 DOI: 10.18231/2394-2126.2017.0024

Effect of maternal human immunodeficiency virus infection on neonatal anthropometry, a hospital based, cross sectional, multicentric study

K Ephraim Vikram Rao[1,*], Shiny Vinila B H.[2], Sridevi N S.[3]

[1]Assistant Professor, Dept. of Anatomy, Deccan College of Medical Sciences, Hyderabad, Telangana,
[2]Senior Lecturer, Dept. of Anatomy, Panineeya Mahavidyalaya Institute of Dental Sciences, Hyderabad, Telangana,
[3]Associate Professor, Dept. of Anatomy, Sri Devaraj Urs Medical College, Karnataka

***Corresponding Author:**
Email: drvikram.anat@gmail.com

Abstract

Background: Anthropometric study of the new-born can yield valuable information regarding intrauterine growth and nutritional status of the new-born. The present study aims at identifying the effect of maternal Human immunodeficiency virus (HIV) infection on neonatal anthropometry.

Materials and Methods: It was a hospital based cross sectional multicentric study. A total 100 of HIV positive pregnant women and their neonates were included in the study. The anthropometric parameters taken into consideration in the present study were new-born/neonatal weight and length. The materials used for the study were new-born/infant weighing machine, infantometer and non-stretchable measuring tape.

Results: The mean birth weight was 2.62 ± 0.45kg, 24 (24%) of neonates weighed less than 2.5 kg and 52(52%) neonates showed stunting, 58(58%) neonates showed wasting with weight for length. Mean weight for length, BMI and PI were 2.62 ± 0.46 kg, 48.22 ± 2.13cm, 11.58 ± 1.63 and 2.31±0.28 respectively**.**

Conclusion: Significant correlation was observed between the maternal HIV infection and malnourishment in the neonates as the weight, weight for length and BMI were affected. But the length of neonates was not affected. Neonates of the HIV infected mother can be considered under high risk group.

Keywords: Low Birth Weight, Human Immunodeficiency Virus, Neonates, Anthropometry, Body Mass Index, Ponderal Index.

Introduction

Anthropometric study of the new-born can yield valuable information regarding intrauterine growth and nutritional status of the new-born. According to the previous studies the incidence of pregnant women with HIV infection living in India was estimated between 22,000 to 61,000.[1,2] Literature also states that about 1,89,000 HIV infected women are giving birth every year in India. Only 19% of HIV infected women of child bearing age are reported to have received Anti-Retroviral (ARV) prophylaxis for Prevention of parent to child transmission (PPTCT).[3] World health organization recommended administration of single dose of intra-partum and neonatal nevirapine (single dose NVP) to prevent mother to child transmission of HIV among the women without access to antiretroviral therapy. Preventive therapy against mother to child transmission with single dose NVP have been shown to decrease perinatal HIV transmission to 8% in controlled clinical trial setting.[4] Mother to child transmission of HIV infection has been successfully reduced to less than 2% in developed countries.[5]

Maternal HIV infection makes the pregnancy outcome more vulnerable to transmission of HIV infection.[6] Pediatric AIDS is poised to become a major public health problem in India.[7] Immuno suppression in HIV-positive women may contribute to low birth weight by increasing women's susceptibility to infections and by compromising their nutritional status. Previous studies reported that the advanced-stage HIV disease, intrauterine HIV transmission, CD4 and CD8 cell counts, Plasmodium falciparum malaria, and various intestinal parasitic infections as significant determinants of low birth weight in neonates.[8] Nutritional status of the new-born fetal malnutrition is an important indicator which determines neonatal morbidity and mortality in HIV infection.[9] The present study aims at identifying the effect of maternal HIV infection on neonatal anthropometry.

Materials and Methods

The present study was a hospital based cross sectional study. A total of 100 HIV positive pregnant women and their neonates were included in the study. It was a multicentric study where 3 major maternity hospitals in the Hyderabad and Secunderabad were included. The 3 major hospitals were Modern Government Maternity hospital, Sultan Bazaar Maternity Hospital, and Gandhi Hospital. All the neonates were given a single dose of nevirapine (sd NVP) to prevent mother to child transmission of HIV and all neonates were under supplemental nutrition. Written informed consent was taken from all the HIV positive mothers. Preterm labours were excluded from the study. A detailed proforma was recorded collecting maternal medical and obstetric history, along with neonatal age, sex and anthropometric parameters. These anthropometric parameters of infants of HIV positive pregnancies were compared to WHO growth standards considered normal controls. The materials used for the

study were new-born/infant weighing machine, infantometer and non-stretchable measuring tape.

