Factors affecting mothers' choice of infant feeding method

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Preface and acknowledgements

After three years I have at last finished my mini dissertation. It may have taken long, but it was worth every minute of my time. Sometimes I did wonder what made me decide to do my Masters degree. At this moment I am very happy that I did decide to do it and I am not regretting it at all.

Firstly it is important that you understand the reason why I chose this specific subject. I started working at Lower Umfolozi District War Memorial Hospital in 2007. The services at the hospital include maternity services, obstetrics and gynecology services and neonatal services. At that time they were busy starting to get the hospital ready for the Baby-friendly Hospital Initiative re-assessment. As a Dietician I was very involved with training the staff on breastfeeding. This made me develop a passion for breastfeeding and also wanting to promote breastfeeding as much as possible. It made me decide to do research at the hospital concerning the reason why women choose their infant feeding method that they use.

It was really challenging to collect information because of the communication gap that there existed between me and the patients. The majority of the patients that visit the hospital are Zulu speaking. I had to use staff members to help me get my questionnaires answered. That proved a challenge in the sense that they had their own work to do and I had to work around that. The staff members were really a help in collecting information. Without them I would not have been able to finish this research study. I want to thank the following people for making the collecting of information possible: Zama Mlondo, Nombuso Ngema, Sandile Nkosi and Sr. Mabaso. I am also very grateful to all the mothers that participated in this study.

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The article format has been selected for this article. I planned, executed and wrote the article with guidance from my supervisors that are also the co-authors.

The article will be submitted to Health SA for publication. The co-authors hereby grant permission that the manuscript can be submitted for degree purposes:

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Abstract

The benefits of breastfeeding are well known. It has been shown that HIV is transmitted through breast milk. The HIV epidemic is threatening exclusive breastfeeding in South Africa. It is important that mothers make the right infant feeding choice. There are three basic infant feeding methods available for HIV infected mothers namely; breastfeeding, replacement feeding or formula feeding and heat treatment of breast milk. There are many risk factors for the transmission of HIV through breast milk. Exclusive breastfeeding may reduce the risk of mother-to-child-transmission, compared with mixed feeding. This can only take place when breastfeeding is done safely and not mixed with other food or drinks. There are many factors that influence a mother's decision to breastfeed, for example personal, social, cultural factors, facilities, environmental factors, knowledge about breastfeeding, mass media and friends. There are also many sources of information about infant feeding methods.

The aim of this study was to determine which factors influence the decision on the early infant feeding choice of women who delivered at the Lower Umfolozi District War Memorial Hospital in Empangeni, Kwazulu-Natal. This may help to understand what factors health professionals should focus on in promoting appropriate infant feeding methods. A structured questionnaire was completed by a 100 women and focus group discussions were held with 22 women who delivered at the Lower Umfolozi District War Memorial Hospital. Most of the mothers (72%) did choose breastfeeding, and 58% of these mothers intended to breastfeed for only six months. The majority of the women (97%) received counseling about their infant feeding method, mostly from a health care worker at the clinic. One-third of the women (33%) were influenced by health care professionals on deciding on their infant feeding method and 44% of the participants indicated that no-one influenced them and that they decided themselves. In the focus group discussions the fear of transmission of HIV through breast milk was stated as an important reason why mothers should choose replacement feeding. In conclusion the most important results are that significantly more

HIV-infected mothers chose replacement feeding as infant feeding method, and mothers who chose breastfeeding were significantly older than mothers who selected replacement feeding and they made their infant feeding decision significantly earlier than those who chose replacement feeding. According to the focus group discussion results the communities also felt that the HIV-infected mothers should not breastfeed their infants due to the fact that the virus can be transmitted through breast milk.

Health professionals should still provide all the necessary information about exclusive breastfeeding for the first six months, even where the prevalence of HIV is high. In most of these areas replacement feeding will not be acceptable, feasible, affordable, sustainable and safe, due to lack of safe water, sanitation and the poor socio-economic status of these people. The dangers of mixed feeding should be emphasized.

Most of the women in this study received information from health care workers and family. It is important that family members are included when information is given to women of child-bearing age. Health care workers need appropriate training to ensure that they give the right messages about safe infant feeding to the mothers.

[Keywords: HIV, mother-to-child transmission, breastfeeding, formula feeding, heat treatment of breast milk, risk factors, infant]

Opsomming

Die voordele van borsvoeding is al om bekend. Dit is bewys dat MIV deur borsmelk oorgedra kan word. Alleenlike borsvoeding in Suid Afrika word bedreig deur die MIV epidemie. Dit is belangrik dat ma's die regte besluite neem ten opsigte van hulle babavoedings keuse. Daar is drie basiese voedings keuses beskikbaar vir MIV-positiewe moeders, nl. borsvoeding, kunsvoeding of die hitte-behandeling van borsmelk. Daar is baie faktore wat bydrae tot die oordra van MIV deur borsmelk. Alleenlike borsvoeding kan help om die risiko vir die oordrag van die virus na die baba te verminder. Dit kan net plaasvind wanneer borsvoeding veilig gedoen word en geen ander voedsel of vloeistowwe gegee word nie. Daar is baie faktore wat 'n moeder beïnvloed om borsvoeding te kies. Voorbeelde hiervan is persoonlike, sosiale, kulturele, fasiliteit en omgewings faktore, kennis oor borsvoeding, massa media en vriende. Daar is ook baie bronne van inligting beskikbaar oor babavoedings metodes.

Die doel van die studie was om vas te stel watter faktore beïnvloed dames wat geboorte gee in die LUDWM Hospitaal in Empangeni, Kwazulu-Natal met hulle keuse van hulle vroëe babavoedings metode. Dit sal help om te verstaan watter faktore gesondheidswerkers op moet fokus wanneer hulle die gepaste voedings metodes bevorder. 'n Gestruktureerde vraelys was voltooi deur 'n 100 vrouens en fokus groep besprekings was gehou met 22 vrouens wat almal geboorte geskenk het by die LUDWM Hospitaal. Meeste van die dames (72%) het borsvoeding gekies, maar net 58% het voorgeneem om te borsvoed vir ten minste ses maande. Die meeste van die dames (97%) het inligting ontvang ten opsigte van hulle babavoedings keuse van die gesondheidswerkers by die klinieke. Een derde van die dames (33%) was beïnvloed deur die gesondheiswerkers toe hulle besluit het oor hulle babavoedings metode en 44% van die deelnemers het aangedui dat niemand hulle beïnvloed het ten opsigte van hulle keuse nie.

In die fokus groep besprekings het dit aan die lig gekom dat die vrees van die oordrag van MIV deur borsmelk een van die groot redes was hoekom sommige moeders kunsvoeding kies. Die belangrikste resultate is dat 'n bedeidende meer HIV-geinfekteerde moeders kunsvoeding gekies het as babavoedings metode en dat moeders wat borsvoeding gekies het bedeindend ouers was as die wat kunsvoeding gekies het en hulle het hulle voedings keuse bedeidend vroeër gemaak as die wat kunsvoeding gekies het. Ooreenstemming met die fokus groep besprekings resultate het die gemeenskappe gevoel dat MIV-geïnfekteerde moeders nie moet borsvoed nie as gevolg van die feit dat die virus deur borsmelk oorgedra kan word.

Gesondheidswerkers moet nogsteeds alle moontlike inligting verskaf oor alleenlike borsvoeding vir die eerste 6 maande al is die prevalensie van MIV baie hoog. In die meeste van hierdie areas sal kunsvoeding nie gepas wees nie omdat dit nie aanvaarbaar, uitvoerbaar, bekostigbaar, aanhoubaar en veilig is nie, omdat daar 'n tekort aan skoon water en sanitasie is en asook die slegte sosio-ekonomiese status van hierdie gemeenskap. Die gevare van gemengde voeding moet ook beklemtoon word.

Die meeste van die dames in hierdie studie het inligitng verkry van gesondheidswerkers en van hulle familie. Dit is belangrik dat die familielede ook betrek word wanneer inligting gegee word vir dames. Gesondheiswerkers het geskikte opleiding nodig om te verseker dat hulle die regte boodskap aan dames oordra oor veilige babavoeding.

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CHAPTER 1: INTRODUCTION

Infant and young child feeding is very important. Many children under 5 years die from malnutrition around the world (WHO, 2002). This means that many infants do not receive the right nutrition to grow up healthy. Mixed feeding is a major problem in South Africa when it comes to breastfeeding (Anon, 2002; Anon, 2004), due to the fact that exclusive breastfeeding is not being practiced for the first 6 months of the infants life. Exclusive breastfeeding is defined as the giving of breast milk only without the addition of any foods or liquids, not even water except the drops and syrup consisting of vitamins, mineral supplements or medicines. Mixed feeding is defined as feeding both breast milk and other foods or drinks (WHO, 2003).

Human Immunodeficiency Virus (HIV) and the Acquired Immune Deficiency Syndrome (AIDS) pandemic are affecting mothers and children, especially in sub-Saharan Africa (Latham & Preble, 2000). The role of breastfeeding in HIV-transmission has been exaggerated by health agencies (Latham & Preble, 2000). This causes mothers to choose the wrong feeding method and in the end it does not give their infants the best start in life. Issuing of free formula has not made it a safer feeding method. Morbidity and mortality are very likely to increase due to the formula feeding because of other infectious diseases (Coutsoudis *et al.*, 2002). Many of the countries in Africa do not have the resources available to successfully formula feed their infants. Even though breastfeeding is the best choice, the role of formula feeding must be acknowledged when it comes to the prevention of mother-to-child transmission. If women are given appropriate nutrition counseling and they have access to clean water and have an adequate supply of formula, formula feeding would not be harmful (Becquet *et al.*, 2007). Safer breastfeeding practices can help to reduce the risk of HIV transmission, especially the promotion of exclusive breastfeeding (Coutsoudis, 2005; Piwoz *et al.*, 2007).

It is important that health professionals understand the factors that affects the mothers decision with regards to her infant feeding method. This will help to understand the areas to focus on in breastfeeding promotion. It is also important that health professionals' focus on exclusive breastfeeding and that the health professionals do not make it a statement that is used when mothers are HIV-infected. Exclusive breastfeeding should be a general term that is used universally when talking about breastfeeding, so that health professionals can ensure that all infants get the best start in life, by receiving the benefits of breastfeeding.

Kwazulu-Natal was chosen as a setting because the prevalence of HIV infection is very high in this province (Anon, 2007). This would give a good indication if mothers' choose their infant feeding method due to the fact that they are HIV-positive. It would probably also help to identify other factors that can affect an HIV-uninfected mothers' decision on feeding method in a setting where many mothers use formula as an infant feeding method. The aim of this study was to determine how the decision was made on the infant feeding choice and the reasons for the infant feeding choice.

