

## **Factors influencing HIV-positive mothers to choose to use the flash-heat process of heating breast milk in South Africa.**

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### **Abstract**

The objective of this cross-sectional study was to establish factors influencing HIV-positive mothers to choose to use the Flash-heat (FH) method to feed milk to new-born babies in South Africa. A total of 70 HIV-positive mothers were selected using purposive sampling methods. Backward stepwise binary logistic regression analysis was carried out to establish their willingness to use the FH feeding method. More than half (54.3%) the mothers were not breastfeeding their infant and among them a third (31.6%) mentioned that breastfeeding was difficult and this was given as the reason for not breastfeeding. Most of the mothers (74.3%) reported that they would use the FH method at home as a feeding method for their infants, and most (83%) of the mothers reported that they were willing to heat-treat their expressed breast milk (EBM) in a pot on a Primus stove until the water boils-as required by the FH guideline. The results showed that mothers who reported that they were willing to heat EBM at home were 24 times more likely to adopt FH compared to those who were not willing to heat EBM at home (OR=24.23, p=0.001). Also, those mothers who reported that they were willing to express milk for 4 months had 22 times more chance of adopting FH than mothers who reported that they were not willing to express for 4 months (OR=21.60, p=0.016). The findings suggest that HIV-positive mothers in a public-health facility would adopt flash-heating as an alternative infant-feeding method at home.

**Keywords:** HIV, Flash-heat, Breast milk.

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### **Introduction**

The HIV prevalence rate in the South African general population has shown a steady increase. In 2008, 10.6% of the population were HIV positive and that increased to 12.2% in 2012 [1]. The national antenatal HIV prevalence rate was 29.5% in 2012 and mother-to-child transmission rate was 2.7% in 2011 [1,2]. About a decade ago, Antiretroviral Therapy (ART) was only provided during the intra uterine and intra partum period-therefore not providing any protection during the breastfeeding period [3]. More recently, ART is provided at the first antenatal visit and until one week after cessation of breastfeeding-resulting in reducing infants born to HIV positive mothers who contract HIV [4]. However, this still leaves 2.8% of infants unprotected [5]. HIV-positive pregnant women and new mothers in South Africa are still not sure which infant feeding method is best for their new babies [6]. Another study revealed that only 25% of mothers in South Africa practise exclusive breastfeeding, while 75% use formula for feeds during the first six months [7]. The need for a guideline promoting alternative infant feeding techniques for HIV-positive mothers, was intensified by literature suggesting

that 66% of HIV-positive mothers in South Africa still make inappropriate infant feeding choices [8]. Few HIV-positive women are aware of the strategies that could prevent them from infecting their children-leaving many with the dilemma of whether to breastfeed or bottle-feed their infants [9].

Much of the guidance literature on infant feeding in the context of HIV has led to confusion regarding the optimal feeding choice. In 2006, the World Health Organization (WHO) recommended that mothers exclusively breastfeed their infants up to six months and then rapidly wean them off the breast-as a method of Preventing Mother to Child Transmission (PMTCT) of HIV. Thereafter, they were advised to give replacement feeds such as soft foods and formula milk. It should be noted that there was an emphasis on the dangers of mixed feeding and that supplementary foods should only be introduced when they were "acceptable, feasible, affordable, sustainable and safe" [10]. The updated 2013 national PMTCT guidelines call for exclusive breastfeeding up to six months as one of the strategies to prevent mother-to-child transmission [3]. The Flash-heat (FH) technique (also termed flash-heating) is a process of heating Expressed Breast Milk (EBM) from HIV-positive mothers, in order to kill HIV [11]. The FH technique

entails manually expressing 75-150 ml of breast milk into a peanut butter, jam, or honey jar. The jar is placed in a simple aluminium pan containing around two finger widths of water above the level of the milk. The water and the jar of milk are heated together over high heat. When the water reaches a visible rolling boil, the milk is immediately removed from the water and allowed to cool. The infant may then be fed with a cup or spoon [11]. Exclusive breastfeeding for 6 months while on ART is promoted as part of the national PMTCT strategy. The flash-heat technique has not been adopted as an alternative method of reducing mother-to-child transmission.