For the present study The WHO reference standards were taken into consideration as advised by The Indian Academy of Paediatrics (2010) for comparison with the anthropometric parameters of the study sample. The anthropometric parameters taken into consideration in the present study in neonates were Weight, Length or Crown heel length and Weight for Length (Fig. 1, 2 & 3). From these parameters Body Mass Index and Ponderal Index were calculated.

Fig. 1: New-born weighing machine

Fig. 2: Measurement of birth length by infantometer

Newer method - apposing only one lower limb to the foot board to minimising discomfort to the neonate.

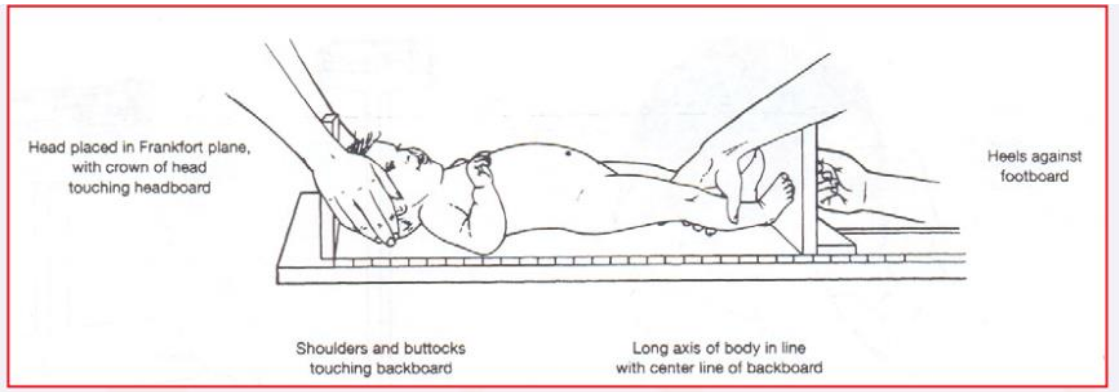

Fig. 3: Technique of measurement of Birth length (Conventional)

Observations & Results

In the present study out of 100 neonates the number of male neonates among the sample population was found to be 46 (46%), the number of female neonates being 54 (54%). According to gestational maturity 90 were of term pregnancies at delivery and 10 cases were post term deliveries (Fig. 4).

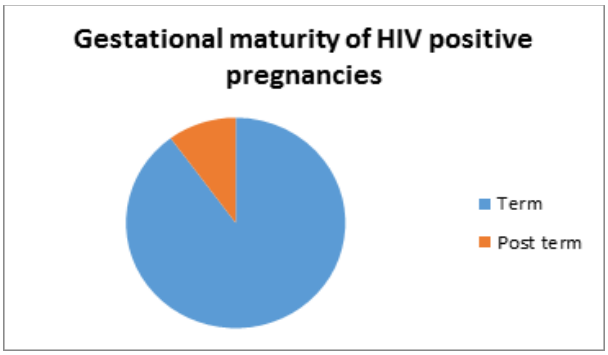

Fig. 4: Pie chart showing gestational maturity of HIV positive pregnancies at delivery

The neonates were classified according to their gender and age in weeks. Out of the 100 neonates in the present study 24(24%) were found to have a birth weight of < 2.5kg and thus were found to be of low birth weight (Fig. 5).

