

**THE SAFETY OF INFANT FEEDING PRACTICES IN A
SEMI-URBAN COMMUNITY IN THE NORTH WEST
PROVINCE**

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**A mini dissertation submitted in partial fulfilment of the requirements for the
degree Magister Curationis (Obstetric and Neonatal Nursing Science) at the
Potchefstroom Campus of the North-West University**

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November 2007

AKNOWLEDGMENTS

I wish to express my sincere thanks and gratitude to all the people who contributed in so many ways towards the completion of this research at the North-West University.

In particular, I wish to thank the following persons:

- My father and mother for their support, love and true belief that I could do this.
- My brother and sister, Jannes and Isabel for encouraging me.
- My friends, Marilize, Moza, Karlien, Marieke and Miranda for always understanding when I was absent-minded due to being busy with my studies.
- My boyfriend Danie, for believing in me and encouraging me to finish what I started.
- My study leaders, Dr. Karin Minnie and Prof. Christa van der Walt for all their patience, help and motivation.
- Prof. Hester Klopper for all her help and support.
- Dr. S Ellis for her statistical consultation.
- Prof. L.A. Greyvenstein for editing the dissertation.
- The participants who completed the questionnaires.
- The friendly staff at all the local clinics.
- My fieldworkers, Ruth, Elizabeth and Sarah. Without them this would not have been possible.
- The rest of my family for all their support and prayers.
- The North-West University of Potchefstroom.
- NRF and NWU bursary as part of Thuthuka-Grand (C.S. Minnie – HIV testing in pregnancy).

DEDICATION

I dedicate this dissertation first and above of all to God, my Saviour. I thank Him for giving me the ability to complete this research project, for in Him lays my strength and hope.

ABBREVIATIONS

MTCT:	Mother-to-child transmission
PMTCT:	Prevention of Mother-to-child Transmission
WHO:	World Health Organisation
UNICEF:	United Nations Children's Fund
UNFPA:	United Nations Population Fund
ILO:	International Labour Organisation
UNAIDS:	Joint United Nations Programme on HIV/AIDS
UNFPA:	United Nations Population Fund
UNHCR:	United Nations High Commission for Refugees

SUMMARY

In this mini-dissertation the aim was to explore and describe the safety of infant feeding practices. It is argued that safe infant feeding practices can have a positive and long term effect on the health status and growth development of all infants.

World wide, countries but more specific developing countries, are faced with the growing dilemma of high mortality and morbidity rates among infants. The need to find a way to eliminate and prevent the causing factors of life-threatening infectious diseases like diarrhoea and HIV/AIDS is now more important than ever before. A sound nutritional foundation together with safe infant feeding methods play a predominant role in ensuring the very survival of the infant.

A cross-sectional, descriptive research design was used in this study. Non-probability sampling was used to identify the sample who complied with the set selection criteria. The research took place in a semi-urban community as the community serves a large group of mothers and infants as well as being accessible to the researcher. The semi-urban community was also identified as an area with health care needs that could be addressed in the research project. A questionnaire was adapted from an existing WHO assessment tool. A pilot study was conducted after which the questionnaire was finalised and the questionnaires were completed with the aid of three fieldworkers. Data collection took place until the sample size (n=155) was achieved according to the calculation of the statistician. The data analysis was done by means of descriptive statistics such as frequency, percentage, mean and standard deviation by using the STATISTICA data analysis software system programme.

The results of the research study indicated that the majority of participants practice mixed feeding methods which do not comply with safe infant feeding standards. Infant feeding methods are not changed during illness or disease experienced by either the mother or infant, which again may greatly compromise their health status. The uptake of HIV testing and disclosure were relatively high.

Recommendations are made for nursing education, nursing research and nursing practice with special focus on establishing safe infant feeding practices.

[Key terms: infant feeding practices, safe and unsafe infant feeding practices, HIV/AIDS, mothers and infant]

OPSOMMING

Die doel van hierdie mini dissektasie was om die die veiligheid van babievoedingsgebruike te ondersoek en te beskryf. Daar word geargumenteer dat die veiligheid van babavoedingsgebruike 'n positiewe en langtermyn effek op the gesondheidstatus asook ontwikkeling van die baba kan hê.

Wêreldwyd word lande, maar veral ontwikkelende lande, met die groeiende dilemma van hoë morbiditeit en mortaliteit syfers onder babas gekonfronteer. Die behoefte om 'n weg te vind om die bydraende faktore van lewensbedreigende infeksies soos diarree en MIV/VIGS, te elimineer en te voorkom is nou belangriker as ooit. 'n Standvastige voedingsfondasie is nodig tesame met veilige voedingsmetodes aangesien dit 'n primêre rol speel om die oorlewing van die baba te verseker.

'n Kruis-seksie, beskrywende navorsingsontwerp is gebruik tydens die studie. 'n Nie-waarskynlikheid steekproef metode is gebruik om die steekproef te identifiseer volgens die voorgesette kriteria. 'n Vraelys is afgelei aan die hand van 'n bestaande vraelys van die WGO. 'n Proefstudie is gedoen waarna die vraelys gefinaliseer is. Die vraelyste is voltooi met die hulp van veldwerkers. Data insameling het plaasgevind totdat die steeproof grootte bereik is ($n=155$), soos vooraf bereken deur die statikus. Data analise is gedoen deur gebruik te maak van StatSoft (2006) analise sagterware rekenaar program en beskrywende statistieke soos frekwensie, persentasie, die gemiddeld asook standaard afwykings.

Die navorsingsresultate het daarop gedui dat die meerderheid van deelnemers gebruik maak van gemengde voedingsmetodes wat in teenstelling is met veilige voeding standarde vir babas. Babavoedingsmetodes bly onveranderd in die teenwoordigheid van siektetoestande by die moeder of baba en dit kan die gesondheidstatus van beide benadeel. Die opname syfers vir MIV toetsing was relatief hoog.

