

**INFANT FEEDING PRACTICES OF MOTHERS OF KNOWN HIV STATUS
IN LUSAKA, ZAMBIA**

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SUMMARY

Background: As up to 44% of mother to child transmission (MTCT) of HIV occurs through breastfeeding, feeding guidelines for infants of HIV infected mothers are being formulated in many resource poor countries. The impact of introducing these guidelines on mothers' actual feeding practices has not previously been examined, and might inadvertently increase the risk of MTCT. Infant feeding practices of mothers of known HIV status, who should have received advice during pre and post-test HIV counselling to reduce MTCT were assessed, and compared with those of uninfected mothers.

Methods: Mothers of infants aged two to twelve months, 55 HIV infected and 85 HIV uninfected, were recruited from an HIV Family Support Unit in Lusaka, Zambia. HIV status was known to 121 of these mothers, who had all received pre and posttest HIV counselling. Feeding practices were determined by verbal questionnaire.

Findings: All mothers breastfed but only 35% of infants below four months were exclusively breastfed. HIV infected mothers introduced fluids and weaned their infants significantly earlier than HIV uninfected mothers ($p=0.03$ and $p=0.002$ respectively). Infants of HIV infected mothers had significantly lower WAZ scores indicating poorer nutritional or health status ($p=0.004$). 36 mothers used commercial formula milk or cow's milk as replacement feeds. Cow's milk was inappropriately modified and four mothers reported adding salt.

Interpretation: Infant-feeding practices of HIV infected mothers differed significantly from HIV uninfected mothers, and this may contribute to their poorer growth. Paradoxically these mothers feeding practice could be putting these infants at greater risk of both HIV transmission and non-HIV related morbidity.

Keywords: breast feeding, HIV, infant feeding, mother to child transmission, Zambia

Introduction

It has been estimated that in Africa three million children under the age of 15 years are infected with HIV with 600,000 infections occurring annually. More than 90% of these are by mother to child transmission (MTCT) ¹ and breast-feeding has been estimated to cause between a third and a half of transmission ². In a randomised controlled trial of breastfeeding versus formula feeding in Nairobi 44% of transmission occurred through the breast ³. In sub-Saharan Africa, the prevalence of HIV is high, and infectious disease and malnutrition are the major causes of childhood death. In this setting the World Health Organization (WHO) recommends HIV infected mothers be advised on feeding options according to their local circumstances and to guide them make an informed choice on how best to feed their infants ⁴. However, information by which to assess the risks or benefits of breast and alternative feeding is rarely locally available. Only a handful of appropriate studies have been published world-wide prior to the HIV era, which allow attribution of the relative risk of feeding breast milk or breast milk substitutes to infants ⁵.

In Zambia, the estimated HIV prevalence in antenatal mothers is 12-24% ⁶ perinatal transmission is 39% ⁷ and breast-feeding is estimated to transmit HIV to 14% of these infants. In Lusaka, where 40,000 deliveries occur annually, 96% of mothers receive antenatal care and few mothers do not breastfeed. The risk of MTCT from continuing breast feeding is unlikely to be reduced by current preventive perinatal antiretroviral regimes should they be made available, and trials of antiretrovirals whilst breast feeding are being conducted to address this. Mothers who are known to be HIV

infected receive counselling in the clinic about infant feeding and should be advised on various feeding options in a non-directed interview in accordance to WHO recommendations ⁴.

According to the guidelines for the prevention of MTCT, mothers should have been informed about the risk of MTCT during infant feeding ⁸. Information to be given include the options of exclusive breast feeding for six months, exclusive breast feeding then weaning abruptly at three months or replacement feeding with breast milk substitutes (BMS). The risks of replacement feeds are discussed and mothers are encouraged to make their own choice on how to feed their child. Therefore the study was conducted during a period of changing practice, with local policy based on research and advice available in early 2000.

Information on infant feeding counselling advice in resource rich communities, such as the UK, indicates that all HIV infected mothers decide not to breast-feed their infant when they know their status ⁹. However there is anecdotal evidence from African communities, that mothers are reluctant not to breast feed their infant, even if free formula is provided. In a randomised trial of breast feeding in Nairobi, four fifths of HIV infected mothers chose not to enrol, principally because of the possibility of being randomised to artificial feeding, and 30% of those allocated to this option did not comply ³. The primary reason for this appeared to have been the stigma of HIV infection, which had become associated with formula feeding. Conversely, in three formative research studies in different communities within Zambia, non pregnant women given information on MTCT risks, indicated that if they as mothers knew their HIV status was positive, they would not breast feed their infant as it would increase the risk of their infant developing AIDS ^{10,11,12}.