CHAPTER 2: LITERATURE STUDY

2.1 Introduction

It is common knowledge that breastfeeding is the best feeding method for infants. The benefits of breastfeeding for new-born infants are well documented (WHO, 2000). When we consider the risk factors for perinatal transmission of HIV, studies have shown that high maternal plasma viral load (John *et al.*, 2001; Fawzi *et al.*, 2002), low maternal CD4+ lymphocytes cell count (Coutsoudis *et al.*, 2004; Ekpini *et al.*, 1997), vaginal birth and breastfeeding are important (Stringer *et al.*, 2008). In developed countries like United States of America (USA) and Europe, the paediatric Acquired Immune Deficiency Syndrome (AIDS) epidemic has basically been eradicated. This was ensured by high service coverage and by targeting each risk factor systematically. In developing countries the situation is much different (Mofenson, 2003). In developing countries the risk factors for transmission are basically the same, but there are fewer options available for mothers. Some women do not even have access to basic antenatal services, anti-retroviral regimens, elective Caesarean or a safe alternative to breastfeeding (Stringer *et al.*, 2008).

Due to the fact that breastfeeding remains an important route of transmission, it is important that other feeding methods are considered. The benefits of replacement feeding in Africa are not that clear because of the competing co-morbidities (Stringer *et al.*, 2008) such as malnutrition, diarrhea and respiratory tract infection (Becquet *et al.*, 2007).

2.2 Benefits of breastfeeding

The benefits of breastfeeding were reviewed by Trahms (2000) and Pretorius (1989). Breast milk is nutritionally superior to any alternative. It is bacteriologically safe and always fresh and it contains a variety of anti-infectious factors and immune cells. Of all the infant food, breast milk is the least

allergenic (Trahms, 2000). The incidence of eczema and gastrointestinal allergies are lower in infants that were breastfed than those that were formula fed (Pretorius, 1989). Breast-fed infants are least likely to be overfed. Breast-feeding promotes good jaw and tooth development and it generally costs less than the commercial infant formulas currently available (Trahms, 2000). So it is cheaper to breastfeed than to formula feed an infant (Pretorius, 1989).

Table 2.1. The health benefits of breastfeeding (quoted from Winterburn, 2005)

For the infant – protection against:
• gastroenteritis
• respiratory infection
• otitis media
• urinary tract infection
• atopic disease with a family history
• juvenile onset insulin dependant diabetes
• obesity
For the mother – protection against:
• epithelial ovarian cancer
• pre-menopausal breast cancer
• retention of body fat gained in pregnancy

It also automatically promotes close mother-child contact and it is generally more convenient once the process is established (Trahms, 2000). By establishing the bonding between mother and infant it has a positive effect on the development of the personality of the infant. The most important benefit of breastfeeding is that it is the safest way of feeding an infant. It is more convenient and easier for some mothers. Breastfeeding also has nutritional benefits and also has a contraceptive effect, because it suppresses ovulation. Breast cancer is less evident in women that breastfed their infants than those that did not breastfeed (Pretorius, 1989).

2.3. Baby Friendly Hospital Initiative

Breastfeeding has many benefits, but still there are mothers who choose to feed their infants on formula (Moore *et al.*, 2007). A major obstacle to proper breastfeeding practices is the lack of awareness of breastfeeding practices among health professionals (Okolo & Ogbonna, 2002). The Baby Friendly Hospital Initiative (BFHI) has been implemented to give every infant the best start in life by ensuring maternity facilities comply with the ten steps to successful breastfeeding (Table 2.2) (UNICEF/WHO, 2006).

Table 2.2 Ten steps to successful breastfeeding (UNICEF/WHO, 2006)

Every facility providing maternity services and care for new born infants should:	
1	Have a written breastfeeding policy that is routinely communicated to all health care staff.
2	Train all health care staff in skills necessary to implement this policy.
3	Inform all pregnant women about the benefits of breastfeeding.
4	Help mothers initiate breastfeeding within half an hour of birth.
5	Show mothers how to breastfeed and maintain lactation, even if they should be separated from their infants.
6	Give new born infants no food or drink other than breast milk, unless medically indicated.
7	Practice rooming-in – allow mothers and infants to remain together 24 hours a day.
8	Encourage breastfeeding on demand.
9	Give no artificial teats or pacifiers to breastfeeding infants.
10	Foster the establishment of breastfeeding support groups and refer mothers to them on discharge from the hospital or clinic.

A study done by Moore *et al.* (2007) about the implementing of the BFHI in New Zealand Hospitals found that there were many barriers to implementing the BFHI policy in their public hospitals. There were also many factors that can support or hinder the implementing process. If a hospital is not driving the process themselves then external motivation is very important. Moore *et al.* (2007) found

that it took time to get the hospital staff to actually comply with the hospital policy. The socio-economic status of the community and the complexity of some of the cases can have an impact on increasing of the breastfeeding rates. Specific training and resources must be provided to the staff of maternity facilities to actually deal with the specific cases where exclusive breastfeeding may be hampered (Moore *et al.*, 2007).

In Switzerland the breastfeeding rate has increased since 1994 after breastfeeding was promoted on a national scale. The infants that were breastfed longer were more likely to have been born in a baby-friendly facility. The compliance of facilities was significantly associated with the duration of breastfeeding (Merten *et al.*, 2005). A study in Brazil about the evaluation of the impact of the BFHI on rates of breastfeeding also found that infants that were exposed to the BFHI were breastfed significantly longer than the infants that were born before the BFHI. The BFHI was more effective among children in underprivileged areas. There was a significant increase in breastfeeding and exclusive breastfeeding after the implementation of the BFHI. The frequency of breastfeeding in the first 6 months, especially exclusive breastfeeding is still low, however the BFHI still resulted in an increase in the rate of breastfeeding (Braun *et al.*, 2003).

A study in Nigeria assessed the impact of the BFHI on breastfeeding practices. A significant relationship was found between the practice of exclusive breastfeeding and the designation of the BFHI centre. The study confirmed that the exclusive breastfeeding rate has increased to 61%. This increase may have been connected with the start of the BFHI. In the urban areas of Nigeria the BFHI has proved a great success (Ojafeitimi *et al.*, 2000). Pérez-Escamilla (2007) concluded in a meta-analysis that the BFHI can partly be responsible for the breastfeeding improvements worldwide. Interventions like the BFHI can increase the duration and the degree of breastfeeding and also help with the decrease in the risk of gastrointestinal tract infection and atopic eczema (Kramer *et al.,* 2001).

2.4. Formula feeding and mixed feeding

Programs that offer free formula milk in disadvantaged settings are not easy to implement. There are small groups in countries with limited resources that have basic and essential services that would be able to allow the hygienic preparation of formula feeds. But for the child population in general the promotion of formula feeding would be harmful in the end, because formula milk is being supplied to households that do not meet the World Health Organization (WHO) criteria. For these families to be able to prepare safe formula feeds more than free formula milk needs to be supplied. By having resources such as clean water and electricity children will be getting the benefits of the choice of formula feeding by the HIV positive mothers (Coutsoudis *et al.*, 2008).

It is important that formula feeding should not be recommended for infants of HIV-infected mothers in areas with high infant mortality rates (Söderlund *et al.*, 1999). The infants are already at a disadvantage because of the high mortality rates and by also giving formula it may even make the situation worse. HIV positive women who meet all the criteria of the WHO guidelines can choose formula feeding as an infant feeding method (Coutsoudis *et al.*, 2008). The WHO guidelines state that where formula feeding is acceptable, feasible, affordable, sustainable and safe an HIV-infected woman should formula feed her infant (WHO, 2006). This means that basic necessities like a clean home environment, water and proper sanitation is needed. With the introduction of formula feeding in the prevention of mother to child transmission (MTCT) programme there was a "spill-over" effect to the uninfected population. The danger of formula feeding has been seen in Botswana where there was an explosive outbreak of diarrhea in areas where breastfeeding has been the norm previously. Powdered infant formula is not a sterile product and can contain contaminants that can cause diarrhea even if all the other resources are available to prepare it safely (Coutsoudis *et al.*, 2008).

The benefit of formula feeding is the prevention of any transmission of HIV through breastfeeding (Coutsoudis *et al.*, 2002). This benefit can be seen in the study from Bobat *et al.* (1997) where no infants died in the formula feeding group compared to the breastfeeding group during the study. But this does not exclude the risk that still exists when formula feeding is practiced. The risk of formula feeding is that infants who are not breastfed and receive formula milk or other replacement feeds have a six-fold increased risk of dying in the first two months of life, a four-fold increase between two to three months and a 2.5-fold increase for those four to five months of age compared with those who are breastfed (WHO, 2000). Malnutrition and infectious diseases are the major contribution to child deaths (Coutsoudis *et al.*, 2002). Infants that are formula fed have a slightly increased risk of developing diarrhea or acute respiratory infection (Becquet *et al.*, 2007).

Mixed breastfeeding is the dominant method of infant feeding (Anon, 2002) even though it is recommended to exclusively breastfeed for six months. Mixed feeding is a problem and some mothers believe that their infants need the healthy aspects of breastfeeding and also the "vitamins" in the formula (Bunik *et al.*, 2006). When an HIV-infected mother mix-feeds her infant with breast milk and other foods and drinks, it increases the risk of transmitting HIV to her infant. After exclusive breastfeeding for six months, some mothers tend to start mixed feeding (Coutsoudis *et al.*, 2001). A cohort study done in Durban found that the transmission rates of HIV in infants that are mixed fed are 32%. It is higher than infants that are exclusively formula fed. The rate of progression to AIDS was slower in the exclusive breastfed infants compared to the mixed fed infants (Bobat, et *al.*, 1997)

2.5 HIV and breastfeeding

The HIV epidemic is threatening exclusive breastfeeding, because of the risk of transmission and also the distribution of free formula (Coutsoudis *et al.*, 2008). HIV-infected women now have to make the difficult decision whether to expose their infants to the virus or place their infants at risk of

developing malnutrition and other infectious diseases if they do not choose breastfeeding (Fowler, 2008).

The pattern of breastfeeding also influences the rate of HIV transmission (Coutsoudis *et al.*, 2001). Some new evidence has been highlighted by the new WHO consensus statement (WHO, 2006) on HIV and infant feeding. In three large cohort studies it was found that exclusive breastfeeding for up to six months was associated with a three to four fold decrease in HIV transmission compared to non-exclusive breastfeeding.

Consistent messages on infant feeding and high quality counseling can improve the duration of exclusive breastfeeding up to six months in HIV infected and HIV-uninfected mothers (WHO, 2006). Stopping breastfeeding before six months increases the risk of infant morbidity and mortality (WHO, 2006).

