)*	08(6.6%)	08(7.1%)	20(16%)*	22(18.33%)	24(20%)*
<-2	32(25.6%)*	30(25%)	34 (30%)	73(58.4%)*	44(36.6%)	42(33%0*
>-2	85(68%)*	82(68.3%)	70(63.6%)	32(25.6%)*	54(45%)	83(66%)*

*$P=<0.05$ (0.004) compared to baseline

There was statistically significant difference in weight for age, weight for height Z score at baseline in both groups with statistically significant increase in Z score in ART group. There was no significant difference at baseline in height for age z score in both group. With decrease in score at the end of 1yr that is not statistically significant.

Discussion

In present study total number of children below 12 years registered in was 250. Out of these, female predominance was found in pre ART and male predominance in ART group.

Male predominance was seen in most of the studies. [9, 10, 11]. Other various studies found females predominance. [2, 7, 12] However, there was no statistical significant difference in gender [2]. In present study mean age of presentation was 7.27 years in Pre-ART group and 8.2 years in ART group that was similar to other various studies [1,2,9]. The age distribution of our study population reflects both the

natural progression of HIV in children and the difficulties inherent in early diagnosis of children in resource limited settings.

The recent implementation of virology diagnostic testing in postnatal and pediatric clinics should improve the ability to identify HIV-infected infants earlier in life and screen them for initiation of ART. It is likely that a majority of younger infected children die prior to diagnosis from illnesses not recognized as HIV-related e.g. gastroenteritis, pneumonia and that this leads to under representation of this age group in our study population [13].

However in two studies [11, 12] mean age of presentation was 48 and 17 month as they selectively did study among hospitalized patient who were symptomatic. Mean duration of ART in the present study was 1.5 years, similar to various studies [2, 9,10]. In present study most common mode of transmission to children was vertical transmission in both PRE ART and ART group, similar to other studies [1, 12]. The primary route of infection in the pediatric population is vertical transmission, accounting for almost all new cases. The highest percentage of HIV-infected children acquire the virus intrapartum, The mechanism of transmission appears to be exposure to infected blood and cervico-vaginal secretions in the birth canal, where HIV is found in high titters during late gestation and delivery. The least common route of vertical transmission is breast-feeding [14]. In present study, underweight followed by stunting was most common in PRE ART group. Similar observations were found in other studies [2, 9, 15] while in ART group wasting was 2nd most type of malnutrition that simulates the study conducted in south India [16]. Incidence of acute on chronic malnutrition was low in both the groups. Growth failure may be a direct consequence of the HIV infection, secondary to the clinical illness associated with HIV, a function of the child's adverse environment, or a combination of these factors. The pattern of growth failure among the children in this study suggested the prevalence of both relatively acute (underweight or low weight-for-age) and chronic growth failure (stunted or low height-for-age). The overall prevalence of wasting (low weight-for-height) was low, as seen in our study, suggesting that the majority of children with growth failure as indicated by underweight or stunting, were nevertheless, normally proportioned. Proportional growth failure is more likely in the setting of HIV infection rather than acute weight loss over a short period [9].

In present study, there was significant difference in weight for age (WAZ) and weight for height Z score (WHZ) in Pre-ART and ART group at baseline with significant improvement in Z score in ART group. There was no significant difference in height for age (HAZ) Z score among two groups at baseline neither there was change in z score at one year. Similar observations were found in one study [16].

However, there was improvement in weight for height (HAZ) Z score found at the end of one year in ART group in various studies [12, 17, 18] that was not statistically significant. Stunting is less reversible than wasting and the negative impact of chronic infection and malnutrition on height appears to be long-lasting [16]. A longer follow-up may have provided more information on their potential for catch-up growth. However, considering findings from other studies with longer follow up, increases in height are less pronounced when HAART is initiated later [17].

Conclusions

In present study, underweight was most common type of malnutrition in both group, prevalence of underweight and wasting were more common in ART group as compared to pre–ART group. No difference in prevalence of stunting in both groups. There was statistically significant improvement in nutritional status (underweight and wasting) in ART group at the end of one year with no significant effect on stunting.

Abbreviations

Abbreviations	Long forms
HIV	Human Immunodeficiency Virus.
ART	Antiretroviral Therapy.
WAZ	Weight for age z score.
WHZ	Weight for height z score.
WAH	Height for age z score.

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