However the actual impact of feeding advice on mothers in a community where breast-feeding is almost universal and where stigmatisation may occur is unknown. It is also not known what mothers understand about breast feeding and its relationship to MTCT, how they use the advice given in decision making, and whether the changes in practice resulting from it are as expected.

An understanding of the decision making process, and its outcomes is needed to assess the advantages and disadvantages of advice both on the risk of MTCT of HIV and on infants' nutritional status and morbidity. This study was designed to document infant feeding practices of HIV infected mothers, and to compare these with a group of HIV uninfected controls. We also determined the pattern of breast-feeding, the use and appropriateness of breast milk substitutes, other fluids, and complementary foods.

Methods

The study population was drawn from the Family Support Unit at the University Teaching Hospital, Zambia, which among other functions is a research outpatient review clinic where parents of known HIV status are followed up and counselling offered. Consenting pregnant women admitted to the labour ward were recruited after pre-HIV test counselling to research studies based at this clinic. Disclosure of the HIV results and post-test counselling was done during the first visit to clinic for mothers wishing to know their results. Thirty five percent of the mothers in the clinic returned for follow up at 2, 4, 6, and 12 months which included free access to medical care for both mother and infant. Mothers who attended the follow up clinic between April and June 2000 were invited to participate in the study. None of the mothers or infants was acutely ill. Inclusion criteria were known maternal HIV status and age of baby 12 months and below.

During the period of the study 561 mothers attended clinic, of whom 177 (36.1%) were HIV infected. During their clinic visit, the research nurse selected eligible mothers who (usually knew) had knowledge of their HIV status prior to obtaining consent for the study. HIV infected mothers were specifically targeted. The research nurse and one of the authors (AAAO) conducted interviews in the local language during clinic hours. Selection was opportunistic and depended on which women were not involved in other clinic activities.

Data were collected using a structured questionnaire, in the local dialect, which included basic socio-demographic indices such as; maternal age, parity, marital status, education, employment, infant weight, gestational age at delivery and mode of delivery. Detailed information on maternal knowledge, attitudes to, and use of breast milk substitutes and complementary foods was also collected. Following preliminary analysis some additional questions were introduced in response to mothers' answers to obtain more detailed information. The mother's stated HIV status was confirmed against clinic records.

(The study was approved by both the Research Ethics Committees in the University of Zambia and The Liverpool School of Tropical Medicine). (Both the Research Ethics Committees of the University of Zambia and The Liverpool School of Tropical Medicine approved the study.

Data was double entered into Epi Info (Version 6.01) programme. Chi squared tests were used to compare categorical data and Student's t test for continuous anthropometric data. Proportions and means were used for descriptive data. Results are expressed according to maternal HIV status.

Results

Mothers of 152 infants were invited to participate in the study of which 140 were recruited. 121 (86.4%) mothers knew their HIV serostatus. Of the remaining 19, ten (nine HIV infected) did not want to know their status, and nine (six HIV infected) were waiting to be informed. One mother wrongly identified herself as being HIV infected. Fifty-five mothers were HIV infected and 85 HIV uninfected. Their mean ages and socio-demographic characteristics are shown in Table 1.

The median age of the infants was six months (Range 2-12 months). Growth assessed by the weight for age Z (WAZ) score was significantly lower for the infants of HIV infected mothers (WAZ -0.22), compared with those of HIV uninfected mothers (WAZ 0.41, Student t test, $p=0.004$). This was more apparent in the older infants (Table 2).

HIV infected mothers were questioned about breast milk transmission of HIV; 85% stated that this occurred. Despite this, all but one infant were currently being breast-fed (a 12 month old baby had stopped breast feeding at 8 months when his HIV infected mother commenced anti-tuberculosis therapy). One quarter of the HIV infected mothers reported having been (being) advised to stop breast-feeding because of their HIV status. Exclusive breast-feeding was practised by 35% of the mothers with infants aged four months or younger.

Most mothers planned to breast feed for two years, with an intended median duration of 20.5 months. Of the HIV infected mothers, 12% intended to breast feed for less than 12 months compared to 2% of those who were HIV uninfected ($p = 0.03$), with 31% compared with 8% planning to stop by 18 months ($p<0.001$).

Of all the 106 infants aged four months or older, 52 % had been started on alternative fluids to breast milk by four months of age. More HIV infected mothers (28%) reported commencing alternative liquids below the age of two months, compared with 11% of HIV uninfected mothers ($p=0.03$). Of 77 mothers asked about water quality, 52 %, always boiled water given to the baby, 38% added chlorine and 27% did neither.

The median age of introduction of complementary foods was 4.0 months. Taking all the infants together, 15% had complementary foods (usually maize based porridges) introduced by two months, and 60 % by four months. HIV infected mothers had introduced complementary foods earlier than HIV uninfected mothers ($p = 0.002$). All six infants below two months of age currently receiving complementary foods had (mothers with HIV infection) HIV positive mothers.