The WHO published a pooled analysis about the effect of breastfeeding on infant and child mortality due to infectious disease in less developed countries. It was found that the protective effect of breastfeeding is the strongest in the first six months after birth. For breastfed infants there is a four to six fold survival benefit. During the six to twelve month period there is also a protective effect against mortality, so they have an extended benefit throughout the first year of life (WHO, 2000).

There is still a dilemma with regards to the benefits of breastfeeding and the low but ongoing risk of transmission of HIV (Fowler, 2008). A randomized clinical trial in Nairobi was done to see the effect of breastfeeding and formula feeding on transmission of HIV-1. The estimated rate of HIV-1 transmission through breastfeeding was 16.2% during the first two years. There was some non-compliance in the formula feeding group, so the estimated breastfeeding transmission rate would be 23.5%. It was also found that most of the transmissions were during the early stages of

breastfeeding. An estimated 75% of transmission had already taken place by the age of six months. The transmission through breastfeeding is non-linear with regards to exposure duration. After 6 months when complementary foods are introduced and the milk intake declines then the exposure to the HIV-1 also decreases. In the breastfeeding group 58% of the women had an infant that was not infected and alive at the age of two years. The conclusion was that avoiding breastfeeding could potentially decrease MTCT by 44%. Mortality rates in the two different groups were the same, but it must be noted that the formula feeding group had access to clean water and instructions on how to safely give the formula. In developing countries there would be a different scenario because clean water is not always available and knowledge about formula feeding is limited. This causes the balance of risks and benefits being shifted. Looking at these results the best would be to avoid breastfeeding to remarkably reduce MTCT of HIV-1. It must also be noted that formula feeding is unaffordable for most of the people in sub-Saharan Africa (Nduati *et al.,* 2000).

A report that was derived from a prospective hospital based cohort study on the natural history of vertically transmitted HIV-1 infection at King Edward Hospital in South Africa found the following information with regards to the association between feeding practice and outcome. For the infants' that only received breast milk for the first month the infection rate was 45%. Those that were breastfed for two months the infection rate was 64% and those that were breastfed for three months the infection rate was 75%. Unfortunately these figures were statistically insignificant. Only seven of the seventeen infected infants that died were exclusively breastfed and the other ten were mixed fed. In the formula feeding group there was no mortalities. The mortality rate was the highest in the breastfeeding group compared to the formula fed and mixed fed groups. The expected benefits of breastfeeding were not found in this study. These results indicate that it would be the best to avoid breastfeeding to help reduce the transmission of HIV (Bobat *et al.*, 1997).

A prospective cohort study done in Malawi from 1994 – 1997 measured the frequency, timing and risk factors of HIV transmission through breastfeeding. Forty-seven children became infected while breastfeeding but none were infected after stopping breastfeeding. The incidence of HIV infection per month was 0.7% during the age of one to five months, 0.6% during the age of six to eleven

months and 0.3% during the age of twelve to seventeen months. This suggests that the risk of HIV infection is the highest in the early months of breastfeeding (Miotti *et al.*, 1999).

By providing consistent counseling messages about exclusive breastfeeding it is feasible to breastfeed exclusively for the first four to six months of life. Breastfeeding has an overall protective health benefit and it also provides protection against HIV transmission when compared with mixed feeding. By giving maternal highly active antiretroviral therapy (HAART) to women with a CD4 count under 350 cell/mm^3 during lactation will also help to reduce the transmission of HIV during breastfeeding (Fowler, 2008).

Another way of ensuring the reduction of the transmission of HIV through breast milk is to actually heat treat the expressed breast milk. There are two simple heating methods namely Pretoria Pasteurization and the flash heating method, which may be able to denature the HIV while retaining many of the protective factors of the breast milk (Israel-Ballard *et al.*, 2005). These two heating methods were compared to determine the impact that they would have on HIV, nutrients and antimicrobial properties in breast milk. It was found that the flash heating method was better in eliminating all the viral activity. Both of the methods did not destroy any nutrients but destroyed all the bacterial contamination (Israel-Ballard *et al.*, 2005).

In a study done by Jeffrey *et al.* (2001) they concluded that by using the Pretoria Pasteurization method on expressed breast milk, it will effectively inactivate HIV in breast milk. Expressed breast milk that has been heated by the Pretoria Pasteurization method can be kept without refrigeration for up to twelve hours when it is kept in a closed container and not handled (Jeffrey *et al.*, 2003).

It is more likely that mothers who express their breast milk would actually breastfeed for six months (Win *et al.*, 2006). This will help the infants to get the benefits of breastfeeding without the risk of the transmission of HIV. It will also enable the mother to keep on breastfeeding for longer than six

months. This is important, because after infants from HIV-infected mothers were exclusively breastfed for six months and started on mixed breastfeeding, these infants tended to develop mixed-breastfeeding associated infections (Coutsoudis *et al.,* 2001).

2.6 Appropriate feeding method

There are three possible infant feeding methods namely breastfeeding, formula feeding and heat treatment of breast milk. It is difficult to choose the right infant feeding method that will actually save lives, reduce the cost to society and also have fewer negative effects (Latham & Preble, 2000). Breastfeeding still remains a key infant feeding method, because of all the benefits and also the link it has to the reduction of morbidity in infancy (McConnachie *et al.,* 2004). HIV-infected women have to make a difficult decision with regards to their infant feeding method. She may expose her infant to a potentially fatal viral infection or she may place her infant at risk for early death due to malnutrition or other infectious diseases, if she chooses not to breastfeed (Fowler, 2008).

2.6.1 Breastfeeding

Interventions to improve rates of exclusive breastfeeding are very important, especially if we want to help to improve the breastfeeding practices of HIV-infected women (Coutsoudis *et al.*, 2001).

A study by Coutsoudis *et al.* (2001) on the method of feeding and transmission of HIV-1 found that the rate of transmission post-nataly is influenced by the pattern of breastfeeding. The risk of MTCT of HIV-1 over six months was not higher when comparing infants that were exclusively breastfed against those that were never breastfed but given formula and other foods. Infants that were given mixed feeds (mixture of breast milk and other foods and drinks) had the greatest risk of being infected (Coutsoudis *et al.*, 2001). The mothers that chose not to breastfeed had a better social

background (high school education, employment, electricity in the home, piped water in the home) when compared to mothers who chose exclusive breastfeeding (Coutsoudis *et al.*, 2001). Some mothers stopped exclusive breastfeeding and continued with mixed breastfeeding. This resulted in the occurrence of mixed breastfeeding associated infections. When children were exclusively breastfed, they were protected from HIV transmission through breastfeeding, but they were not protected when they were not exclusively breastfed (Coutsoudis *et al.*, 2001). The risk of MTCT as a result of breastfeeding is estimated at 12% by fifteen months. The breastfeeding transmission accounts for approximately 39% of all HIV transmissions (Coutsoudis *et al.*, 2001). Infants are 2.9 times more likely to get infected postnatally when they are exposed to solids during the first two months (Becquet *et al.*, 2008). This means that the risk of breastfeeding varies with the pattern and also the duration of breastfeeding (Coutsoudis *et al.*, 2001; Becquet *et al.*, 2008). This information will be helpful to mothers when they are making their infant feeding choices. It will lead them to make a better informed choice (Coutsoudis *et al.*, 2001). By promoting exclusive breastfeeding to all the mothers with unknown HIV status it can decrease the transmission rates in those that are HIV positive (Piwoz *et al.*, 2007).

2.6.2 Formula / replacement feeding

Formula feeding is the correct choice for some HIV-infected mothers who meet the WHO guidelines criteria. Exclusive breastfeeding for the first six months is still the best choice for the majority of HIV-infected mothers who are living in poor conditions. This reflects the optimum balance between the advantages and disadvantages (Coutsoudis *et al.*, 2008). The WHO (2006) guidelines state that it is recommended that when replacement feeding is "acceptable, feasible, affordable, sustainable and safe" then an HIV-infected mother should avoid all breastfeeding.

In the study done by Becquet *et al.* (2007) in Côte d'Ivoire they found that when a mother was given appropriate nutritional counseling and care, with access to clean water and also an adequate supply of formula milk, early weaning and formula feeding was not harmful to HIV-exposed

children. In their population-based study these alternatives to prolonged breastfeeding was not only safe for the children but also acceptable and feasible. It is important that a mother makes a decision with regards to her own individual situation (Becquet *et al.*, 2007).

Mothers that choose formula feeding do it mainly because of wanting to protect their infant from the transmission of HIV. This fear of the transmission through breastfeeding is a result of information that over-estimates the risk (Doherty *et al.,* 2006).

2.6.3 Heat-treatment of expressed breast milk

Mothers who express breast milk can be away from their infants intermittently by exercising lifestyle choices while they are still breastfeeding (Win *et al.*, 2006). A study done by Win *et al.* (2006) in Australia found that mothers who expressed breast milk were more likely to continue breastfeeding till six months. Expressing breast milk is an alternative to using formula or replacement feeding. Heat-treating expressed breast milk is another way of ensuring the infant still receives the benefit of breastfeeding without the risk of transmission of HIV. Heat treatment of expressed breast milk may even be more feasible when an infant is introduced to complementary foods. The heat treated breast milk will still give the infant the immune protection when complementary feeding is started while it helps in preventing transmission of HIV (Israel-Ballard *et al.,* 2005).

There are two methods namely Pretoria pasteurization and the flash heating method.

Pretoria Pasteurization

- A container of water is heated to boiling point.
- The water is removed from the heat.
- A closed container of breast milk is put into the hot water for 20 minutes.
- It is allowed to cool until 37 degrees Celsius (Israel-Ballard *et al.*, 2005).

Flash heating method

- The water and the container of breast milk are heated together until the water reaches a rolling boil (100 degrees Celsius).
- The container of breast milk is then removed from the water and allowed to cool until 37 degrees Celsius.

As already mentioned both of the methods do not destroy any nutrients but destroys all bacterial contamination (Israel-Ballard *et al.*, 2005).

2.7 Mechanism of decreased risk of MTCT through exclusive breastfeeding

The mechanism of how exclusive breastfeeding may be safer than mixed feeding is unknown. With mixed feeding it may be that because of the decrease in the consumption of breast milk, due to the replacement with formula and other liquids, the protective factors decrease below their critical threshold (Coutsoudis *et al.*, 2001). Coutsoudis *et al.* (2001) concluded that further studies must be done to ensure that the finding that infants that are exclusively breastfed for six months have no greater risk of getting HIV-infected than infants that do not receive breast milk.