Aanbevelings is gemaak ten opsigte van verpleegonderwys, verpleegnavorsing asook verpleegpraktyk met die fokus om veilige baba voedingsgebruike te vestig.

[Sleutelkonsepte: babavoedingsmetodes, veilige en onveilige voedingsmetodes, MIV/VIGS, moeder en baba]

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CHAPTER ONE

OVERVIEW OF THE STUDY

1.1 INTRODUCTION

In Chapter One an overview of the research will be presented, including a discussion on the background, the research aim, the paradigmatic perspective, the research design and methods, validity and reliability as well as ethical aspects.

1.2 BACKGROUND TO THE STUDY

The HIV/AIDS epidemic has a major impact on the health and survival of infants worldwide, especially in the sub-Saharan Africa region where it continues to evolve in a catastrophic fashion. The HIV prevalence rate in Africa is among the fastest growing in the world. In Sub-Saharan Africa an estimated 24.7 million adults and children under the age of 15 years lived with HIV/AIDS in 2004 (Veldman & Brink, 2004:38) and an estimated 2.8 million adults and children were newly infected at the end of 2006 (AIDS epidemic update, 2006). Since infection mostly affects the reproductive age-group, few are at greater risk of infection than babies born to HIV-positive women (Eide, Myhre, Lindbaek, Sunby, Arimi & Thior, 2004:146). In 1998 South Africa was identified as one of the countries with the fastest HIV expanding rates and although it appears that the HIV prevalence rate has stabilized, survey results published in a report by the Statistics South Africa estimate that annual deaths being HIV related increased by 87% from 1997 to 2005 (MRC, 2007). Among those aged 25-49 years, the rise was as much as 169%. According to the South African Department of Health (2006), an estimated 29.1% of pregnant women were living with HIV in 2006.

The overwhelming source of HIV infection among children is mother-to-child transmission (MTCT) which accounts for 7.7% of deaths in children under five years of age in Sub-Saharan Africa and up to 40% in other African countries (AIDS epidemic update, 2006). According to Eide *et al.* (2004:147), the MTCT rates are very high and lie between 15 to 40%, of which the highest rates occur among breast feeding populations.

Transmission of HIV to infants can take place during pregnancy, labour and delivery, but vertical transmission due to unsafe infant feeding practices is the major contributing factor in mother-to-child transmission of the HI-virus during the postnatal period (Coutsoudis, Pillay, Spooner, Kuhn & Coovadia, 1999:474; WHO, 2001d; Coutsooudis, Pillay, Spooner, Kuhn & Coovadia, 2001:15).

The HIV transmission rate from mother-to-child via breast milk is approximately 30% in developing countries, thus accounting for 12% to 26 % of all cases (Veldman & Brink, 2004:39). This knowledge has significantly altered the context within which women make decisions about how they will feed their infants. Most HIV-infected women in the industrialized world now choose to formula feed and avoid breast feeding, but this remains a challenge in resource-constrained settings, where cultural beliefs play a prominent role with regards to infant feeding practices (Veldman & Brink, 2004:40). The lack of access to safe water, constant and reliable formula supply and means to safely prepared formula feedings, greatly compromise the ability of mothers in developing countries to implement safe formula feeding practices as recommended by the World Health Organisation (WHO, 2001b).

According to WHO (2003a:v), 50% to 70% of diarrhoeal, measles, malaria and lower respiratory infections in childhood are attributable to under nutrition and unsafe feeding practices. As unsafe and poor infant feeding practices have a life-long impact on health and development which can lead to poor school performance, reduced productivity and impaired intellectual and social development, all possible actions must be taken to avoid this (WHO, 2003a). The WHO (2003b) strongly supports the implementation of safe feeding practices and, therefore, infant feeding guidelines are based on two main principles, namely, all guidelines are to be grounded on the best available scientific evidence as well as being participatory as far as possible. According to these guidelines, safe infant feeding includes the protection, promotion and support of exclusive breast feeding and timely and adequate complementary feeding, while paying special attention to low birth weight infants, risk of HIV/AIDS and malnutrition. For mothers who test negative for HIV, or who are untested, exclusive breastfeeding remains the recommended feeding option. For mothers who are HIV positive, adequate advice is necessary on the choice of either practicing exclusive breast feeding for the first six months or opting for an alternative replacement feed such as formula feeding. The emphasis must remain on choosing a safe and suitable feeding method taking each mother's individual circumstances into consideration (WHO, 2003b:11-12). The major problem in the developing countries, including South Africa, is that the majority of pregnant women do not know their HIV status. This study

forms part of a NRF study which focuses on HIV and pregnancy and the safety of infant feeding practices. A study conducted in Durban, South Africa, on the influence of infant feeding patterns on early MTCT of HIV-1 (Coutsoudis, 2000:136), found that children exclusively breast fed to at least three months were less likely to be infected (14,3%) than those receiving mixed feeding before three months (24.1%). As the proportion of infants under four months currently receiving exclusive breast milk does not exceed 20% in most African countries, it leaves the health sector facing a significant challenge with regard to HIV prevention efforts (Tholandi,Wilkinson, Dabis, Kennedy, Madi & Leroy, 2003:1).

Exclusive breast feeding is defined as the infant only receiving breast milk and no additional fluids of any kind, except drops of vitamins, mineral supplements or medicine. Mixed feeding is when an infant receives breast milk together with other fluids or solids, such as water, juice or porridge. Exclusive formula feeding is when an infant only receives formula feeds and other fluids, but is never exposed to breast milk (WHO, 2001c). In South Africa the PMTCT (Prevention of Mother-to-child Transmission) programme recommends counselling of all pregnant women with regard to infant feeding practices and encourages the mother to choose either exclusive breast feeding with early weaning at four to six months or exclusive formula feeding, freely provided by the government until six months. This is according to the guidelines of the WHO (2003a).