The FH technique is a form of pasteurisation where milk is heated to high temperatures to rid it of harmful bacteria. In this setting, the technique was used to rid the milk of HIV. Flash-heating will heat milk over a short period of time—a method called High Temperature Short Time (HTST). This method performs best in killing micro-organisms while retaining the nutritional value of the milk [12]. Studies have evaluated the safety and effectiveness of this method and pilot safety studies found that the FH method could inactivate HIV in spiked breast-milk samples from healthy mothers, while retaining most of the milk's nutritional and anti-microbial properties [11]. The FH technique has been recommended by WHO as an alternative to traditional infant feeding, but this option has largely gone unnoticed [11]. Viral analysis of the flash-heated and unheated breast milk found that cell-free HIV had been inactivated in all of the heated samples [12]. This, unlike some of the other recommendations of infant feeding the WHO has suggested, could be a practice that women undertake in underserved communities. It is a cheaper option as the resources required are already found in households. The objective of this paper was to establish factors influencing HIV-positive mothers in terms of choosing FH as a process of heating expressed breast milk, prior to feeding infants exposed to HIV in South Africa.

## Material and Methods

### *Setting of study*

This was a descriptive cross-sectional study conducted during June 2011 in two postnatal wards at Tembisa Hospital, which is a regional hospital located in the Northern Service Delivery Region of Ekurhuleni, South Africa. The two wards admitted mothers and infants who were delivered either via Spontaneous Vertex Delivery (SVD) or via Caesarean Section (C/S)-for observation and management of possible puerperal complications prior to discharge. The daily number of SVD and C/S varied between 20 and 30. The two postnatal wards had four units of eight beds which were occupied by 32 patients each when at full capacity. Ward staff included registered nurses and midwives, a family planning counsellor, an obstetrician, dietician, administration staff, and cleaners. Antenatal women were given health education talks (at every visit as a group)-which include two main methods of infant feeding: exclusive formula feeding or exclusive breastfeeding. Tembisa Hospital provided formula for infants in the postnatal

wards as part of the national PMTCT strategy [13]. On discharge from the postnatal ward, a family planning nurse provided health education on contraception and infant feeding: primarily breastfeeding and its contraceptive qualities if done exclusively.

### *Population and sample*

Based on the information on SVD or C/S in the health facilities, the population size for the study was 140 for a week. The minimum sample size for the study was calculated to be 103 based on a 95% confidence level and a 5% confidence interval. Therefore we approached 110 mothers to participate in the study, but only 86 participants agreed. Quantitative data were collected from seventy (70) participants, and sixteen (16) were excluded from the study for being under-age. Purposive, sampling was used to obtain the sample size. Participants who were under the age of 18 years (need consent letter from parents), HIV negative, and not living in the Tembisa hospital catchment area, were excluded from the study. All the HIV-positive mothers were approached for participation in the study after the health education talks were given. The researcher had access to all the women who were one day post-delivery, after they congregated in one area for the health education talk-prior to discharge. Specific access to HIV-positive women was allowed, as these women were escorted into a room for PMTCT education and medication. Women who delivered via SVD were discharged from the postnatal ward on day two (2), and those who delivered via C/S after approximately four (4) days. Because of the short admission time of women who delivered via SVD, they were recruited shortly after admission to the postnatal ward-after all vitals were stable and ward processes completed.

### *Data collection*

Researcher-administered questionnaires were used to gather data for the study. The questionnaire consisted of three sections. Section 1 contained socio-demographic information such as age, level of education, marital status, ethnic group, occupation, tenancy, receipt of support grant, access to water and electricity in the home and number of children. Section 2 included information on disclosure of HIV status and the desire to breastfeed even while HIV-positive. The last section asked questions regarding the FH technique. This part of the questionnaire collected information firstly on whether the mothers understood the technique. If the answer to this question was 'no' the researcher would discuss the technique again to ensure efficient comprehension prior to the commencing with the next section. Information was collected on all the required stages for doing the FH technique correctly from expressing manually into a glass jar, heat treating the breast milk, cooling the milk and spoon-feeding, exclusively for four months. Reason for choosing exclusively for four months was that South Africa's exclusive breastfeeding rates are 8%, which is low [14], and four months seemed a more likely time period to assess mothers' willingness to express and exclusively feed their infants on breast milk. Additional