Rollins *et al.* (2001) looked at the intestinal permeability of breastfed and non breastfed infants. Infants who became HIV infected by fourteen weeks had higher intestinal permeability at six and fourteen weeks than uninfected infants. Infants that were given no breast milk had a higher intestinal permeability at one week than infants that were given breast milk exclusively or with other foods. Rollins *et al.* (2001) concluded that infant HIV infection induced changes in gut permeability.

2.8 Risk factors for breastfeeding transmission of HIV

Coutsoudis (2005) summarized the risk factors in Table 2.3 with regards to the strength of the evidence that is available presently.

Table 2.3. Risk factors for breast-feeding transmission of HIV (Coutsoudis, 2005)

Strong evidence	Limited evidence
High plasma viral load	Nonexclusive breastfeeding in the first 6 months
Advanced disease/low CD4 count	High breast milk viral load
Breast pathology – mastitis, abscesses, cracked bleeding nipples	Subclinical mastitis as evidenced by increased breast milk sodium levels
Primary infection / new infection	Low maternal levels of vitamins B, C and E
Prolonged duration of breastfeeding – more than 6 months	Infant oral lesions

A Safer Breastfeeding Programme for HIV-infected women was introduced in Cato Manor, South Africa during the period January 2000 to December 2003. In the safer breastfeeding package the following components were encouraged: exclusive breastfeeding for six months, good lactation management to avoid breast problems, shorter duration of breastfeeding – six months, condom use during lactation, no breastfeeding from breast with breast problems, prompt treatment of infant oral thrush and heat treatment of expressed breast milk. In this Safer Breastfeeding Programme, they observed that the HIV transmission rate during breastfeeding up to nine months was 2.6%. The breast pathology experienced by the mothers was less than normally reported by HIV-infected women. Promoting heat treatment of breast milk was not that successful in that the mothers only saw it to be feasible after six months of age and that formula was readily available (Coutsoudis, 2005).

A cohort study done in Durban, South Africa on breastfeeding by HIV-1-infected women and outcome in their infants reported the following findings. The transmission rate of infants that were only formula fed was 24% lower than the infants that were mixed fed (32%) or exclusively breastfed (39%). There was a 15% increased risk for transmission when the infant was breastfed compared to formula fed (Bobat *et al.*, 1997).

On counseling of women on the risk of the transmission of HIV through breastfeeding, it should be highlighted that breastfeeding for six months carried a risk of 5% of transmission, but continuing until two years increased the risk to 15% (Coutsoudis *et al.*, 2002). Formula feeding decreased the rate of postnatal transmission of HIV but it can increase the morbidity and mortality from other infectious diseases, which in turn decreases overall child survival. The majority of babies born to HIV positive mothers will in the end benefit from exclusive breastfeeding for about six months (Coutsoudis *et al.*, 2002).

During a Zimbabwean study, an intervention was developed which educated the mothers in the study about MTCT and the implications it has on infant feeding method. The goal of the intervention was to encourage the mothers to learn their HIV status and also provided the HIV infected mothers with the necessary skills and information to make the best infant feeding choice (Piwoz *et al.*, 2007). In this study the postnatal HIV transmission declined in a dose-response manner with increasing frequency of intervention contact. The postnatal HIV transmission rates for the intervention contacts are summarized in Table 2.4.

Table 2.4. HIV transmission rates among women with regards to their number of intervention contacts (Piwoz, *et al.*, 2007)

HIV status known			HIV status unknown		
Intervention contacts	%*	95% CI	Intervention contacts	%*	95% CI
0	11.5	4.8, 25.2	0	13.3	5.5, 28.6
1	9.1	3.9, 19.7	1	8.8	3.9, 18.6
2	5	1.0, 21.6	2	6.2	1.2, 26.0
3	0		3	0	

*% transmission rate

The postnatal transmission reduced by 38% with each additional intervention contact. Postnatal transmission rates were significantly lower for mothers who were exposed to both print and video materials compared with mothers that were not exposed to any educational materials (Piwoz *et al.*, 2007). This means that education about MTCT and infant feeding is important in helping to decrease HIV transmission rates.

2.9. Factors influencing a mother's decision on her infant feeding method

There are many factors that can influence a mother's decision on whether to breastfeed, formula feed or even mix feed. A qualitative study done by Hoddinot & Pill (1999) about the infant feeding decision among women in the east end of London found that women with a low socio economic background who perceived exposure to breastfeeding as positive were more likely to initiate breastfeeding. Breastfeeding still remains a skill that needs to be learned (Hoddinot & Pill, 1999).

Ludvigsson (2003) did a study in Bolivia on the information and attitudes with regards to breastfeeding. The exclusive breastfeeding median duration was three months. Colostrum was given to most of the infants. The women who exclusively breastfed for longer, received education regarding breastfeeding from health care personnel prior to delivery or in the maternity ward. Educational level was found to be a determinant of knowledge of breastfeeding, where higher education was associated with longer duration of breastfeeding. The study did not find any link between attitude of the mother and duration of breastfeeding. Health care personnel can have an influence on the mothers' infant feeding pattern by giving information about infant feeding (Ludvigsson, 2003).

Attitudes of mothers towards breastfeeding are important, because it is more predictive of their intention to breastfeed (Kloeblen-Tarver *et al.*, 2002; Shaker *et al.,* 2004). Families' attitudes are also important in the infant feeding decision (Kloeblen-Tarver *et al.*, 2002). Prior breastfeeding experience is also an influential predictor of a mother's infant feeding decision (Kloeblen-Tarver *et al.*, 2002). The father of the infant can also play an important role in the infant feeding decision (Shaker *et al.*, 2004), although there was not a strong association between the father's antenatal views about breastfeeding and the mothers feeding intention and actual behaviour (Hoddinot & Pill, 1999).

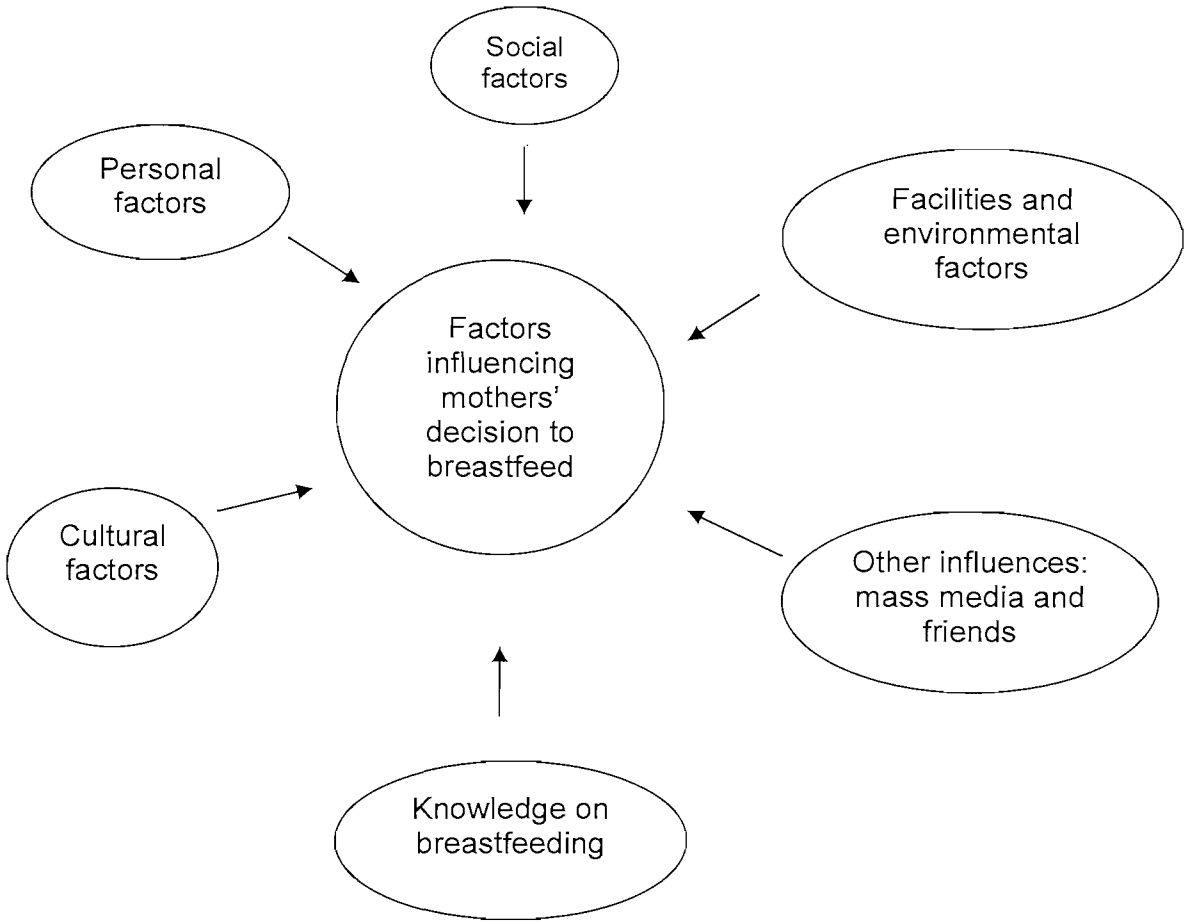

Figure 2.1. Conceptual framework for the decision to breastfeed (Kong & Lee, 2004).

Figure 2.1 shows the conceptual framework of the factors that influences a mother's decision with regards to her infant feeding method. This conceptual framework highlights the many factors that play a role in the decision making process.

Table 2.5 summarizes the factors that influenced the decision making about breastfeeding in Hong Kong women.

Table 2.5. Factors influencing breastfeeding decisions of Hong Kong women (Kong & Lee, 2004)

To breastfeed	**Not to breastfeed**
Knowledge about breastfeeding.	Negative response to breastfeeding in public.
Personal feeling of responsibility, self worth and closeness to the baby.	Inadequate breast milk that is perceived as a barrier.
Encouragement and support from husbands to breastfeed (Fathers' preference).	Fathers preference not to breastfeed
	Consider breastfeeding as socially limiting. Women should not be tied to the baby and family.
	Lack of facilities for breastfeeding in public places.

A study by Muko *et al.* (2004) in a rural setting in Cameroon found the following factors that influenced a mother's decision on her infant feeding choice (Table 2.6).