Despite counselling on the benefits of exclusive feeding practices and the provision of free formula, many mothers fail to comply with the proposed feeding practices (Doherty, Chopra, Nkonki, Jackson & Greiner, 2006:91). On the other hand one of the reasons for non-compliance may possibly be ascribed to poor counselling with minimal advice and support to promote the chosen feeding method as recent studies have revealed that this is rather a common tendency among health care workers (Doherty, Chopra, Jackson & Ashworth, 2005:359). This inevitably leads to unsafe feeding practices, again contributing to an increased risk of mother-to-child transmission (Veldman & Brink, 2004:41; Doherty *et al.* 2005:361).

Another contributing factor is that neither exclusive breast feeding nor exclusive substitute feeding practices are the cultural norm in most African countries (Chopra *et al.* 2005:357; Doherty *et al.* 2006:90).

Non-compliance to safe infant feeding practices is often found among mothers living in poor settings, irrespective of their HIV-status. Complete avoidance of breast feeding or exclusive breast feeding practices are either impossible, or not the most favourable option, resulting in mixed infant feeding, which in turn seriously compromises the effectiveness of child survival programmes (Bergstrom, 2003:4-20).

The choice to be tested and disclose an HIV status as well as non-compliance to safe feeding practices can be ascribed to a number of reasons, such as stigmatization, discrimination, rejection or isolation and in some cases even episodes of violence (Doherty *et al.* 2006:92; Eide *et al.* 2006:149). Another problem confronting HIV positive mothers with regard to the choice of infant feeding is peer pressure, from the side of both health workers and family members. Health workers have a decisive influence on initial infant feeding choices (Suryavanshi, Piwoz, Liff, Moulton, Zunguza, Nathoo, Hargrove, Zvitombo study group & Humphrey, 2003:1327).

Exclusive breast feeding is the best feeding practice, even in the absence of HIV. The most important advantages of exclusive breast feeding is a lower morbidity rate related to gastrointestinal infection, respiratory tract infections and atopic dermatitis, especially in developing countries (Kramer & Kakuma, 2006:2; MacDonald, 2003:1).

Over 3,000 studies on the nutritional benefits of exclusive breast feeding for four to six months have been identified, reviewed and evaluated by the Expert Committee of the WHO in 2001 (WHO, 2001c) and it was conferred that the health benefits of exclusive breast feeding cannot be ignored. It was concluded that exclusive breast feeding can meet all nutrient needs during the first 6 months, with possible exception of vitamin D and iron deficiency occurring in some populations (Dewey, 2001:87; WHO 2001c). This problem, however, is addressed by the provision of vitamins and iron by the primary health clinics and, therefore, the WHO (2001c) globally recommends exclusive breast feeding to be practiced by all mothers, unconditional of their HIV status.

The existing situation concerning infant feeding practices calls for intensified efforts to improve and promote the health status of all mothers and babies, irrespective of their HIV status. The power to change the negative consequences associated with unsafe feeding practices needs to start at the primary health sector among midwives and health care workers and every mother with an infant. Through thorough investigation into the current feeding practices of mothers, one

hopes to contribute to the process of equipping mothers to feed their babies in the safest and most beneficial way.

Against the background of different aspects of safety of infant feeding related practices, the following question arises:

- What are the infant feeding practices with regard to safety in a semi-urban community in the North West Province of South Africa?

1.3 RESEARCH AIM

The aim of this study was to explore and describe infant feeding practices within the semi-urban community in the North West Province of South Africa in order to determine whether the safety of feeding is compromised by current infant feeding methods.

1.4 PARADIGMATIC PERSPECTIVE

The paradigmatic perspective of this research is based on the author's meta-theoretical, theoretical and methodological assumptions. The paradigmatic assumptions will present a clearer understanding of the researcher's philosophical ideas and perceptions providing a firm foundation upon which the researcher based the research.

1.4.1 Meta-theoretical assumptions

The meta-theoretical assumptions are founded in the Christian faith and include assumptions regarding man, environment, health and illness.

1.4.1.1 Man

Man is a human being created in the image of God and functions as a whole in body, mind and spirit. Man cannot live alone, but lives in constant interaction with other human beings in a community with the direct command to rule the world, together with the responsibility to be accountable for all actions.

A mother carries the ultimate responsibility to ensure that her baby receives adequate nutrition. As a human being the mother has a free will and the ability to make informed decisions about feeding methods. She looks up to the midwife for guidance in this regard. However, her constant interaction with her environment (for example the midwife, family and friends in the community and especially her own mother or other older women), greatly influences her choice and practice of infant feeding.

1.4.1.2 Environment

The world was created by God and given to man to cultivate and care for. Man shares the world with other living beings and functions within an interdependent relationship between the external world being other human beings and the immediate environment as well as man's internal environment consisting of body, mind and spirit. Man's lifestyle can, therefore, be influenced in either a positive or negative way by the environment, posing possible threats to man's health and well-being. For this study the environment includes both the social and physical environment, which both can influence the safety of infant feeding practices e.g. peer pressure and stigma experienced in the social environment and unhygienic living conditions in the physical environment.

1.4.1.3 Health and illness

Health does not only refer to the absence of illness or disease, but is a state of spiritual, mental and physical wholeness and well-being experienced by man. Illness can be described as ranging from minimum to severe illness implying the presence of either physical, mental, social and spiritual risks or problems. Health can be promoted and illness can be prevented and limited by gaining knowledge through health education and practicing safe infant feeding practices.

The health status of each individual is dependent on many factors, amongst which generic, environmental and individual lifestyle factors are important. Safe feeding practices are important determinants in the health of infants, especially given the high prevalence rate of HIV/AIDS and Aids in the South African context. The presence of good health or illness has a long term effect which directly determines the quality of life experienced by each individual and needs to be taken seriously from as early as infancy.