questions such as whether they believed that the FH method prevented PMTCT of HIV, and what feeding vessel they preferred to use when giving their babies flash-heated milk were asked. The last three questions focused on whether the mothers were willing to use the FH technique under a number of different circumstances, and if they believed that there was anyone at home that would prevent them using it. Lastly whether they believed they had the skills required to use the technique at home after it was demonstrated to them. A pilot study was conducted over a period of two days to ascertain whether the question path and time taken to complete the questionnaires were acceptable for the participants and minor amendments to the questions were made.

### Data-analysis process

Data were captured using a Microsoft Excel 2003 spreadsheet and imported to SPSS18.0.1 Windows version for analysis. All the variables were summarised using descriptive summary measures: expressed as mean (standard deviation) for continuous variables and percent for categorical variables. Chi-squared/Fisher exact tests, wherever necessary, were carried out to find association between two categorical variables. Backward stepwise binary logistic regression analysis was carried out to establish the mothers willingness to adopt FH. P-values were reported to three decimal places-with values less than 0.001 being reported as <0.001. Values less than 0.05 were considered statistically significant.

### Ethical consideration

Ethical clearance to conduct the study was granted by the University of South Africa's Health Studies Research Ethics Committee. Approval to conduct the study was obtained from Chief Executive Officer of Tembisa Hospital. Informed consent was signed by all study participants. Participation in the study was voluntary, and participants could withdraw if they so desired, without any penalty. Anonymity and confidentiality were maintained at all times.

### Results

Table 1 summarises socio-demographic characteristics of the mothers. More than half of the mothers (54.3%) were 36 years or older, most (91.4%) had high school education, 77.1% were single, and 77.1% were unemployed. Almost half (45.7%) of mothers were living with their relatives. Regarding financial support, almost half the mothers (44.3%) received financial support from government. Some 40% of the mothers did not have access to running water in the home and 14% did not have access to electricity. Table 2 shows the opinions on the adaptation of the feeding technique. More than half (54.3%) the mothers were not breastfeeding their infant and among them about a third (31.6%) mentioned that breastfeeding was difficult, and this was given as the reason for not breastfeeding. Most of the mothers (74.3%) reported that they were willing to use the FH method at home, and among them 83% reported that they were willing to heat treat their EBM in a pot on a

Primus stove until the water boils-as required by the FH guideline.

**Table 1.** Socio-demographic information of the participants (n=70).

Variables	Frequency	Percent
<b>Age group</b>		
≤ 20 yrs	5	7.1
21-25 yrs	15	21.4
26-30 yrs	9	12.9
31-35 yrs	3	4.3
36-40 yrs	22	31.4
41-45 yrs	16	22.9
Average age (SD)	33.07 (8.39) yrs	-
<b>Level of education</b>		
<Std 6	2	2.9
Std 6-7	13	18.6
Std 8-9	27	38.6
Std 10	24	34.3
College	3	4.3
Higher	1	1.4
<b>Marital status</b>		
Single	54	77.1
Married	16	22.9
<b>Employment status</b>		
Employed	16	22.9
Unemployed	54	77.1
Living with	-	-
Boyfriend	19	27.1
Husband	13	18.6
Relatives	32	45.7
Alone	6	8.6
<b>Received financial support from government</b>		
Yes	31	44.3
No	39	55.7
<b>Accessing running water in the home</b>		
No	28	40
Yes	42	60
<b>Have electricity</b>		
No	10	14.3

Yes	60	85.7
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Results also indicated that about a quarter of these women (23.1%) highlighted that someone at home would prevent them from using the FH method.