Table 2.6. Factors influencing women's infant feeding choice in Cameroon (Muko *et al.*, 2004)

Not choosing breastfeeding	**Not choosing formula feeding**
Advice of a health worker	Cost
Ill health	Stigma
Free milk	Family pressure
Job pressure	Inconvenience in preparation / administration
Loss of beauty	Prior education from health workers
	Loss of special attention from family

A direct relationship was also found between age, education level, income size, marital status and choice of feeding (Muko *et al.,* 2004). Social influences have an effect on younger women especially young adolescents and some can even experience uncertainty when it comes to making a decision (Wambach & Koehn, 2004). A study by Grossman *et al.* (1990) found that women who received support from their families were more likely to choose breastfeeding. The duration of breastfeeding was correlated to previous attempts at breastfeeding. The low income women were less likely to receive support in their infant feeding decision. Participation in Lamaze classes, previous success in breastfeeding and maternal education were variables that predicted a decision to breastfeed at birth. The type of delivery (vaginal and caesarean) was a predictor for the duration of breastfeeding. The time at which the mothers' chose their infant feeding method was either early in pregnancy or even before pregnancy (Grossman *et al.*, 1990).

In a systematic review about maternal obesity and breastfeeding Amir & Donath (2007) concluded that breastfeeding behaviour was multi-factoral. Socio-cultural and physiological factors affects a woman's decision and ability to breastfeed. Maternal obesity may be detrimental to lactation, however, overweight and obese woman's decision not to breastfeed could still not be clearly linked to their obesity (Amir & Donath, 2007).

A study by McInnes *et al.* (2001) in the United Kingdom (UK) found that previous breastfeeding experience and increasing maternal age were independently associated with feeding choice. There was also a significant positive relationship between choice of feeding and living with the partner. This may relate to physical environment and privacy. Smoking was found to be independently predictive of infant feeding choice. An individual who smokes may represent an individual who has resisted health promotion attempts to address high smoking levels among women and particularly among pregnant women. Such an individual may also be resistant to attempts to promote breastfeeding as a healthy option. Infant feeding intention was, however, a more intense predictor of breastfeeding duration than maternal smoking (Amir & Donath, 2007).

A Zimbabwean study reported that the mother's knowledge about her HIV status did not influence her infant feeding choice (Piwoz *et al.*, 2007). This study was the first study to suggest that an intervention that encouraged exclusive breastfeeding reduced postnatal HIV transmission among those mothers that did not know their HIV status. Exclusive breastfeeding is beneficial for HIV uninfected mothers and this message can be used in the general population without targeting HIV positive mothers and in the end stigmatizing them. The most effective way of reducing transmission rates is by increasing the intervention contacts that use both printed and video material (Piwoz *et al.*, 2007).

In a South African study the knowledge gaps of midwives influenced their perception regarding health education to pregnant women. Due to these perceptions there was a decrease in choosing breastfeeding as an infant feeding method. Education from midwives at antenatal clinics played a significant role in their infant feeding decision (Minnie & Greeff, 2006).

2.10. Sources of infant feeding information

Deciding on an infant feeding method is very important for a pregnant woman. When the decision of an infant feeding method is made it should be a personal choice after much reflection. A variety of factors influence a woman's decision, including information and advice from health personnel, family and friends and also reading material. It has been found that women would rather discuss their infant feeding methods with their family than the health care workers. This means that key individuals should be included when giving information on infant feeding methods. This will help pregnant women with regards to their decision by also getting accurate information from their family and friends (Chezem *et al.*, 2001).

Breastfeeding information from health care workers may help to influence infant feeding pattern (Piwoz *et al.,* 2007). When this information is provided before birth or in the maternity ward it can lead to a longer duration of exclusive breastfeeding (Ludvigsson, 2003). Nurses that undergo a BFHI training workshop are more knowledgeable about aspects concerning exclusive breastfeeding and will be able to use correct practices when it comes to promoting exclusive breastfeeding (Owoaje *et al.*, 2002).

The information that counselors must give HIV-infected women is important and they must receive appropriate and adequate information. If training is not provided for these counselors it can compromise the health of the infants due to personal attitudes and bias. Training is important to strengthen counseling skills of health care workers and ensure that the right message about safe infant feeding reaches the mother (Piwoz *et al.*, 2007).

2.11. Conclusion

Exclusive breastfeeding is being threatened by the HIV epidemic (Coutsoudis *et al.*, 2008) and it has changed the context in which women make decisions with regards to their infant feeding method (Doherty *et al.*, 2006). Being able to identify factors that affect a mother's decision on which infant feeding method she is going to choose will help to improve interventions and health professionals will be able to identify the risk group that will not be breastfeeding. Efforts should be made to encourage mothers to breastfeed their infants exclusively up to the age of six months.

In conclusion the following are predictors of breastfeeding intention: previous breastfeeding experience (Kloeblen-Tarver *et al.*, 2002; McInnes *et al.*, 2001), maternal age (McInnes *et al.*, 2001; Muko *et al.,* 2004), living with a partner, non smoking and being primigravid (McInnes *et al.*, 2001).

It is important that the focus must be on giving the correct information about breastfeeding to pregnant mothers. Promotion of breastfeeding must target young women and also their families. Improving the attitude towards breastfeeding in the population will be helpful in increasing the number of women that initiate breastfeeding.

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Article title:

FACTORS AFFECTING MOTHERS' CHOICE OF INFANT FEEDING METHOD IN THE LOWER UMFOLOZI DISTRICT WAR MEMORIAL HOSPITAL, KWAZULU-NATAL

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ABSTRACT

The aim of this study was to determine which factors influence choice of early infant feeding. This may help to understand what the focus should be when promoting the right infant feeding methods. A structured questionnaire was completed by a 100 women and focus group discussions were held with 22 women who delivered at the Lower Umfolozi District War Memorial Hospital in Kwazulu-Natal. Most of the mothers (72%) chose breastfeeding, but 58% intended to breastfeed for only six months. One-third (33%) were influenced by health care professionals and 44% of the mothers made their own decisions in their infant feeding method. In the focus group discussions, the fear of transmission of HIV through breast milk was stated as an important reason why mothers choose replacement feeding. Significantly more HIV-infected mothers chose replacement feeding as infant feeding method, and mothers who chose breastfeeding were significantly older than mothers who selected replacement feeding. They made their infant feeding decision significantly earlier than those who chose replacement feeding. Health professionals should still promote exclusive breastfeeding for the first 6 months, even when the prevalence of HIV is high, in areas where replacement feeding will not be acceptable, feasible, affordable, sustainable and safe, due to lack of sanitation and poor socio-economic status.

[Key words: Infant feeding; exclusive breastfeeding; mother-to-child-transmission; HIV; mixed feeding]

OPSOMMING

Die doel van die studie was om vas te stel watter faktore beïnvloed dames wat geboorte gee in die LUDWM Hospitaal in Empangeni, Kwazulu-Natal met hulle vroëe babavoedings keuse. Dit sal help om te verstaan watter faktore gesondheidswerkers op moet fokus wanneer hulle die gepaste voedings metodes bevorder. 'n Gestruktureerde vraelys was voltooi deur 'n 100 dames en fokus groep besprekings was gehou met 22 dames wat almal geboorte geskenk het by die LUDWM Hospitaal. Meeste van die dames (72%) het borsvoeding gekies, maar net 58% het voorgeneem om te borsvoed vir ten minste ses maande. Die meeste van die dames (97%) het inligting ontvang oor babavoedings keuses van die gesondheidswerkers by die klinieke. Een derde van die dames (33%) was beïnvloed deur die gesondheiswerkers en 44% van die deelnemers het aangedui dat niemand hulle beïnvloed het ten opsigte van hulle keuse nie. In die fokus groep besprekings het dit aan die lig gekom dat die vrees van die oordrag van MIV deur borsmelk een van die groot redes was hoekom sommige moeders kunsvoeding kies. 'n Bedeidende groot hoeveelheid MIV-geïnfekteere moeders het kunsvoeding gekies. Die moeders wat borsvoeding gekies het was bedeidend ouer en hulle het die babvoedings metode bedeidend vroeër gekies as die wat kunsvoeding gekies het. Gesondheidswerkers moet nogsteed alleenlike borsvoeding bevorder vir die eerste 6 maande al is die prevalensie van MIV baie hoog veral in areas waar kunsvoeding nie aanvaarbaar, uitvoerbaar, bekostigbaar, aanhoubaar en veilig is nie, omdat daar 'n tekort aan sanitasie is en asook die slegte sosio-ekonomiese status.

INTRODUCTION

One of the most important decisions that a pregnant woman has to make is choosing an infant feeding method (Chezem *et al.*, 2001). The benefits of breastfeeding for new-born infants are well documented (WHO, 2000). The World Health Organization (WHO) recommends that to achieve optimal growth, development and health in infants they should be exclusively breastfed for six months (WHO, 2002). According to the South African Demographic and Health Survey (SADHS) in 1998 only 10% of infants from zero to three months were exclusively breastfed (Anon, 2002) and in 2003 only 1.5% of infants from four to six months and 11.9 % of infants younger than four months were exclusively breastfed (Anon, 2004). As seen in these SADHS results the percentage of mothers that exclusively breastfeed is very low. The question is why some mothers still choose other feeding methods even after receiving information about the benefits of exclusive breastfeeding.

In Kwazulu-Natal the prevalence of Human Immunodeficiency Virus (HIV) infection is high (Anon, 2007). HIV has an impact on a mother's infant feeding choice, because of the risk of the transmission of HIV through the breast milk (Gara *et al.*, 2005). In a study by Coutsoudis *et al.*, (2001) they found that infants had the highest risk of being infected by HIV when they were mixed fed (breastfeeding and other foods and liquids) by their HIV-infected mothers. Another study by Bobat *et al.* (1997) found that infants that were exclusively formula-fed had a lower transmission rate of HIV than the infants that received exclusive breastfeeding or mixed feeding. There is a 15% (CI, 1.8-31.8) increase in risk of being infected with HIV when breastfeeding is compared to formula feeding. Infants who were mixed fed progressed to Acquired Immune Deficiency Syndrome (AIDS) faster than infants who were exclusively breastfed (Bobat *et al.*, 1997). To decide to breastfeed or formula feed is a difficult decision that must be made by an HIV-infected mother (Bland *et al.*, 2007).

The WHO still recommends that HIV-infected women should exclusively breastfeed their infants unless replacement feeding is acceptable, feasible, affordable, sustainable and safe (WHO, 2006). All children have the right to be breastfed by their mothers and no one should interfere with the mothers' right to breastfeed (Kent, 2006). The aim of this study was to determine how the decision was made on the early infant feeding choice and the reasons for the infant feeding choice.

METHODS

A questionnaire was developed to obtain information about the early infant feeding decision that mothers make. The questionnaire consisted of questions regarding demographic information (4 questions), socio-economic information (8 questions), delivery details (2 questions) and infant feeding (10 questions). The questionnaire was available in English and Zulu. A focus group discussion guide was also developed to gain some more insight into the subject. The questionnaire items, as well as the focus group discussion guide were based on the literature focusing on decisions that a pregnant woman has to make when choosing an infant feeding method (Kong & Lee, 2004; Shaker *et al.*, 2004; Grossman *et al.*, 1990; Doherty *et al.*, 2006).