1.4.2 Theoretical assumptions

Theoretical assumptions include the formulation of the central theoretical argument as well as the theoretical descriptions of key terms applicable to this study.

1.4.2.1 Central theoretical argument

The safety of infant feeding practices is an important measure to prevent the occurrence of life threatening diseases including HIV/AIDS. In order to promote safe infant feeding practices, it is important that current practices need be investigated and described.

1.4.3 Theoretical descriptions

The following concepts are central to this study and are, therefore, defined:

1.4.3.1 Human immunodeficiency virus (HIV)

The virus that causes AIDS. In this document, the term HIV means HIV-1. Mother-to-child transmission of HIV-2 is rare (UNICEF, 2003:v).

1.4.3.2 Mother-to-child-transmission (MTCT)

Transmission of the HI-virus to a child from an HIV-infected woman can occur during pregnancy, delivery or breast feeding. The term is used here because the immediate source of the child's HIV infection is the mother. Use of the term *mother-to-child transmission* implies no blame, whether or not a woman is aware of her own infection status. A woman can contract HIV from unprotected sex with an infected partner, from receiving contaminated blood, from non-sterile instruments (as in the case of injecting drug users), or from contaminated medical procedures (UNICEF, 2003:v).

1.4.3.3 Infant

A person from birth to 12 months of age (UNICEF, 2003:v), also refer to as baby in this study.

1.4.3.4 Infant feeding

The food given to an infant to provide in his/her nutritional needs. This includes breast feeding and a breast feeding substitute like formula feeding, irrespective of the method the feed is given to the infant (UNICEF, 2003:v).

1.4.3.5 Mixed feeding

Mixed feeding can be defined as practices where the mother gives other fluids or food in addition to breast milk, thus feeding both breast milk and other foods or liquids (UNICEF, 2003:iv). This includes any supplements given to the infant such as substitute feeds, either milk or cereal, or other food, such as water and rooibos tea.

1.4.3.5.6 Safe infant feeding practices

Infant feeding practices that promotes health and growth and do not contribute to illness.

1.4.3.7 Exclusive breast feeding

An infant receives only breast milk, and no other liquids or solids, not even water, with the exception of drops or syrups consisting of vitamins, mineral supplements or medicines. The infant may be exclusively breast fed with expressed human milk from his mother, a breast milk donor or from a milk bank (UNICEF, 2003:v).

1.4.3.8 Breast-milk substitute

Any food being marketed or otherwise represented as a partial or total substitute for breast milk, whether or not suitable for that purpose (UNICEF, 2003:v). A industrially produced breast-milk substitute must be formulated in accordance with applicable Codex Alimentarius standards to satisfy the nutritional requirements of infants during the first months of life up to the introduction of complementary foods (UNICEF, 2003:iv). It can also be referred to as formula feeding or replacement feeding during this study. If no breast milk is given with the breast milk substitute, the term exclusive formula feeding is used.

1.4.4 Methodological assumptions

The methodological assumptions of this research study are based on the research model of Botes (1992:37-42). The model provides a broad approach to the research process as well as providing an opportunity to be creative within a clearly defined framework. The model is arranged in three levels. The first level entails nursing practice from which problems are derived. The second level involves nursing research and enhancement of the scientific body of knowledge and the third level entails the paradigmatic perspective of the researcher. In this research all three levels were applied, with the aim to achieve quality data through the formal, objective and systematic research process when investigating the safety of current infant feeding practices.

1.5 OVERVIEW OF THE RESEARCH DESIGN AND METHODS

Only a cursory discussion on the research methodology will now follow because a detailed discussion is provided in Chapter Three.

1.5.1 Research design

In this study a cross-sectional, descriptive research design was used to answer the research question. The study specifically focuses on examining and describing the existing infant feeding practices in the semi-urban community in the North West Province of South Africa at a specific point in time, namely July 2007.

1.5.2 Research methods

1.5.2.1 Population and sampling

A non-probability sampling method was used, namely convenience sampling, as it was not possible to compile a sampling frame beforehand. To compensate for the possible occurrence of bias with certain elements being overrepresented or underrepresented as often the case with convenience sampling, specific measures were put into place. A detailed discussion will follow in Chapter Three.

The study was done in a semi-urban community of the Potchefstroom district in the North West province of South Africa consisting of five primary health clinics in the district.

The target population was women with six-weeks up to three months-old babies attending the clinic for post-natal check-up appointments. The participants were recruited at the clinics while they were waiting to see the midwife or physician, telling them about the study and what it would entail. The sample size was calculated according to the guidelines provided by a statistician from the Statistic Department of the North-West University.

1.5.2.2 Data-collection

A structured questionnaire was used for data collection (See Appendix D and E) . The contents of the questionnaire were adapted from a WHO assessment tool for infant feeding practices and are based on existing literature. The questionnaire was submitted to competent professionals followed by a pilot study, after which the necessary alterations were made where necessary. Written consent was obtained from the Research Committee of the School of Nursing Science and the North-West University, Potchefstroom Campus as well as the District Manager of Health Services of the Potchefstroom District before any data collection commenced.

The questionnaires were provided by the researcher to the identified clinics and three trained fieldworkers assisted the participants to complete the questionnaire. The completed questionnaires were then gathered by the researcher.

1.5.2.3 Data- analysis

Descriptive statistics (frequency, percentage, mean and standard deviation) were used to analyse the data. The processed data are presented in Chapter Four accompanied by data in table and graphic format.

1.6 VALIDITY AND RELIABILITY

The study complied with specific requirements in order to ensure validity and reliability. The criteria as provided by Burns and Grove (2005:377) were used to ensure validity and reliability. A detailed discussion will follow in Chapter Three.