The main reasons stated for introducing complementary foods early were the baby crying, and the mother's perception of having insufficient breast milk. Of the 71 babies aged six months or more 38 (54%) were being given two or less feeds daily, with only 8 (11%) receiving more than four feeds daily.

Thirty-six mothers (26%) of whom 16 were HIV infected had used or were using breast milk substitutes (BMS). The median age at which BMS were commenced was 2.5 months. Commercial formula feeds were used by 23 of these mothers, of whom

eight were HIV infected) 13 (9%) mothers had used fresh cow's milk, and only six (of these 13) mothers modified the cow's milk, two by adding sugar, four added salt (Table 2), and no mother added water. Of 29 mothers asked, 20 used a teated bottle and nine used a cup and spoon. Mothers who used BMS had significantly greater wealth than the others, as assessed by possession scores ($p=0.008$).

Discussion

This study is important because it examines the actual infant feeding practices of HIV infected women in Lusaka. Previous studies in Zambia^{10,11,12} have asked (non-pregnant) women how they would feed their infants if they knew they were infected with HIV, but have not defined the actual practices of mothers who know they are infected. Whereas these studies had been predominantly based on focus group discussions, in this study mothers were separately interviewed to elicit individual knowledge, attitudes and practice. The aim of this study was to examine the mothers feeding practice following advice from a range of sources and not to specifically test the effectiveness of the counselling given in clinic. By comparing these findings with HIV uninfected mothers we have assessed the impact of this infant feeding advice on practice (Table 1).

The HIV infected mothers were slightly older than HIV uninfected mothers, which reflects the age group with the highest reported HIV prevalence in Zambia¹³. It is possible that this might have influenced feeding choice but the number of live siblings, and other parameters measured were similar for both groups. Although all mothers had consented to have the HIV test, ten (of the 140) had not wanted to know the result subsequently. Nine of these ten were HIV infected suggesting an awareness of their probable status. This accords with the work of Kelly et al¹⁴ who found 69% of the participants attending voluntary HIV testing in Lusaka correctly predicted their result.

As 85% of the HIV infected mothers had knowledge of the risk of transmission of HIV through breast-feeding, we can assume that they did receive information on infant feeding and HIV. Despite this, breast-feeding continued to be almost universal in the HIV infected group. However, HIV infected mothers intended to breast feed for a shorter period than HIV uninfected mothers, but there was a discrepancy between mothers stated feeding intention and their actual practice, as almost all had continued breast feeding. Possible reasons for this include; deep rooted traditional beliefs, health education messages that breast feeding is best, fear of indirect disclosure of HIV status if seen to replacement feed, the stigmatisation of a non breastfeeding mother, and the high cost of replacement feeds. These results indicate that most mothers appeared to understand the increased risk of MTCT through breast-feeding, and on questioning suggest they would reduce the total duration of breast-feeding. Despite this we did not find evidence that this was the case indicating that other factors may carry greater weight in their decision making process.

Only babies aged four months or younger were exclusively breast fed. HIV infected mothers introduced both alternative fluids and complementary foods earlier than HIV uninfected mothers and often before two months. In Zambia, the introduction of complementary foods for the infants of non- HIV infected mothers is recommended from four to six months¹⁵, in line with contemporary WHO recommendations on continuing exclusive breast feeding for six months¹⁶. This goal, however, is rarely

achieved.

Recently it has been found that babies given early mixed feeds may be at a greater risk of acquiring HIV than those breast fed exclusively¹⁷, with infants up to 3 months of age given both breast milk and other foods having significantly greater MTCT of HIV (24.1%) than exclusively breast fed, non breast fed (14.6%) and formula fed infants(18.8%). At 15 months of age the cumulative probability of HIV infection remained lower¹⁸. Therefore, it may be that extended exclusive breast-feeding is a more practical, feasible and acceptable option for mothers with HIV in low resource settings. It also has the potential advantage of reducing the stigmatisation of HIV infected mothers. Results from other studies will help in determining policy change following these findings.

Replacement feeds (commercial milk formula and animals milk) were being used by less than 27% of mothers. Commercial infant formula was the most popular although a greater proportion of HIV infected mothers modified cows milk. Cow's milk fed to infants below six months should be modified by adding water and sugar¹⁹, however, no mother correctly modified this breast milk substitute. Four mothers added salt, a particularly dangerous practice for infants. It is possible that mothers are confusing this with the home preparation of oral rehydration salt sugar solutions (SSS). This finding indicates that if modified cows milk is recommended to mothers, specific practical training is needed.