For the first part of the study a convenience sample of a 100 women that delivered at the Lower Umfolozi District War Memorial Hospital (LUDWMH) in Kwazulu-Natal was approached to answer the questionnaire. Consent was obtained from the hospital and the relevant participants. Staff employed by the hospital was used as field-workers to assist the participants to complete the questionnaires. Permission was granted by the participants to look up their HIV status in their hospital files. The researcher was available during the period of data collection.

The body mass index (BMI) was calculated by measuring the weight (electronic scale, Seca) and the height (stadiometer, Seca) of the participants. Only two participants' BMI was not calculated

due to the fact that at the time of the interview they were not yet able to stand up for the measurements to be taken.

The second part of the study consisted of focus group discussions that were held with mothers that had also delivered at LUDWMH, but that were currently lodging at the hospital due to the fact that their infants had been admitted to the nursery after birth. The focus group discussions were divided into two different categories of mothers. The categories consisted of mothers that had previous children and those that have delivered their first infant. A total of four focus group discussions were held with the help of a staff nurse that assisted with translating the questions and answers. Written consent was also obtained from these participants.

The ethics committee of the NWU approved this research (NWU-0025-08-S1). Written consent forms were completed by all the participants and they were also given verbal information about the purpose of this research. Confidentially was ensured by not recording the personal details of the participants.

Statistical analyses

Descriptive statistics were used to present the frequencies of the responses of the women on the questionnaire items. The chi-square test was performed to assess statistically significant differences between the group who chose to breastfeed and those who chose replacement feeding for the following categories: age group, marital status, education level, employment status, number of people in household, number of previous children, BMI after delivery, type of house, access to electricity, water or toilet facilities, the person who made the feeding choice, when the decision was made, if they received counseling about feeding choice and HIV status.

RESULTS

Questionnaire

Demographic information

The age distribution of the participants is shown in Figure 1.

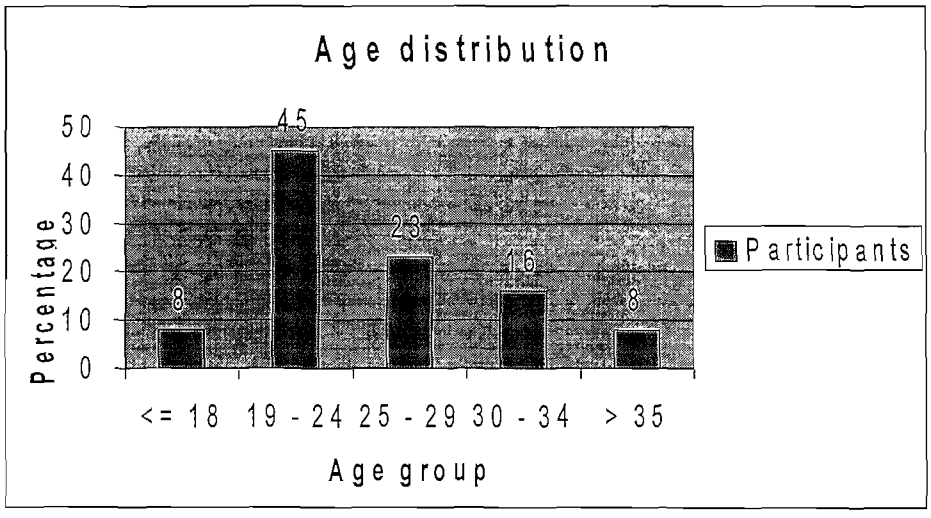

Figure 1. Distribution of age of participants (n=100).

The majority of the women (96%) were of African ethnicity, while only 1% was white and 1% Indian and the other 2% were coloured. Most of the women (83%) were not married, 15% were married and only 2% were living with their partners. Concerning education level a total of 86% went to high school, but only 47% completed Grade 12.

Socio economic information

The majority of the women (81%) were either unemployed or a student and only 19% of the participants were employed, either by formal or informal employment. This could be an indication that the participants would not be able to afford infant formula if that was their choice of infant feeding method. Almost half of the women (49%) lived in households with more than seven members, 44% lived in households with four to six members and only 7% lived in households with

only one to three members. Thirteen percent were primigravid, 76% indicated that they had one to three children, 7% had four to six children and only 4% had more than seven children. Almost all of the participants (99%) did not smoke. The BMI distribution of the participants on the day after delivery is shown in Table 1.

Table 1. BMI distributions of participants.

BMI categories	Breastfeeding mothers n = 71*	Mothers who selected replacement feeding n = 26*
< 18	0	0
18 – 24.9	21 (29.6%)	7 (26.9%)
25 – 30	28 (39.4%)	12 (46.2%)
> 30	22 (31%)	7 (26.9%)

* 2 women could not be measured due to illness
* 1 women chose mixed feeding

No significant differences between the BMI categories of the two groups

Eighty one percent lived in a brick house and 15% lived in a traditional Zulu style clay hut. The resources that were available for these women are summarized in Table 2.

The majority of the women had electricity (73%), outside tap water (59%) and a pit as toilet facilities (63%). Some of the participants indicated that they had no toilet facilities available and that they use the bush. Sixty seven percent used electricity for cooking, 33% wood or coal, 13% gas and 8% paraffin. Some of the women used more than one energy source for cooking.

Table 2. Resources available to the mothers (n=100)

Resource		Percentage (%)
Electricity		73 %
Inside tap water		33 %
Outside tap water		59 %
River / dam		8 %
Toilet facilities:	Pit toilet	63 %
	Inside flush	20 %
	Outside flush	8 %
	Other: Bush	9 %
Energy source for cooking	Gas	13 %
	Electricity	67 %
	Paraffin	8 %
	Wood or coal	33 %

Delivery details

The most common method of delivery (64%) for the participants was elective caesarean section under anaesthetic drugs. Only one participant had general anaesthesia and 35 % had spontaneous vaginal delivery. Thirty three percent reported post-partum haemorrhage as a maternal complication.

Infant feeding choice

Of the 72% that chose breastfeeding as an early infant feeding method (Figure 2) only 42 (58%) were intending to breastfeed between zero to six months of age (Figure 3). Some of the participants indicated that when they stop breastfeeding at six months they will switch to formula feeding. When it came to the question of whom or what influenced your infant feeding decision 44% of the participants indicated that no-one influenced them and that they decided themselves. One

participant actually answered that she chose formula feeding because of her HIV status. This may have been a reason for some of the mothers who chose formula feeding, but because of the stigma of HIV they did not want to divulge their status. The second highest percentage (33%) of participants indicated that the nurses or counselors or someone at the clinic influenced their decision. This is an indication that they get information about infant feeding choices from the clinic. Only 4% mentioned that because they are working or a student they chose formula feeding because they are not going to be looking after their babies. Thirteen percent of the participants were influenced by their mothers or female relatives when it came to their infant feeding decision.

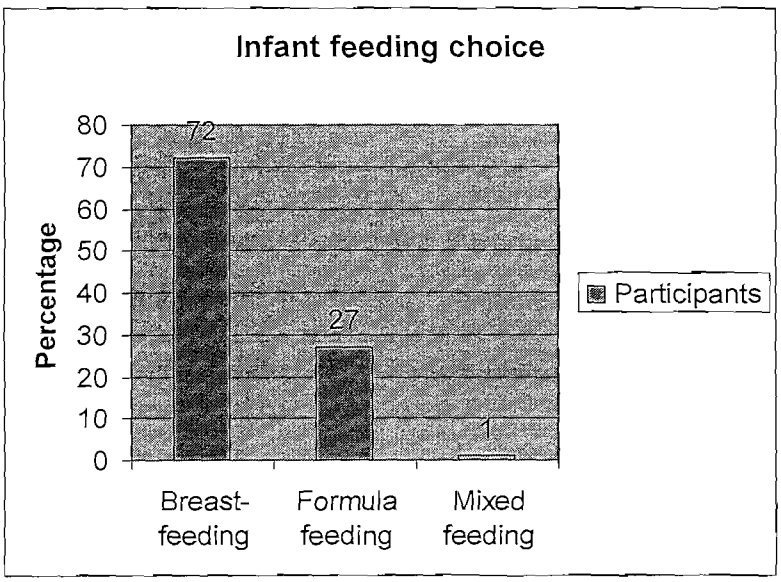

Figure 2. Infant feeding choice of the mothers (n=100)

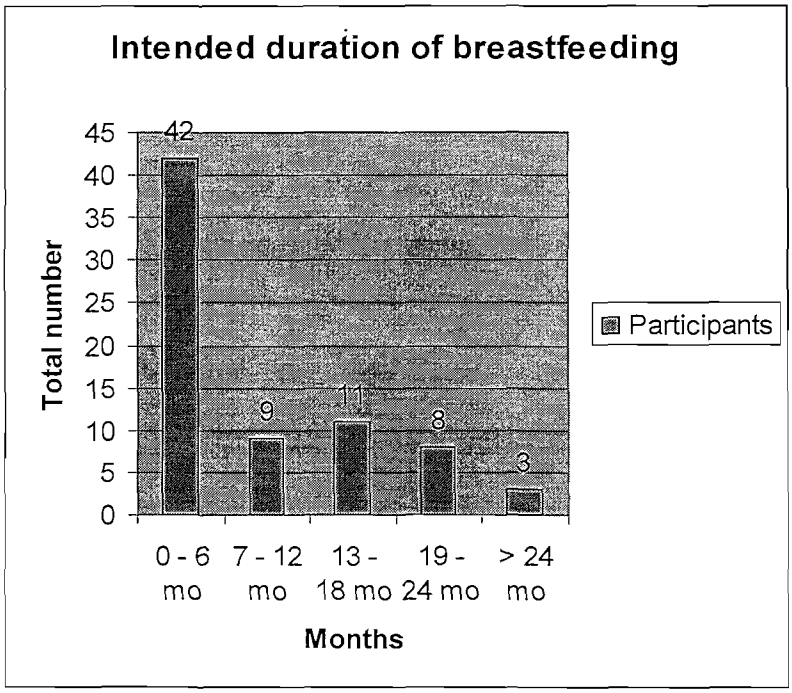

Figure 3. Intended duration of breastfeeding (n=73, breastfeeding + mixed feeding)

The decision with regards to their infant feeding method was mostly made before pregnancy (61%). Only 8% made the decision after delivery, 5% in the first trimester, 12% in the second trimester and 14% in the third trimester. Only 32% of the participants lived with someone that used the same infant feeding method. For these women they will have a person in their own household who would be able to support them in their infant feeding method. Fifty seven percent had previous experience in their infant feeding choice. This gives an indication that they would probably repeat the same behavior. Five of the participants could not remember how long they breastfed or bottle fed their infants, nine women fed them less than six months and 24 women more than twelve months. The majority of the women (97%) received counseling or education about their infant feeding method. Ninety three percent of the women got information from a health care worker at the clinic. Other sources of information were the mother, sister, printed material that included books, magazines and pamphlets and the TV or radio.