1.7 ETHICAL ASPECTS

Research is conducted in an ethical manner, especially where *human subjects* are involved and was approved by the Ethics Committee (Appendix A). As researcher, the great responsibility to protect the rights of all participants throughout the research process by adhering to a set of ethical codes of conduct is acknowledged (Burns & Grove, 2005:83; Brink, 2006:30). The ethical considerations and measures will be discussed in detail in Chapter Three.

1.8 STRUCTURE OF RESEARCH REPORT

The structure of the thesis is as follows:

CHAPTER TWO: Infant feeding practices: A literature review

CHAPTER THREE: Research methods and procedures

CHAPTER FOUR: Results / Findings

CHAPTER FIVE: Conclusions, limitations of the study and recommendations for nursing practice, education and research

1.9 SUMMARY

In this chapter an overview of the research study was presented describing the background, the research aim, the paradigmatic perspective, the research design and methods, validity and reliability as well as ethical aspects and the structure of the research report. In the following chapter the literature review will be presented.

CHAPTER TWO

INFANT FEEDING PRACTICES: A LITERATURE REVIEW

2.1 INTRODUCTION

In this chapter a thorough overview of the current situation regarding infant feeding practices will be presented. The topics of discussion include the importance of safe infant feeding, nutritional needs of the infant, factors influencing choice, breast feeding versus substitute feeding as well as safe versus unsafe feeding practices.

2.2 IMPORTANCE OF SAFE INFANT FEEDING

The feeding method plays a predominant role in the process of giving each infant a fair chance to experience the highest possible level of quality life. Safe infant feeding practices are, therefore, vital to ensure that the health status of all mothers and infants is improved and promoted.

Several obstacles bar the way to achieve safe feeding practices. Research into all the issues regarding infant feeding practices, such as safety, feasibility and the threat of the deadly disease of HIV/AIDS as experienced in South Africa, will allow one to draw a clear picture of the current situation surrounding existing feeding practices and needs of the infant. In this way, the health care sector will be equipped with the necessary knowledge to act with efficiency against the high infant mortality rate, which in many ways is closely connected and associated with unsafe infant feeding practices. The conducted research is aimed at describing possible factors compromising infant health due to unsafe feeding practices, the important issue of the risk posed by the HIV-pandemic with special emphasis on mother-to-child transmission (MTCT) through infant feeding practices will be addressed.

Infant feeding practices have received much attention lately, being identified as an important component in the fight against infant and child mortality and morbidity, especially in developing countries. This statement is supported by (i) the Global Strategy for Infant and Young Child Feeding (WHO, 2001b) and (ii) the HIV and Infant Feeding Framework for Priority Action (UNICEF, 2003:5) and it is endorsed by (iii) WHO, UNICEF, UNAIDS, UNFPA, World Bank, WFP, UNHCR, FAO and IAEA (2001d) (see page iii for abbreviations). The Infant Feeding Framework for Priority Action proposes actions related to infant and young child feeding and includes intensifying efforts to protect, promote and support appropriate infant and young child feeding practices among all mothers, while recognizing HIV as one of the primary diseases contributing to global infant and young child morbidity and mortality. The framework furthermore supports and encourages research and disseminates findings on the topic of HIV and infant feeding – including operations research, learning, monitoring and evaluation at all levels (WHO, 2003a). The emanating recommendations are applied globally, with emphasis on areas with high HIV prevalence and low acceptance or availability of interventions to prevent mother-to-child transmission, thus also reaching HIV-negative women or women unaware of their status.

According to the Global Summary of the AIDS epidemic update (2006), in 2006 an estimated 530 000 children under the age of 15 years were newly infected with HIV and 2.3 million children under 15 years already live with HIV worldwide. Southern Africa is viewed as the epicentre of HIV/AIDS with 32% of the population infected with HIV (AIDS epidemic update, 2006). The HIV prevalence rate among pregnant women living in urban areas of Botswana increased from 38.5% in 1997 to 44.9% in 2001. In 2005, statistics showed that at least 40% of pregnant women between the age of 25-39 years were living with HIV situated in Southern Africa (UNAIDS, 2006:14). According to the UNAIDS (2006), the prevalence rate of HIV among South African women attending antenatal clinics has increased and was more than one third higher (35%) in 2005 than it had been in 1999. According to the youngest statistics, the infection levels among young pregnant women appear to stabilize (Department of Health, 2006). As the health status of the mother directly influences the health of her infant, the high HIV prevalence rate cannot be ignored as this diminishes the infant's right to a safe and healthy life, starting as early as the moment of conception continuing into infancy.

Safe infant feeding also relates to prevention of diarrhoea and other conditions caused by infection. If breast milk is substituted to prevent the risk of MTCT of HIV, the alternative must

also be safe with regard to infection, especially as the protection against (non-HIV) infection is lost if the baby is not receiving breast feeding (WHO, 2003a).

The feeding method plays a predominant role in the process of giving each infant a fair chance to experience the highest possible level of quality life.

2.3 NUTRITIONAL NEEDS OF INFANTS

Good nutrition is a crucial, universally recognized component of the child's right to the enjoyment of the highest possible standard of health. To ensure that this right is achieved, the global strategy for infant and child feeding is based on respect, protection, facilitation and fulfilment of accepted human rights principles (WHO, 2003b).

The mother and infant form a biological and social unit and, therefore, they share their nutritional foundation which already starts intra-uterine. The mother's well-being and nutritional status are key factors in the building process to ensure the infant's well-being and therefore the biological role of the mother does not end with birth but continues into the extra-uterine life where she provides feeding and care to her newborn infant (Raiten, Kalhan and Hay, 2007:577s). As the newborn enters extra-uterine life, the nutritional foundation needs to be strengthened to empower the infant to adjust successfully to the many exposed changes in growth and development that occur over a relatively short period of time (Biancuzzo, 1999:130). The choice and safety of feeding practices are two of the primary factors contributing to the process of building and maintaining an optimal nutritional status for the infant.