**Table 2.** Opinions on adaptation of FH technique at home among HIV + mothers (n=70).

Variables	Frequency	Percent
<b>Currently breastfeeding</b>		
No	38	54.3
Yes	32	45.7
<b>Reasons for not breastfeeding (n=38)</b>		
Painful breasts	1	2.9
Relatives do not want me to breastfeed	1	2.9
Work	12	32.4
Twins	3	8.8
HIV positive	1	2.9
Worried will infect baby	1	2.9
Try formula	3	8.8
It looks difficult	13	35.4
Got formula from clinic	1	2.9
<b>Would use flash-heat method at home? (n=70)</b>		
Yes	52	74.3
No	11	15.7
Not sure	7	10
<b>Willing to heat treat their expressed breast milk? (n=52)</b>		
Yes	43	82.9
No	9	17.1
<b>Would anyone prevent you from using flash-heat at home? (n=52)</b>		
Yes	12	23.1
No	39	75
Not sure	1	1.9

Chi-squared test of association was used to find the association between use of FH technique and socio-demographic variables (Table 3). None of the socio-demographic variables were found to be significantly associated with the use of FH method ( $p>0.05$ ). It was found that there were significant associations between using the FH method and the belief the FH method can prevent transmission, heating EBM at home, expressing for four (4) months, and can easily heat-treat the milk ( $p<0.05$ ) (Table 4). Backward stepwise binary logistic regression analysis was carried out to find the willingness to use FH method. Initially those variables had significant association with the use of FH method, were included in the regression

analysis. Then those variables that did not contribute significantly to the overall model were removed from the model. The final step of the analysis results are shown in Table 5.

**Table 3.** Association between socio-demographic variables and willingness to adopt FH.

Variables	Willingness to adopt FH among HIV+ mothers		Chi-squared value	P-value
	Yes	No		
<b>Age (in years)</b>				
18-20	4	1	9.141	0.116 <sup>*</sup>
20-25	11	4		
25-30	9	0		
30-35	3	0		
35-40	12	10		
40-45	13	3		
<b>Marital status</b>				
Single	40	14	0.006	0.941
Married	12	4		
<b>Educational level</b>				
< Std 6	1	1	8.117	0.123 <sup>*</sup>
Std 6-7	11	2		
Std 8-9	19	8		
Std 10	20	4		
College	1	2		
Higher	0	1		
<b>Work</b>				
No	41	13	0.333	0.564
Yes	11	5		
<b>Live with whom</b>				
Alone	6	0	6.172	0.112 <sup>*</sup>
Relatives	20	12		
Husband	9	4		
Boyfriend	17	2		
<b>Running water in the home</b>				
No	20	8	0.199	0.655
Yes	32	10		
<b>Have electricity</b>				
No	6	4	1.246	0.264
Yes	46	14		
<b>Received child-care grant from SA government</b>				

No	27	12	1.178	0.278
Yes	25	6		
*Fishers exact test				

The result highlighted that those mothers who reported that they could heat EBM at home were 24 times more likely to use

FH method compared to those who could not heat EBM at home (OR=24.23, p=0.001). Also those mothers who reported that they could express milk for 4 months had 22 times more chances of using FH method than mothers who reported that they could not express for 4 months (OR=21.60, p=0.016).

**Table 4.** Association between adopting FH and feeding practice and perceptions towards FH.

Variables	Willingness to adopt FH among HIV+ mothers		Chi-squared value	P-value
	Yes	No		
Currently breastfeeding	No	25	3.141	0.076
	Yes	27		
Believe FH prevents transmission	No	43	5.355	0.021
	Yes	9		
Heat EBM at home	No	2	31.13	<0.001
	Yes	50		
Express for 4 months	No	1	32.979	<0.001
	Yes	51		
Can you easily heat treat the milk?	No	2	25.171	<0.001
	Yes	50		
Mother with a positive reaction to FH	No	37	0.297	0.586
	Yes	15		

**Table 5.** Stepwise logistic regression analysis output.

Independent variables <sup>a</sup>	B	Wald	p-value	Odds Ratio (OR)	95% C.I. for OR	
					Lower	Upper
Heat EBM at home	3.188	10.334	0.001	24.233	3.47	169.221
Express for months	4 3.073	5.773	0.016	21.596	1.761	264.79
Constant	-2.574	24.031	<0.001	0.076	-	-

<sup>a</sup>Variable(s) entered on step 1: Believe FH prevents transmission, Heat EBM at home, Express for 4 months, Can easily heat-treat the milk.

