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Original Research Article

Prospective Study of Impact of Feeding Practices on the Growth, Development and Infections in HIV Exposed Infants versus HIV non-exposed Infants

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Abstract

Background: Appropriate feeding practices in early life are widely identified as important determinants for growth and development in children. Identifying and promoting the best feeding practice for HIV exposed infants has been a real challenge in the developing world.

Aims and Objectives: To study the impact of type of feeding practices on growth, development and occurrence of infections in HIV exposed infants versus HIV non-exposed infants.

Methods: A total of 105 infants were enrolled in the study and divided in two primary groups, HIV-exposed infants (50) and HIV non-exposed control infants (55). Thereafter each group was divided according to the feeding pattern as exclusive breast fed, top fed and mixed fed. All infants were followed from birth to 6 months of age and at each visit they were examined for rate of infections, anthropometry developmental milestones, feeding methods were recorded.

Results: There was a significant increase in infections among top fed and mixed fed babies in both control and exposed group compared to exclusive breast fed group ($p < 0.05$). Growth was affected in top fed and mixed fed exposed infants compared to exclusive breast fed infants. Development was affected most in the mixed fed infants but difference was statistically insignificant.

Conclusion: Exclusive breast feeding is a choice of infant feeding, as it causes lesser infections and better growth and development of the child.

Keywords: Feeding practices, HIV exposed infants, HIV non-exposed infants, Exclusive breast fed, Top fed, Mixed fed.

1. Introduction

The HIV/AIDS pandemic is one of the most important challenges in global health today. Although important progress has been achieved in preventing new HIV infections and in lowering the annual number of HIV related deaths, the number of people living with HIV continues to rise. HIV-related illnesses remain one of the leading causes of deaths globally and are projected to continue as a significant global cause of premature mortality in the coming decades. In 2007, 33 million people worldwide were estimated to be living with HIV [1] and 2.6 million people became newly infected with HIV at the end of 2009,it was estimated that 2.4 million people were living with HIV in India.

Mother to Child Transmission (MTCT) is by far the most significant route of transmission of HIV infection in children below the age of 15 years. In 2005 alone, 700,000 children were reported to have acquired HIV infection. HIV can be transmitted during pregnancy, during child birth, or breast-feeding. Without intervention, the transmission from an infected mother to her child ranges from 15% to 25% in developed countries and from 25% to 45% in developing countries and the difference is largely attributed to breast-feeding practices [2].

Table 1: Mode of HIV transmission from infected mother to her child

During pregnancy	5-10%
During labour and delivery	10-15%
During breast feeding	5-20%
Overall without breast feeding	15-25%
Overall with breast feeding up to 6 months	20-35%
Overall with breast feeding to 18 to 24 months	30-45%

Source: WHO

The risk of HIV transmission continues as long as a child is breastfed. Therefore it is nesessary to weigh the risk of infants acquiring HIV through breastfeeding with the risk of death from causes other than HIV, in particular malnutrition and serious illnesses such as diarrhoea and pneumonia among non-breastfed infants. For these reasons, health workers in countries where both HIV is common and many children die from other illnesses, continue to face the real challenge in identifying and promoting the best feeding practice for HIV exposed infants in their care. Women in developing countries have the difficult choice of balancing the risk of transmitting HIV through breast milk against the substantial benefits of breastfeeding. It is not known, however, whether the benefits of breastfeeding are the same when the mother is HIV-infected. With this background, we studied the impact of type of feeding on infections, growth and development in the infants of HIV-1-infected women versus HIV non-exposed infants.

2. Materials and Methods

After obtaining Institutional Ethical Committee approval and parent's written informed consent, this prospective, cohort study was conducted in 105 assenting pediatric patients with ages ranging from 1–120 days, in the Pediatric Centre of Excellence for HIV Care, at the Department of Pediatrics in a tertiary care medical college and hospital. The study included HIV-infected infants and non exposed infants from general Pediatric OPD.. Infants with congenital malformations, pre-existing heart disease, respiratory disease or any pre- existing disease which can predispose the child to infections were excluded from the study.

The enrolled infants were grouped into HIV exposed (50) and non-exposed control (55) depending on the HIV status of the mother. Then according to feeding pattern, they were grouped into exclusive breast fed, top fed and mixed fed. All infants were followed monthly from birth till 6 months of age and at each visit, were examined for rate of infections, anthropometry and developmental milestones. All data was recorded, especially feeding methods, and current and interim illnesses. These parameters were plotted on the WHO growth charts. The 'z' score was obtained which was used for analysis.