The infant's nutritional needs are based on the physical activity and rate of growth needed to support life. As an infant requires an excess of energy intake over energy expenditure in order to grow adequately, a state of chronic energy deficiency can develop if feeds do not fully provide in the infant's needs (Reilly & Wells, 2005:871).

The dilemma of insufficient energy supply can exist in a breast fed infant in the absence of enough milk production as well as in an infant receiving substitute feedings due to inadequate preparation methods (Bergstrom, 2003:8). The newborn infant must, therefore, receive an adequate feed intake whether it is breast milk or substitute feedings, sufficient in nutrients and other supplements to ensure that it provides in all the needs of the infant.

Breast milk is ideal as it naturally contains all the necessary components such as antibodies, living cells and enzymes. Substitute feedings on the other hand must be supplemented with essential components to ensure healthy growth and development of the infant (Bennet & Brown, 2002:710).

According to the American Pregnancy Association (2006), O'Conner (1998) and Newman (1995:76), the following components in breast milk are essential to ensure normal development and growth of the infant.

- Lipids are needed for brain development, absorption of fat-soluble vitamins, and are also a primary energy source. The long chain fatty acids are needed for brain, retina and nervous system development.
- Proteins are needed for cell development as well as facilitating the repair process of damaged cells caused by infectious diseases. If the protein composition is not correctly balanced as is the case in breast milk, it has the potential to damage the intestinal mucosa of the infant increasing permeability for foreign material like microbes (causing infection) and other types of protein that can cause an allergic reaction. The ratio of proteins (40%) versus whey (60%) as found in breast milk is less than found in any other mammalian milk. Allergic problems occur less frequently in breast fed babies than in bottle-fed babies (Lawrence & Lawrence, 2005:237; Bennet & Brown, 2002:707-711). Proteins also play a very important role in the defense mechanism of the infant against pathogens and diseases. Lactoferrin for instance has the ability to bind with two atoms of iron and as many pathogenic bacteria thrive on iron, lactoferrin prevents their spread by making iron unavailable. The growth of bacteria is furthermore impeded by lactoferrin as it disrupts the process by which bacteria are produced and multiplied.
- Carbohydrates are a vital component in energy supply, but also fulfil other important functions, for example lactose help to decrease the amount of unhealthy bacteria in the stomach. This assists the body to fight against diseases by promoting growth of healthy bacteria. This in turn improves the absorption of minerals such as calcium, phosphorus and magnesium.
- The various vitamins, both fat-soluble and water-soluble are essential for normal development and maintenance of body functions. Some vitamins are given to the infant just after birth and during post-natal visits, for the infant's body is not yet able to produce significant amounts. These vitamins include Vitamin A as well as Vitamin K, of which the latter is specific in preventing bleeding tendency in the infant.

- The Bifidus factor promotes the growth of a beneficial organism named *Lactobacillus bifidus* which inhibits the growth of bacteria by creating an acidic environment, thus increasing the disease-resistant system.

The responsibility for meeting the infant's nutritional needs first of all lies with the mother, but the health-care worker and midwife have the responsibility to provide the necessary information and guidance to equip the mother to establish and maintain a safe and adequate feeding method (Mandleco, 2004:86). The mother must provide feedings adequate in nutrition, for only then can the essential components as discussed above fulfill their important function to ensure normal growth and development. There are, however, various factors influencing the mother's choice of infant feeding.

2.4 FACTORS INFLUENCING THE CHOICE OF INFANT FEEDING

Known factors that may influence a mother's choice with regard to infant feeding practices will now be discussed.

2.4.1 Attitude of the society

Various factors strongly influence a mother's choice when it comes to making a decision between infant feeding methods, especially in the case of breast feeding. Such factors include the society's attitude, perceptions, cultural beliefs and traditions towards baby feeding practices (Khoury, Moazzem, Jarjoura, Carothers and Hinton, 2005:64; Omer-Salim, Persson and Olson, 2007:2; Ruowei, Rock and Grummer-Strawn, 2007:122). The choice of infant feeding is also associated with public status and more specifically economic deficiency where breast feeding may be seen as a method chosen by people of lower social and financial class, although this is more frequently applicable to mothers in developed countries, such as the USA (Khoury *et al.* 2005:66; Ruowei *et al.*, 2007:122).

The society's attitude towards baby feeding practices has undergone significant changes in the last few decades, especially towards breast feeding. Results from a survey conducted in the USA on public attitudes towards breast feeding show that a larger percentage of respondents agreed to the statement, "Infant formula is as good as breast milk", increasing from 14.3% to 25.7% from 1999 to 2003. The increase was particularly large among people of low

socioeconomic status (Ruowei, *et al.* 2007:122). This is supported by Khoury *et al.* (2005:64) who found that breast feeding rates are very low among some women despite the documented benefits of breast feeding for women and infants. This may be ascribed to the society's perception that infant formula is equivalent to breast milk. Although this research was done in the USA, it may also be applicable in Africa.

2.4.2 Tradition and cultural beliefs

In Africa, one must bear in mind that cultural beliefs and tradition still play a decisive role in the way mothers feed their babies, especially in developing countries such as found in Southern Africa (Chalmers, 1990:63). A good example of this is the belief among Pedi women that breast feeding results in weight loss. This is viewed as undesirable among them, opposed to Western women favouring weight loss due to breast feeding (Chalmers, 1990:64). Another example is that of mothers discarding colostrum, for it is viewed as insufficient. African values differ markedly from Western values and although their influence has diminished over the past few years, they must still be acknowledged and considered. African women are increasingly exposed to Westernized ways which may affect a mother's choice of infant feeding methods, causing confusion between her cultural and western beliefs (Chalmers, 1990:63; Jackson, Chopra, Witten and Sengwana, 2003:122; Hunt, 2006:24).