## Discussion

The present study investigates the factors influencing HIV positive mothers in terms of choosing to use the FH process of heating breast milk at home. More than half the mothers (51%) in the present study did not breastfeed or intend to breastfeed their current infant. Furthermore, about a third thought that it looked difficult to breastfeed. Since the FH technique involves EBM into a glass jar, the mothers' perceptions of the difficulties of breastfeeding itself do not have any bearing on the adoption of the proposed technique. Breastfeeding and expressing milk are two different activities-one involving

positioning of an infant, and the other not. Positioning and latching of the infant for breastfeeding and the perceived difficulties thereof may have an influence on the entire breastfeeding experience. A South African study found that breastfeeding is a practice that 83% of mothers in South Africa adopt after the births of their infants [9]. The significance of this behaviour is not well understood-but the desire to breastfeed may be related to specific cultural influences.

The present study investigated the variables that could predict the willingness to adopt the FH infant feeding technique as a process of heating breast milk among HIV-positive mothers, prior to feeding their infants, in order to increase their chances of HIV-free survival. The two variables found to predict the use of the FH method were 'Express for four months' and 'Heat Expressed Breast milk'. These two variables explain two of the eight principles in Backer's (2001) Theory of Individual and Group Change [15]. 'Express for four months' indicates the verbal commitment the mothers made to manually expressing their breast milk at home for a period of four months, and the latter variable indicates their ability to effectively use the FH method. The mothers are required to express a minimum of half a cup of breast milk by hand and inactivate the HIV from the breast milk by heat treating it according to recommendations. Most of the mothers indicated that they were willing to try these requirements at home-

suggesting that they have a high sense of “self-efficacy” in using this feeding technique. However, this finding is contrary to other South African studies which concluded that HIV-positive mothers often have low levels of self-efficacy in relation to infant feeding [16]. The distinction between internal and external attributions is an important one, in that how we attribute our personal successes and failures has been shown to be related not only to our behaviour, but also to our self-esteem and self-efficacy for different tasks [17]. Self-efficacy is one’s confidence in the ability to take action and persist in that action. It is perhaps the single most important factor in promoting changes in behaviour [18].

Most mothers in this study reported that they were willing to use the FH method under several different circumstances at home, which may suggest if given the opportunity to explore this technique in detail more mothers could opt to use it. Most of the women felt that no one at home would prevent them from using the method. This indicates that the mothers have an influence on or were willing to make decisions on their infants’ feeding methods soon after being counselled and supported with demonstrations of the technique-and did not leave that to relatives or health professionals. In this context, their decision or willingness to use the technique is favourable for HIV-free infant growth and development. Given that the FH technique was discussed to ensure that mothers were confident of the technique, may suggest that counselling on infant feeding go a step further than merely providing various options. This is consistent with the 2010 guidelines on HIV and infant feeding, which suggested that counselling by health professionals be more “directive”-i.e. making a recommendation for or against breastfeeding as opposed to just presenting different options without any opinion [10]. These approaches to counselling may have a significant role to play in shaping feeding behaviours.

This study found that in the postnatal wards, mothers and infants were sometimes separated by nurses, in support of mothers resting after delivery. This is contrary to the recommended WHO steps of breastfeeding-to promote exclusive breastfeeding in mothers who chose to breastfeed. WHO maintains that babies should be encouraged to breastfeed within the first half-hour of life [19]. Furthermore, given that a large percentage of mothers were not breastfeeding their babies because it ‘looked difficult’-suggests they were not getting optimal counselling and support in terms of breastfeeding.

### Limitations

The study is limited by its cross-sectional study design. The study was conducted in an urban setting-Tembisa Hospital in Gauteng Province-and therefore findings could not be generalised to other hospitals in other provinces. Also, the purposive sampling technique used to obtain its homogenous sample could have resulted in the small sample size. Therefore, the results should be interpreted with caution.

### Conclusion

A large number of HIV-positive mothers did not breastfeed their children. But most of the mothers are willing to use FH method as a process of heating their expressed breast milk. It is therefore crucial that nurses use the “benefit-motivation” principle when educating HIV-positive mothers on alternative infant feeding techniques-such as expressing breast milk and flash-heating it prior to feeding.

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