Of the group who chose breastfeeding significantly more were in the older age groups (X^2 = 5.5, p = 0.02) and a significantly higher percentage made their infant feeding decision before pregnancy (X^2 = 8.6, p = 0.003) (Table 3). The women in the 30 – 34 year group was 12.5% vs 7.4% and women >35 years was 8.3% vs none when comparing those that chose breastfeeding versus replacement feeding. There were no significant differences between the group who chose to breastfeed and the group who chose replacement feeding regarding the following categories: marital status, education level, employment status, number of people in household, number of previous children, BMI after delivery, type of house, access to electricity, water or toilet facilities, the person who made the feeding choice, and if they received counseling about feeding choice.

Table 3. Age distribution of mothers and timing of feeding decision according to infant feeding choice group

Age category (years)[1]	Breastfeeding mothers (n=72)	Replacement feeding mothers (n=27)
<18	8 (11.1%)	9 (33.3%)
19-24	35 (48.6%)	9 (33.3%)
25-29	14 (19.4%)	7 (25.9%)
30-34	9 (12.5%)	2 (7.4%)
>35	6 (8.3%)	0
When was the infant choice made:[2]		
Pre-pregnancy	50 (69.4%)	10 (37%)
First trimester of pregnancy	3 (4.2%)	2 (7.4%)
Second trimester of pregnancy	8 (11.1%)	4 (14.8%)
Third trimester of pregnancy	7 (9.7%)	7 (25.9%)
Post partum	4 (5.6%)	4 (14.8%)

1 Significant difference between women who chose breastfeeding vs replacement feeding by age category (X2 = 5.5, p=0.02)

2 Significant difference between women who chose breastfeeding vs replacement feeding by time when the decision was made (X2 = 8.6, p=0.003)

According to hospital records more than half of the participants (55%) were not infected with HIV, while 37% were infected and 8% had an unknown HIV status. Nineteen (51%) of the HIV-infected women actually chose breastfeeding as infant feeding method. Sixteen of these women were only going to breastfeed for less than six months. The recommendation is that one should breastfeed exclusively for six months. In the group of mothers that were not infected or had an unknown HIV-status only ten (18%) chose not to breastfeed. A significantly smaller percentage of the HIV infected women decided to breastfeed their infants, than women with known HIV negative status or unknown status (Figure 4).

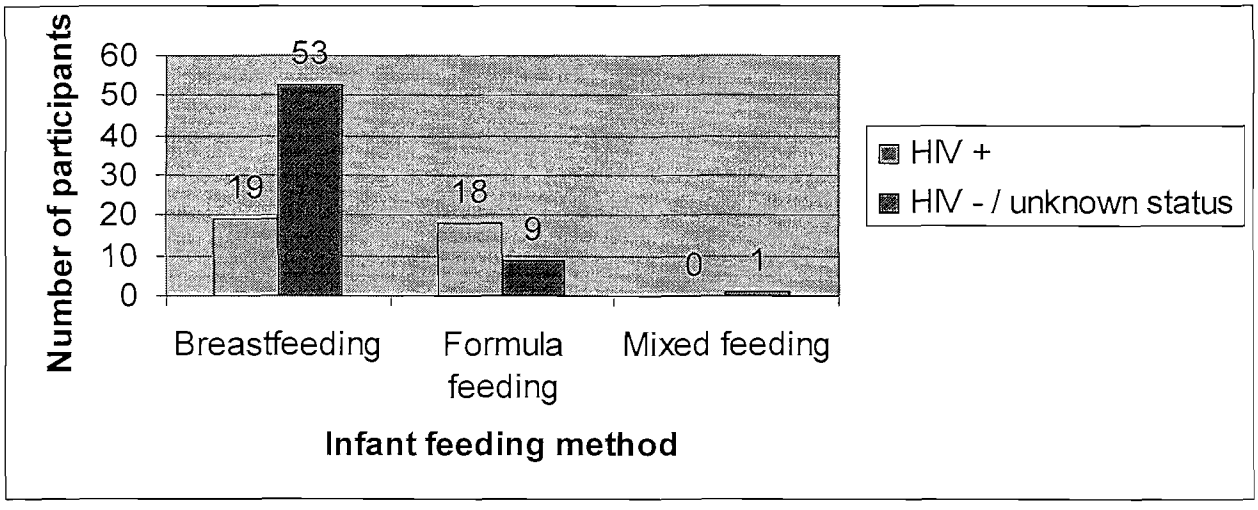

Figure 4. Comparison of choice of infant feeding method by HIV infected vs. HIV-negative women and women with unknown status (significant difference in distribution, $X^2 = 12.7$, $P = 0.0004$, chi-square test).

Focus group discussion

Most of the information that mothers got about infant feeding was from the clinics and health care workers. They mostly received information about the benefits of breastfeeding. The mothers that were breastfeeding their infants felt very positive about breastfeeding. They mentioned many benefits of breastfeeding when asked what their feelings were about breastfeeding (Box 1).

Box 1. **Feelings about breastfeeding**

"Breastfeeding is good, when you are positive or not."

"It is better to breastfeed, because you develop a strong and healthy baby."

"... you bond with your baby."

"It is better to breastfeed even if you are positive. You have a right to breastfeed your baby."

The mothers that were breastfeeding felt negative about formula feeding (Box 2).

Box 2. **Feelings about formula feeding**

"Formula feeding is not right. If you are not sterilizing the bottles the baby can get infections."

"I do not think it is better to formula feed because you are only supplied for 6 months and after that you do not have money to buy formula. It is better to breastfeed and not formula feed."

"It is not good when she is diluting the formula or not cleaning the utensils properly."

When it came to formula feeding the mothers felt that it is important that one mixes it correctly and ensures that the utensils that one uses are sterilized. The mothers that did choose formula said that when one formula feeds an infant one can go back to work or school and then someone else can look after their baby. When it came to infant feeding and HIV some mothers said that it is better to formula feed, because with breastfeeding one can transmit the virus to the baby. Others felt that

breastfeeding was still important for the first six months, but after that one should stop breastfeeding and not mix-feed.

According to the respondents some communities think that when one is HIV-infected one should not breastfeed, because one can infect the baby. The non-educated also think that you are wrong in breastfeeding your baby. Stigmatization is still very relevant, because when you formula feed you are labeled as being HIV-infected. There are some communities that do prefer mothers to formula feed. One mother pointed out that there is a lack of education in the community, because they do not understand why one chose formula feeding or breastfeeding (Box 3).

Box 3. **Community's feelings about formula feeding when HIV +**
"The community would prefer the formula feeding because the child will not get infected."
"They just point at you and say that you are positive."
"They think it is the better way when you are giving formula. They also think you are positive when you formula feed."
"They think you do not want to provide your baby with the best milk when you are formula feeding."

The mothers that did decide on formula feeding said that the most important reason was either because they were in school or going back to work (Box 4). There was one mother that stated one should use formula because it is available for free from the Government.

Box 4. **The most important reason why they chose their infant feeding method**

"I chose formula feeding because I can leave the baby with the nanny when I am working."

"I chose breastfeeding so that my baby can grow well."

"I chose breastfeeding so that my baby will get love from me and get strong."

DISCUSSION

There was a high prevalence of breastfeeding in this group of women. This could be because the hospital is accredited with being a Baby-friendly hospital. It has been shown that BFHI can partly be responsible for an increase in breastfeeding rates (Perez-Escamilla, 2008). The information from the questionnaires and the focus group discussions gives an indication that the mothers receive good education about breastfeeding and formula feeding from the clinics. The high number of women choosing breastfeeding may probably be linked to the fact that the majority had a high school education. It has been shown that breastfeeding women tend to be more educated then non breastfeeding women (Grossman *et al.,* 1990). The mothers that did decide on formula feeding said that the most important reason was either because they were in school or going back to work. Only a small group (1.1%) of the women that did choose formula feeding chose it because they were going back to work or school. Even if a mother is not going to be with her infant during the day, it is still possible to breastfeed her infant. The mother can express her breast milk and leave it at home for the caregiver to give with a cup. Also when she is at home, she can still breastfeed her infant. In this study it was not yet known if the women that did choose breastfeeding, would be breastfeeding exclusively. The rates of exclusive breastfeeding in South Africa are very low (Anon, 2002). This will also have implications with regards to HIV-infected women that would not

breastfeed exclusively for the first 6 months, because it would increases the risk for transmission of HIV through breast milk (Fowler, 2008).

Eighteen (48.6 %) of the HIV-infected mothers chose formula feeding as an infant feeding method. One participant actually answered that she chose formula feeding because of her HIV status. This may have been a reason for some of the mothers who chose formula feeding, but because of the stigma of HIV they did not want to divulge their status. Permission was however granted by the participants to look up their status in their file. Many mothers lived in resource poor settings and would not be able to formula feed their infant safely. The WHO (2006), stated that replacement feeding is recommended for HIV-infected women only when it is acceptable, feasible, affordable, sustainable and safe. This high percentage of mothers that chose formula feeding is a cause for concern, because of the problems that are associated with not breastfeeding their infants. Infants that are formula fed have a six times greater risk of dying in the first two months of their life, infants two to three months have a four times greater risk and four to five months a 2.5 times greater risk than infants that are being breastfed (WHO, 2000). Formula feeding is not a safer feeding method in Kwazulu-Natal due to the fact that there was a cholera epidemic in 2000 (Coutsoudis *et al.*, 2002). This would increase the risk for formula fed infants to develop cholera in such an epidemic that can lead to death. Sixty three percent of the women only had pit toilets and 59% had tap water outside and 8% got their water from rivers or dams and this could cause hygiene problems due to the fact that they did not have proper sanitation at their homes.

There is also the problem with obtaining the free formula from the clinic. Some mothers do tend to run out of formula milk and at some facilities the formula milk is only given on specific dates (Doherty *et al.*, 2006). Some mothers could even be pressured into making an inappropriate decision (Coutsoudis *et al.*, 2002) and end up harming the health of their children. The mothers that come from a poor socio-economic background would not be able to afford to buy formula and in the end the child suffers. For women who do not know their status it is important to still promote

exclusive breastfeeding, because it reduces the postnatal transmission of HIV among these mothers (Piwoz *et al.*, 2007).