Urbanisation the traditional support system of the family, relatives and friends may have eroded or changed, diminishing the influence of traditional beliefs. The mother is now subjected to information from the mass media and the health care system (Omar-Salim *et al.* 2006:2). Although this is true, some traditions do continue. The possibility exists that the support mothers want and need may in reality differ from what is provided. Sensitive issues such as cultural and spiritual customs, therefore, need to be discussed and further explored during counselling sessions, only then can a combination of health care and community based interventions be developed and implemented in support of mothers (Chopra *et al.* 2005:357; Bland, Rollins and Coovadia, 2002:709).

2.4.3 Socio-economic factors

Breast feeding an infant does not require any additional costs with regard to preparation or running out of supply, but requires devotion, time and patience from the mother. Breast feeding

substitutes like formula feeding on the other hand does involve additional expenses. Feeding an infant for six months with commercial infant formula requires approximately 20 kg of formula, with an estimated cost of R160.00 per month according to current marketing prices.

According to the UNICEF (2003:54), a tendency may exist among health care workers to be biased towards formula feeding in the case of HIV positive mothers and where formula is provided by the government free of charge, which in turn may create a problem of counselling bias and equity. Taking into account the high unemployment rate in South Africa, the main dilemma of mothers of formula feeding infants is the cost related to nutritional needs when free formula supply is stopped at six months. The current situation in Uganda is a good example of this, as only 32% of HIV-positive mothers are opting for formula feeding after the government stopped providing free formula in 2002. According to UNICEF's PMTC coordinator, Dorothy Achola, one of the reasons for the decline is the expenses associated with formula feeding (Wendo, 2003:542).

Poverty also contributes to unhygienic preparation methods and over-dilution of formula milk to make it last longer and this in turn can cause child morbidity and mortality rates to increase due to diarrhoea, respiratory diseases and malnutrition (Suryavanshi *et al.* 2003:1326). Health care workers should, therefore, take every woman's individual financial and social circumstances into account when assisting her to make an informed decision with regard to infant feeding methods.

2.4.4 Health-care workers' knowledge and their influences

Health-care workers, especially midwives, play a vital role in facilitating the mother to choose a specific feeding method. The need to achieve consistency and rationality in the support given by health staff to all mothers has long been recognised, but is now more important than ever, especially in view of the threatening difficulties imposed by current diseases such as HIV/AIDS (Seidel, Sewpaul & Dano, 2000:24; Royal College of Midwives, 2002:xiv). As a health care worker, the researcher observed a shortage of hospital and clinic staff which complicates the situation even further, often resulting in a midwife being responsible to care for as many as 30 pregnant women to be examined and educated per day. The time available to provide in each individual mother and baby's needs with special regard to establishing a safe feeding practice is, therefore, often severely restricted. It is, therefore, crucial that all midwives and health-care

workers are well informed and adequately skilled to offer every mother the best advice available on the safest infant feeding practices. According to the Royal College of Midwives (2002:xiv) and Leroy, Newell, Dabis *et al.* (1998:599) the advice given needs to be uniform and constantly reinforced by all health care workers if any success is to be achieved.

High quality counselling is an important component of the PMTCT programme, for done well, it will facilitate the mother to make an informed decision about how to adequately and safely nourish her infant (Suryavanshi *et al.* 2003:1327). Good counselling can lead to a decrease in postnatal HIV transmission and improve infant feeding practices, but if done badly, results in poor infant feeding practices and life threatening infections of which HIV/AIDS via MTCT and diarrhoea are the primary causes of many unnecessary infant deaths (Chopra *et al.* 2005:357). A report by Khoury, Moazzem, Jarjoura, Carothers and Hinton (2005:68) supports this by stating that knowledge of the benefits of breast feeding are associated with higher initiation and duration rates among mothers, yet again emphasizing the importance of adequate health education.

In 2000 PMTCT programmes were launched by the South African government, providing free formula for the first six months to HIV-positive mothers. Eighteen pilot sites were set up in health facilities in the nine provinces of South Africa. Here specially trained counsellors provide pre- and post delivery health education and counselling to mothers about HIV testing as well as feeding options for the infants, based on the WHO's guidelines (Bergstrom, 2003:18). All mothers are encouraged to know their HIV status in order to provide proper and adequate support to mother and baby. Despite these efforts, recent studies have reported that health education provided is still not as successful as anticipated due to health care workers not conveying knowledge in a sufficient and practical way to pregnant women and mothers (Minnie & Greeff, 2006:19).

A study conducted by Chopra *et al.* (2005:359) on the quality of counselling in South Africa also concluded that although communication skills of counsellors are relatively good, a lack in crucial information communicated towards the patients does exist. This finding is supported by Bergstrom (2003:9) who found that counselling seemed to be given theoretically with no practical exercise, resulting in misconceptions and unsafe feeding practices. Chopra *et al.* (2005:359) also found that only a small percentage of mothers were informed about the risks of HIV transmission through MTCT and received instructions on correct preparation of formula

feeds and access to clean water, even though these factors play a decisive role when considering an infant feeding method.

The Baby Friendly Hospital Initiation (BFHI) intervention launched by the WHO in 1991 provided a uniform approach to breast feeding support, reducing the incidence of conflicting advice, and adheres to one of the major priorities of the WHO, namely, supporting exclusive feeding practices. This initiative proved to significantly increase breast feeding initiation rates, but further research also shows that this increased rate was not sustained once the mother leaves the hospital (Pincombe, Baghurst, Antoniou, Peat, Henderson & Reddin, 2007:6). The study conducted in Australia by Pincombe *et al.* (2007:6) to investigate the relationship between adherence to six of the BFHI *Ten steps to successful breast feeding* and the duration of breast feeding in first time mothers, concluded that early cessation of breast feeding could be strongly linked to the economic and socio-cultural environment and the absence of home visits by health care workers. The mean aggravated prevalence of exclusive breast feeding was 45% for the home visit group compared with 13% for the no-visits group. As health care facilities in Africa, including South Africa, experience a shortage in trained health care workers compared to the vast number of patients, postnatal home visits are rarely possible. This may contribute strongly to the tendency of mothers to deviate from exclusive breast feeding and turn to mixed and unsafe feeding practices.