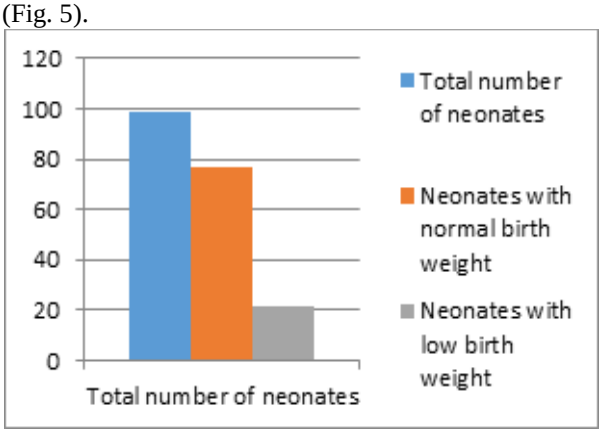

Fig. 5: Low Birth Weight Neonates

Mean weight for length, BMI and PI were 2.62 ± 0.46 kg, 48.22 ± 2.13cm, 11.58 ± 1.63 and 2.31 ± 0.28 respectively. The weight, length and weight for length were measured in the 1st and 2nd weeks after birth and compared with the WHO & IAP standards. All the measurements were recorded based on WHO & IAP reference classification in Table 1. According to the present study 73% of the neonates were underweight, 52% of the neonates were shorter for age, 58% of the neonates were having less weight for length and in 81% of the neonates were malnourished based on the body mass index for age scores which were below normal according to the IAP standards and ranging from mild to severe (Fig. 6).

Table 1: Showing the weight, length and weight for length of all the neonates

Status	Weight	Length	Weight for length	BMI
Normal	27	48	42	19
Mild (under)	43	36	42	43
Moderate (under)	22	10	10	31
Severe (under)	8	6	6	7

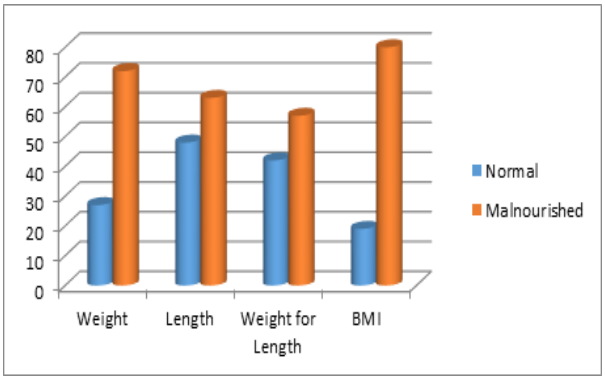

Fig. 6: Bar diagram showing comparision of weight, length and weight for length of normal and malnourished neonates

Ponderal index is a measure of leanness. An index between 2.5 and 3.0 is considered as normal, between 2.0 and 2.5 as marginal, and a child with this index less than 2.0 is classified as small for gestational age (SGA). In the present study most of the neonates were having marginal ponderal index and 9% of neonates were small for gestational age. Ponderal index was calculated by using following formula and the values were tabulated in Table 2. There was no significant difference between the male and female neonates (Fig. 7).

Ponderal Index (for neonates) = weight in gm/(length in cm)^3 x 100.

Table 2: Ponderal Index of Neonates studied

Classification	Number of Neonates Studied	Percentage
Normal	19	19 %
Marginal	73	73 %
Small For Gestational Age	9	9 %

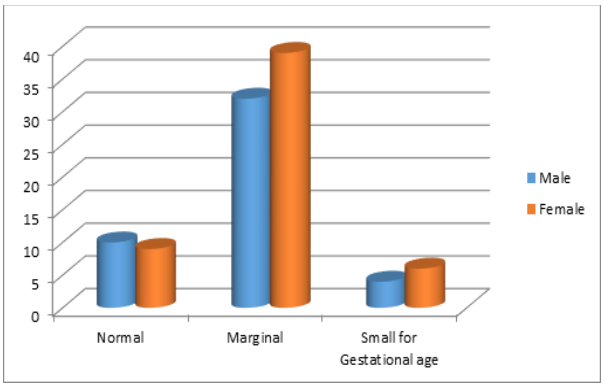

Fig. 7: Bar diagram showing gender wise distribution of Ponderal index

Discussion

HIV-positive status during pregnancy is an important factor influencing the health of mother and foetus. Even uninfected infant of HIV-infected mother has compromised health status compared to non-exposed infants. The need to document the effect of maternal HIV infection on anthropometry of their neonates prompted the present study.

There were 15 mothers in the present study who experienced weight loss during their pregnancy out of which 15 (15%) delivered a low birth weight baby (<2.5kg), attributing the occurrence of low birth weight neonates to maternal weight loss during pregnancy which was supported by Villamor E et al., and also concluded that the low maternal height and weight at the first visit were significantly related to lower mean birth weight and increased risk of SGA, but not to preterm delivery.[10]

Studies report inconsistent results concerning the consequences of maternal HIV infection on fetal growth. Some authors report that anthropometric measures for both HIV-infected and uninfected infants born to HIV-infected mothers are significantly lower than those for infants born to HIV-negative mothers. Other studies failed to find any association between maternal HIV related effects on growth of neonates. Leroy V et al., Ellis J et al., Markson LE et al**.,** reported that the HIV positive mothers have an increased risk of bearing low birth weight infants.[11-13] The percentage wise incidence of low birth weight infants in HIV positive mothers is shown in Table 3.