The well infants of HIV infected mothers had poorer growth compared with those whose mothers were not infected (Table 2). What mechanisms were likely to be causing this growth deficit which worsened through the first year of life? We have demonstrated these infants had an earlier introduction of fluids and solids which is known to increase exposure to enteric pathogens, increase the risk of gastro-enteritis, and is associated with poorer nutritional status⁵. We suggest this is likely to be the major factor, although the study was unable to test this. Other factors may also be important. The frequency of complementary feeds given to infants over 6 months of age was low, with 55% of infants receiving two or less feeds daily, but this was similar in both groups. This suggests a potential strategy by which nutrition in infants over 6 months could be improved, as this is less than the recommendation of at least three feeds daily for infants who are still being breast fed, or five feeds if not breast fed¹⁵ to meet growth requirements.

Could infant HIV infection have caused the differences seen? Although the HIV status of the infants was not known, the number of symptomatic HIV infected infants in the study would have been small as the expected proportion of infants with MTCT of HIV is 39%⁷, and of these 26% would be symptomatic by one year of life²⁰. We therefore, would have expected less than ten percent of infants of HIV infected mothers to be symptomatic from HIV at the time of the study. The ability of sick HIV infected mothers to breast feed their infant could have also been influenced by their own poor health but we selected mothers who were not ill.

This study was to determine the feeding practices of HIV infected mothers and their infants and not to test the cause of the poorer nutritional status observed. We should therefore recognise the limitations of the study design, before interpreting its results.

Recruited mothers were from prospective HIV research studies who voluntarily attended outpatient follow up. However, socio-demographic statistics in the group were comparable to the local urban Zambian population apart from having a slightly higher educational attainment²¹. This difference would not however be expected to be associated with poorer infant feeding practice and mothers would have been expected to have been more responsive to feeding advice. Recruited mothers were aware that the study was examining feeding practice and HIV, which could have influenced their responses, and the research nurse was usually aware of the mothers' HIV status, which could have been another potential source of bias. Mothers receive health messages from a variety of sources including the clinic. In this study we have demonstrated the sum effect of these sources of information and advice on HIV infected mothers feeding practice.

Conclusion

Zambian mothers with HIV infection receiving advice on infant feeding appeared aware of the increased risk of HIV infection through breast-feeding. Although none had stopped breast-feeding because of their HIV status, these mothers introduced complementary feeds earlier than HIV uninfected mothers, a potential cause for the poorer infant growth documented. We have also identified potential for confusion through the apparently contradictory messages of either exclusively breast feeding for six months, or not breast feeding and using breast milk substitutes. This study also found possible confusion of advice with other health information messages, as no mother appropriately modified home prepared breast milk substitutes. Paradoxically these results suggest that HIV infected mothers may be changing their feeding practices to ones which put their infants at greater risk of both HIV transmission and non-HIV related morbidity.

We would, therefore, caution that when international advice on infant feeding practice for HIV infected mothers is adapted locally, the change in actual feeding practice resulting from this should be assessed. Asking non pregnant women how they would feed their infants if pregnant and HIV infected, has in this study been demonstrated to be no substitute for assessing the operational feasibility and acceptability of feeding options in individual setting.

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TABLE 1. MATERNAL SOCIO-DEMOGRAPHIC DATA

Characteristic	HIV infected mothers N = 55	HIV uninfected mothers N = 85	p- value
Mean age - years	27.4	25.3	0.04
Marital status:			0.09
Married	74.5%	85.8%	
Not married	25.5%	14.2%	
Mean no. live children	2.35	2.26	0.77
Education(mean)-years	8.2	8.6	0.43
None	3.6%	2.6%	
Primary	43.6%	38.8%	
Secondary	49.1%	52.9%	
Tertiary	3.6%	5.8%	
Employment:			0.55
Employed	25.5%	21.2%	
Unemployed	74.5%	78.8%	
Possession score	2.1	2.53	0.2

TABLE 2: WEIGHT OF INFANTS BY MATERNAL HIV STATUS

Age (months)	HIV Infected Mother			HIV Uninfected Mother		
	No.	Mean	WAZ *	No.	Mean	WAZ *
2-3	15	5.49	0.68	19	5.52	0.88
4-5	11	6.09	-0.39	24	7.1	0.69
6-8	13	7.7	-0.06	21	8.36	0.74
9-12	16	8.58	-1.1	21	9.28	-0.64
N	55		-0.22 †	85		0.41 †

*Weight for age Z score (NCHS), †p < 0.05

TABLE 3. REPLACEMENT FEEDS USED BY MOTHERS ACCORDING TO HIV STATUS

Breast milk substitute	HIV Infected Mothers N = 55 (%)	HIV Uninfected Mothers N = 85 (%)
None	39 (70)	65 (76)
Cow's milk	8* (15)	5 † (6)
Commercial	8 (15)	15 (18)

Chi square 3.03 p = 0.22; *3 added salt, 1 added sugar; † 1 added salt, 1 added sugar