2.1 Statistical Analysis

ANOVA and Chi-Square test were used for the analysis of data. Unpaired 't-test' was also applied. Analysis was made between groups with the purpose of finding whether there was any difference in type of feeding pattern affected the growth, development or rate of infections.

3. Observations and results

A total 105 infants were selected for the study and divided in two primary groups i.e. exposed and control. Age of the cases was ranging from 01 to 120 days with average age being 21.51±27.12 days among control group and 18.10±23.23 days among exposed group. In control group there were 45.5% males and 54.5% females whereas in the exposed group there were 36% males and 64% females. However, 36 - 45% of the total cases were male in both the groups. Demographical data were comparable between two groups and difference was statistically insignificant.

The rate of infections was significantly higher in top fed and mixed fed infants of both control and exposed babies. This reinforces that breast feeding causes lesser infections, and infact provides beneficial factors against infection, whether in the context of HIV exposed or not (Table 2).

Table 2: Number of Infections

Breast fed Controls	**Breast fed Exposed**	**Top fed Controls**	**Top fed Exposed**	**Mixed Fed Controls**	**Mixed Fed Exposed**
0.29±0.51	0.41±0.42	1.37±0.91	1.36±0.89	2±0.7	2.8±0.83
	BF Vs Top Controls	BF Vs mixed Controls		BF Vs Top Exposed	BF Vs mixed Exposed
P value	<0.05	<0.01		<0.01	<0.001

There was no significant difference between the weights at presentation between any of the groups. In the control group, there was a significant difference in weight between the breast fed and mixed fed group. Mixed fed HIV non-exposed infants showed growth impairment while between breast fed and top fed, the difference was statistically insignificant. In the exposed infants, there was growth impairment in both top fed and mixed fed group which was statistically significant. Mixed fed infants showed lesser weight gain in both HIV exposed and HIV non-exposed infants. Height was affected in top fed and mixed fed babies in the exposed group. Head circumference was affected in mixed fed group of exposed babies .The sample size of mixed fed group was small and so the results should be interpreted with caution, though it is expected for the mixed fed group to be maximally affected as seen in the results of this study, (Table 3).

Table 3: Weight, Height and Head Circumference for Age at follow-up

Breast fed Control	Breast fed Exposed	Top fed Control	Top fed Exposed	Mixed Fed Control	Mixed Fed Exposed
Weight for Age at follow-up					
-0.99±0.78	-0.85±0.79	-1.5±0.66	-1.6±1.01	-2.7±0.95	-2.3±0.2
	BF Vs Top Controls	BF Vs mixed Controls		BF Vs Top Exposed	BF Vs mixed Exposed
P Value	>0.05	<0.05		<0.05	<0.01
Height for Age at follow-up					
-0.62±0.96	-0.63±0.91	-1.42±0.95	-1.53±1.2	-2.11±0.71	-2.77±0.38
	BF Vs Top Controls	BF Vs mixed Controls		BF Vs Top Exposed	BF Vs mixed Exposed
P value	>0.05	>0.05		<0.05	<0.01
Head Circumference for age at follow-up					
-0.67±0.51	-0.94±1.03	-1.44±0.44	-1.83±1.3	-1.05±0.77	-3.07±0.33
	BF Vs Top Controls	BF Vs mixed Controls		BF Vs Top Exposed	BF Vs mixed Exposed
P value	>0.05	>0.05		>0.05	<0.05

Data are Mean and ±SD. P-value is significant if < 0.05

Development was affected in mixed fed group, though statistically insignificant; it can be due to increased rate of infections in this group (Table 4).

Table 4: Development at follow-up

Development	Breast fed Controls	Breast fed Exposed	Top fed Controls	Top fed Exposed	Mixed Fed Controls	Mixed Fed Exposed
Appropriate	36	30	7	17	3	4
	97.29%	96.77%	87.50%	89.47%	60%	80%
Delayed	1	1	1	2	2	1
	2.70%	3.20%	12.50%	10.52%	40%	20%

4. Discussion

Vertical transmission from HIV infected mother to child accounts for 90% of HIV infected infants and children globally. This is the most common cause of HIV transmission in paediatric age group. It can occur during pregnancy (in utero), labour and delivery (intrapartum), or through breast-feeding (postpartum).The biggest dilemma faced in managing HIV exposed infants is to allow breast feeding or not. The beneficial effects of breast feeding are already known. Replacement feeding is fraught with increased risk of infections and / or malnutrition if over diluted. In countries with high infant mortality rate, the mortality caused by infections is highest. At national level in India, it will be an enormous task to spend 75 million rupees per month to provide formula feeds to all babies born to HIV positive mothers. Mixed feeding is the worst option as it increases the risk of HIV transmission and also makes the child more prone to other infections. For the lack of affordability of replacement feeding or avoiding stigma, it is possible that mothers may practice mixed feeding which can be more harmful for the child.