Table 3: Comparison of Percentage of Low Birth Weight Infants of HIV Positive Pregnancies

Authors	Percentage
Markson LE et al., (1996)[13]	29%
Leroy V et al., (1998)[11]	25.5%
Ellis J et al., (2002)[12]	29.3%
Present study (2016)	24%

The percentage of low birth weight neonates in the present study was 24% and correlates well with the results of and Leroy V et al., (25.5%).[11] The results shown by Anna Bucceria et al., and Tracie L Miller et al, that HIV uninfected and infected mothers did not differ significantly according to new-born weight.[14,15]

In the present study the neonatal weight was less for the age when compared to WHO and IAP standard values. 78 % of the neonates were born with normal weight (>2.5kg), but the weights of the neonates were reduced in first 2 weeks after birth reporting 73% of the neonates as underweight. Lepage et al., found that the weight-for-age mean z scores were lower among HIV-infected children than among uninfected ones. But the weights of uninfected children born to seropositive mothers were similar to those of children born to seronegative mothers.[16] Moye J Jr et al., also found that weight-for-age between infected and uninfected infants. Infants infected with HIV were an estimated average 0.28 kg lesser weight than uninfected infants at birth. In concordance with the above studies the weight for age of neonates of HIV positive mothers were less when compared to WHO and IAP standard values suggesting that the maternal HIV infection can cause birth of underweight neonates.[17]

Lepage et al., found that the lengths of uninfected children born to seropositive mothers were similar to those of children born to seronegative mothers.[16] Sombié I et al., found that the mean birth size did not differ significantly between the children of HIV-infected and uninfected mothers. Body lengths of less than 47 cm at birth were described as "small birth size". There were only 19(19%) neonates in the present study whose birth lengths were less than 47cm correlating well with Sombié I et al., Anna Bucceria et al, Tracie L Miller et al.,[14,15,18] In the present study only 19 % showed small birth size but the growth of neonates was hampered in first 2 weeks after birth as 52% of the neonates were shorter for their age.

Lepage et al., compared the anthropometric characteristics of children born to HIV-1 seropositive and seronegative mothers. The weight-for-length mean z score was not consistently lower in HIV-infected children when compared with uninfected ones.[16] Moye J Jr et al., found that the mean z scores of weight-for-lengths were lower by 0.255 SD units compared with uninfected infants.[17] More than those in the results of Tracie L Miller **(**48%) suggesting that maternal HIV infection does produce low weight for length z-scores and thereby wasting in the new born.[15] The present study does not correlate well with results of above studies and suggested that the weight for length scores did not differ among neonates born to HIV-1 seropositive and seronegative mothers.

In concordance with the results of Moye J Jr et al., Tracie L Miller, et al., the body mass indices of 81 % neonates in the present study were lower than WHO growth standards, grading them as malnourished and suggesting a significant correlation between maternal

HIV infection and malnourishment in the new-born period.[15,17]

There were only 9% neonates who were small for gestational as indicated by their low ponderal index (<2), suggesting maternal HIV infection does not significantly affect the new-born ponderal index**.** The present study correlates well with those of Temmbherman M et al., by showing an association of maternal HIV antibody seropositivity of 7.7%, 10.5% respectively in the above mentioned studies, compared to the 9% in the present study and delivery of small for gestational age neonates.[19]

Conclusion

There was no significant association of HIV positive pregnancies with premature delivery in the present study. But the weights, lengths, weight for lengths, BMI and Ponderal index were lower than the normal standard values in the present study. The birth weight was affected to an extent of 24% with 24 low birth weights and birth lengths were not significantly affected by maternal HIV infection. The anthropometric parameters measured were an indication of intrauterine growth of neonates studied, but HIV exposure does not adversely affect growth potential of neonates as the severely affected rate was very low. Therefore efforts need to be focused on preventing maternal to child transmission and post natal nutritional care of the neonate to maintain appropriate weight and lengths of the HIV exposed neonates so that they can have normal growth.

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