The intended duration of breastfeeding in this group of women is very low. Fifty seven percent of the breastfeeding women were intending y to breastfeed their infant for less than six months. Only 26 % of these mothers are HIV-infected and have a reason to stop breastfeeding before six months. It is important that these mothers stop breastfeeding at six months. If breastfeeding should continue it would lead to mixed breastfeeding associated infections in those infants that were exclusively breastfed. Infants are only protected against HIV-transmission when they are exclusively breastfed and this protection ends when they are started on complementary foods while they are still breastfeeding (Coutsoudis *et al.,* 2001). Duration of breastfeeding increases the risk of HIV-transmission through breast milk because of the addition of foods and other liquids. One limitation in the study is that the questionnaire did not include a question about exclusive breastfeeding. This would have been helpful in seeing if the mothers that do breastfeed are going to exclusively breastfeed. Mixed feeding is a problem in South Africa, because not many children are exclusive breastfed the first 6 months of their lives.

Previous breastfeeding experience independently contributes to predicting breastfeeding intention (Kloeblen-Tarver *et al.*, 2002). This would be important to ensure that the mothers choose breastfeeding for their first infant, because this would increase the chance that they would choose breastfeeding for their other infants.

For some of the women the health workers at clinics had a great influence in their infant feeding decision. This has also been documented in other studies (Doherty *et al.,* 2006; Chezem *et al.*, 2001; Piwoz *et al.,* 2006). The second highest percentage (33%) of participants in the present study indicated that the nurses or counselors or someone at the clinic influenced their infant feeding decision. This is an indication that they get information about infant feeding choices from the clinic.

Women who receive information about breastfeeding from health care workers have a tendency to breastfeed exclusively for longer and avoid prelacteal feeds more (Ludvigson, 2003). It has been found in South Africa that the health education at clinics about infant feeding plays a significant role in their choice of infant feeding (Minnie & Greeff, 2006). It is important that education about breastfeeding is emphasized during pregnancy and also after delivery. The perceptions of the health care workers are also important, because that can have an influence on the information that is given to the mothers during counseling and have an affect on the choices that they make (Piwoz *et al.*, 2007). The families' attitude about breastfeeding also plays a role in the decision that was made (Kloeblen-Tarver *et al.*, 2002). The women who have a family member at home that breastfed before will have support to breastfeed. Thirteen percent of the participants in the present study were influenced by their mothers or female relatives in their infant feeding decision. The family still plays an important role when it comes to deciding on an infant feeding method. It is important that the family is also included during health education about breastfeeding (Chezem *et al.*, 2001).

According to the focus group discussion results the community thinks it is important to protect the infant against getting infected with HIV (Box 3). This could be an indication that the community is not getting the whole picture with regards to HIV transmission through breast milk. A study by Doherty *et al.* (2006) found through focus group discussions that the infant feeding choice was made mostly because they wanted to protect their infants. Some of these mothers in the study by Doherty felt forced into their decision of replacement feeding because of their HIV positive status (Doherty *et al.*, 2006). Other community members felt that they would not be giving their infant the "best milk" when they are formula feeding. This can lead to mixed feeding, when mothers chose formula feeding and then they are forced to give breast milk also. The perception that one should use formula because it is available for free from the Government is an indication that wrong messages are communicated to the community.

With the focus group discussions it was evident that mothers that chose breastfeeding had a positive attitude towards breastfeeding and those that chose formula feeding had a positive attitude towards formula feeding. Attitudes can determine behavior and if women display a positive attitude towards breastfeeding it will help support them in choosing breastfeeding as an infant feeding method (Shaker *et al.*, 2004).

The limitations of the study were that it was only done in one hospital in Kwazulu-Natal and cannot necessarily be generalized to the population of South Africa. Most of the women were unemployed and going back to work was not a factor in choosing an infant feeding method in this study. Another limitation was that the questionnaires were not totally done in private, due to the fact that the field workers gathered the information while the mothers were still in their beds. This could have made the mothers not answer truthfully or they could have been influenced by the answers from the other mothers.

CONCLUSION

When it came to the infant feeding decision that the mothers made, some of them were influenced by health care workers. The majority of the mothers made their own decision even after receiving information about infant feeding choices. We must acknowledge the influence that the health care workers have on the choice of infant feeding method, because of their own perceptions about the transmission of HIV through breast milk. Significantly more HIV-infected mothers chose replacement feeding as infant feeding method, and mothers who chose breastfeeding were significantly older than mothers who selected replacement feeding and they made their infant feeding decision significantly earlier than those who chose replacement feeding. Breastfeeding still remains an important part of health education during antenatal clinic visits and the emphasis should be on exclusive breastfeeding.

It is important that health professionals promote exclusive breastfeeding for the first 6 months of the infant's life as a better infant feeding method than mixed feeding. With the high prevalence of HIV in this community, it is important that women of child-bearing age receive all the necessary information about exclusive breastfeeding and the dangers of mixed feeding. The majority of the community came from a poor socio-economic background and they would not be able to safely and successfully formula feed their infants. Many of these infants would then end up with diarrhea, infections and malnutrition that may even lead to death.

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ANNEXURE A: QUESTIONNAIRE

Questionnaire for mothers on how the decision about infant feeding method was made and the reasons for infant feeding choice.

Demographic information:

1. Age (years):

< 18	1
19 – 24	2
25 – 29	3
30 – 34	4
>35	5

2. Marital status:

Married	1
Single – never married	2
Co-habitating	3
Separated (Widowed, divorced)	4

3. Education level:

No school education	1
Primary school only	2
Grade 8 – 11	3
Matric	4
Tertiary education (degree/diploma)	5

4. Ethnicity:

African	1
White	2
Indian	3
Other: specify.....	4

Socio-economic information:

5. Mother's main activity during the day:

Staying at home / Unemployed	1
Student/ scholar	2
Formal employment	3
Informal employment / Part-time	4

6. If employed, state type of employment

Informal sales/ vendor	1
Parking assistant/ security	2
Cleaning services/ domestic work	3
Office work	4
Professional	5
Other: specify.....	6

7. Number of people in household:

1 – 3	1
4 – 6	2
>7	3

8. Previous children:

None	1
1 – 3	2
4 – 6	3
>7	4

9.Are you smoking?

Yes	1	No	2

10. Mother's BMI after delivery: Weight: ..... Height: .....

< 18	1	25 – 30	3
18 – 24.9	2	> 30	4

11. Types of accommodation:

Brick house	1
Tin shack	2
Clay hut	3
Other:	4

12. Resources available:

Electricity	Yes	1	No	2
Access to tap water	inside	3	outside	4
Toilet facilities	pit toilet	5	bucket	6
	inside flush	7	outside flush	8
	Other.....		9	
Energy source for cooking	Gas	10	Paraffin	11
	Electricity	12	Wood/coal	13

Delivery details:

13. Method of delivery:

Spontaneous vaginal delivery	1
Assisted delivery	2
Elective caesarean under general anaesthetic	3
Elective caesarean under other anaesthetic	4

14. Maternal complications:

Post-partum haemorrhage	1
Third degree tear	2
None	3

Infant feeding:

15. What is your infant feeding choice?

Breastfeeding	1
Formula feeding	2
Other:_____	3

16. If you chose breastfeeding, what is your intended duration of breastfeeding?

0 – 6 months	1
7 – 12 months	2
13 – 18 months	3
19 – 24 months	4
> 24 months	5

17. What / who influenced your infant feeding choice the most?

_____

_____

_____

_____

18. Who made the decision about your infant feeding method?

Self	1
Husband/infant's father	2
Mother	3
Grandmother/aunt/female relative	4
Father/ male relative	5
Health professional (doctor/nurse/dietician?	6
Traditional healer	7
Other:	8

19. When was your infant feeding choice made?

Pre-pregnancy	1
Trimester 1	2
Trimester 2	3
Trimester 3	4
Post-partum	5

20. Did anyone in your household use the same infant feeding method?

Yes	1	No	2

21. Do you have any previous experience in your infant feeding choice (breast/bottle feeding)?

Yes	1	No	2

22. If yes for how long?

_____

23. Did you receive any education/counselling about your infant feeding choice (breast/bottle feeding)?

Yes	1	No	2

24. If yes by whom?

_____

Mother	1
Grandmother/aunt/female relative or friend	2
Father/ male relative or friend	3
Health professional (counselor/doctor/nurse/dietician)	4
Traditional healer	5
Books/ magazines/ other printed media	6
TV/ radio	7
Other:	8

ANNEXURE B: DISCUSSION GUIDE

Introduction:

Introduce facilitator, recorder and participants.

Purpose:

The purpose of this discussion is to understand why mothers choose their specific infant feeding method. You were chosen to participate because you have just delivered and the reason behind your infant feeding method is still clear and it will help to enlighten our understanding of this topic. The information that you are giving us will be used for a research study about "Factors affecting mothers' choice of infant feeding method". A questionnaire with regards to this topic was also circulated.

Rules:

There are no wrong or right answers. It is an open discussion and no one will judge you with regards to your answers. Everything will be recorded in writing and on a recorder. Your privacy will be ensured with regards to any comments that you make.

Older women

Questions:

Icebreaker: "How many children do you have?"

Introductory question: "What kind of infant feeding method did you use for your other children?"

1. Who influenced you the most in your infant feeding choice for this new infant?
2. If it was a person who influenced you, what did the person do or say to let you decide how to feed your infant?
3. What type of information did you receive about your infant feeding choice that you have made?

4. What are your feelings regarding HIV+ women breastfeeding their infants?
5. What are your feelings regarding HIV+ women formula feeding their infants?
6. How does your community feel about HIV+ women breastfeeding?
7. How does your community feel about HIV+ women formula feeding?
8. What are your feelings towards breastfeeding in general?
9. What are your feelings towards formula feeding in general?
10. What was the most important reason why you chose your infant feeding method?
11. Is there any other information about your infant feeding choice you would like to add?

Younger women

Questions:

Icebreaker: "How many children do you want?"

Introductory question: "How do you feel about feeding your new baby??"

1. Who influenced you the most in your infant feeding choice?
2. If it was a person who influenced you, what did the person do or say to let you decide how to feed your infant?
3. What type of information did you receive about your infant feeding choice that you have made?
4. What are your feelings regarding HIV+ women breastfeeding their infants?
5. What are your feelings regarding HIV+ women formula feeding their infants?
6. How does your community feel about HIV+ women breastfeeding?
7. How does your community feel about HIV+ women formula feeding?
8. What are your feelings towards breastfeeding in general?
9. What are your feelings towards formula feeding in general?
10. What was the most important reason why you chose your infant feeding method?
11. Is there any other information about your infant feeding choice you would like to add?

Summary:

Summarize all the information received to see if the participants agree with what was recorded.

Thank you for participating in this focus group discussion.

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