Of the five pre-requisites (AFASS) for replacement feeding, safety is often the most critical. Several studies [3-7] of babies born to HIV-positive mothers in developing

countries have tried to determine which type of feeding results in a lower death rate or a higher rate of "HIV-free survival" (the proportion of babies left alive and HIV-negative). Outcomes depend on many local factors, including the conditions in which replacement feeding is provided, and whether breastfeeding is exclusive or mixed. It is worth noting that mothers enrolled in trials usually have access to potable water, extensive education on safe preparation of formula, a reliable supply of formula and medical care for their infants. Taken together, these studies demonstrate that replacement feeding can be beneficial, but certainly not in all situations. WHO recommends that counsellors talk with women and assess their individual circumstances about the risks and benefits before giving guidance regarding different modes of feeding. It is especially important to establish whether the mother has access to clean water and fuel, and whether she has disclosed her HIV status to her partner or family members.

Perhaps the most pressing question to be addressed is the promotion of top milk. Future research to address the nutritional value and safety of the available top milk in this region is warranted. Without proper safety data on top milk, it is not advisable to recommend this feeding option to women with HIV. Given the lack of hygienic conditions, the risk of social repercussions and in the absence of available safe infant formula, breast-feeding should be promoted for HIV positive women in this population. In the absence of available and affordable safe infant formula, interventions that reduce the risk of HIV transmission, also preserving the benefits of breast-feeding are necessary in settings like India. An important issue that should be addressed in future research is how well HIV positive mothers in India follow the recommendation to wean within 4–6 mo to prevent HIV transmission to their children.

In the present study, a total of 105 infants were included. HIV-exposed infants were 50 and HIV non-exposed control infants were 55. Each group was again divided as exclusive breast fed, top fed, and mixed fed. They were followed up for the early part of infancy. The mean age of patients was 21.5 days for control group and 18.10 days among exposed group. Bobat [8] *et al* in a similar study in Durban had taken 43 HIV infected and 90 non-infected infants and each group was divided into similar subgroups. The parameters studied in each group were the rate of infections (acute respiratory infection, diarrhoea, otorrhoea and severe infections), growth (weight, length, head circumference) and development (age appropriate milestones).

The rate of infections in our study was lower in breast feeding group of both control and exposed infants. There was a significant increase in infection among top fed and mixed fed group compared to breast fed group ($p<0.05$). In exposed group $p<0.01$ for breast fed versus top fed and $p<0.001$ for breast fed versus mixed fed infant. Gray *et al* [9] reported an increased transmission rate in exclusively breastfed HIV-infected infants from Soweto, South Africa. In a study of relatively privileged women from the Republic of Congo (formerly Zaire) [10] breastfeeding was found to protect the infants from common childhood illnesses, in those born to both HIV-infected and HIV-negative women. However the Durban study showed that morbidity due to common childhood infections (diarrhoea, pneumonia, otitis media) and failure to thrive, were as frequent in babies who were exclusively breastfed as in those who were either given formula exclusively or a mix of formula and breast milk; this observation was true for both HIV-infected and non-infected infants and children.

At presentation the weight of different groups was compared. There was no difference between the different groups and they were comparable ($p>0.05$). At follow up, comparison between different control groups showed that, growth was significantly impaired among mixed feeding group compared to breast fed babies ($p<0.05$) while the significance was not seen between breast fed and top fed infants. In exposed group, growth was affected in both top fed ($p<0.05$) and mixed fed ($p<0.01$) infants compared to breast fed infants. Height was also significantly affected among top fed and mixed fed exposed infants as compared to breast fed though no difference was found among them in control group. Head circumference was affected in mixed fed exposed infants ($p<0.05$). In other groups, it was not significant. There was no difference observed in the development of various groups. As such, delayed development is difficult to be picked up in early infancy.

The greater prevalence of infections and failure to thrive among top fed and mixed fed HIV exposed infants was predictable and extends the results from other studies in developing and industrialized countries.

5. Conclusion

In conclusion, the higher rate of infections in top feeding and mixed feeding can be explained with improper technique of preparation & lack of protective factors of breast milk. The growth was affected in top fed and mixed fed exposed infants compared to breast fed infants, this can be explained by increased infections & lesser growth factors by replacement feeding. Mixed feeding should be avoided as development was affected more in the mixed fed infants.

The implication of this study is that exclusive breast feeding should be a choice of infant feeding, as it causes lesser infections and better growth and development of the children. In our country, replacement feeding should be used only when the AFASS criteria are met.

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