The need for skilled health care workers communicating adequate information regarding safe feeding practices, especially amongst the low income population cannot be ignored, for it poses to be one of the main obstacles barring the way to safe feeding practices (Bergstrom, 2003:9-13; Minnie & Greeff, 2006:19-27). Not only is the advice important in the initial decision about whether to exclusively breast feed or not, but also in counselling about continuation after an infant is shown to be uninfected (Leroy, 1998:599).

Any degree of professional ignorance or lack of knowledge that may exist among midwives and health-care workers must be addressed without delay, for their contribution in the fight against infant mortality and establishing safe feeding practices to prevent and limit MTCT, is vital.

2.4.5 Insufficient knowledge to make an informed decision

One of the general problems experienced by mothers concerns health knowledge and more specifically the opportunity to make a free and informed choice regarding infant feeding methods during counselling sessions. The importance of every mother's right to make an informed decision is greatly emphasized by the WHO (2001a).

The shortage in health care workers of which many are overworked and have a low morale complicates the matter. It may lead to circumstances of a hierarchical system in which the doctor or nurse makes decisions 'for' and not 'with' the mother (Seidel *et al.* 2000:24).

The inconsistency of health education presented to the public may also impede the mother's ability to make an informed choice with regards to infant feeding. This is supported by Seidel *et al.* (2000:25) who conducted a study in Kwazulu Natal, finding that many communities are plastered with HIV/AIDS posters, but no specific attention is given to the risks and benefits of different feeding practices. The question arises whether there is enough information available on the transmission of HIV due to unsafe feeding practices. A good example is the promotion of breast feeding. In many areas posters are put up which depict mothers from different backgrounds all happily breast feeding, thus promoting "breast is best", but only a few posters warn mothers about the possible risks of MTCT through breast milk. The problem does not lie in the fact that breast feeding is promoted, but the lack of advice on the risks of breast feeding is not done exclusively.

One finds oneself in a situation where counselling to mothers on infant feeding follows a simplistic approach where one feeding option is promoted, rather than to individualize possibilities for each mother. For counselling to be really effective and supportive of safe infant feeding practices, time and a deep understanding of the social issues, compassion, knowledge of the household situation as well as the ability to supply emotional support to the mothers and their babies is vital. Without it, the possibility increases that a situation may develop where mothers opt for a feeding method that they cannot provide safely, leading to unsafe feeding practices such as mixed feeding.

The overall purpose among health professionals remains to safeguard the individual's choice while still promoting breast feeding at the population level. According to Gottlieb, Shetty,

Mapfungautsi, Basset, Maldonado and Katzenstein, (2004:45), HIV positive women who are not aware of their HIV-status, more often conformed to unsafe feeding practices by introducing mixed feeding methods, opposed to mothers who knew their status or were HIV negative. The knowledge of HIV status may thus have a decisive influence on infant feeding practices and the focus should, therefore, be on equipping women with knowledge to practice exclusive feeding methods (that are safe whatever a woman's HIV status), thus promoting the safety of infant feeding.

2.4.6 Coping with reality of life

The hardships of everyday life and the struggle to survive is a constant reality in developing countries and many mothers must face various difficulties each day. In a study by Omar-Salim *et al.* (2007:5) on mother's approaches of support on infant feeding conducted in Dar es Salaam, Tanzania, several perceptions held by mothers were identified that play a significant role in feeding practices. These included (1) Baby feeding, housework and paid work have to adjust to each other; (2) Breast feeding has many benefits; (3) Water or breast milk can be given to quench baby's thirst; (4) Crying provides guidance for baby feeding practices.

These perceptions may be possible reasons forcing many mothers to conform to mixed feeding in order to accommodate the difficult task of providing in everybody's needs, including the infant's special nutritional needs. The mother is often the only breadwinner of a whole household, making the responsibility as provider so much more complex.

2.4.7 Social support system

Social support influences and even guides a mother to make a choice whether to breast feed, formula feed or mix feed. This statement is supported by a study conducted in the USA stating that women who are advised by their family to introduce solid feeds within the first few months, find it difficult to avoid feeding their babies solids, even though the paediatrician recommended exclusive breast feeding (Jackson, 2003:122; Ruowei, *et al.* 2007:122).

Intention does not determine behaviour unless it is conditioned by enabling factors such as support. Findings by Khoury *et al.* (2005:70) points out that peer counselling has a definite influence on the women's feeding decision, with special regard to breast feeding. In cases where the mother was encouraged by the family to formula feed, more than half were likely not to initiate or continue with breast feeding. In many cases decision-making involves significant others of which the fathers, grandmothers and mother-in-law's are the primary counsellors (Seidel *et al.* 2000:31).

According to Gottlieb *et al.* (2004:52), 70% of women who participated in the study on Infant Feeding Practices of HIV-Infected and Uninfected Women in Zimbabwe never breast fed although they reported that their husbands interpreted this as a sign of HIV-positive status. The possibility exists that the women may have felt stigmatized by this, but still chose to follow the safest feeding practice for the infant, despite the negative attention.

Fear and uncertainty among many women cause them to resort to mixed feeding practices and may suggest that stigma is not necessarily associated with non breast feeding, but rather with exclusive feeding practices.

Women in developing countries are faced with the difficult situation of impaired resources which may have an impeding effect on their ability to practice safe and exclusive infant feeding. The different options available must be carefully considered, weighing the safety benefits and the potential risks against each other. The various feeding practices will now be discussed in detail.

2.5 SAFE FEEDING VERSUS UNSAFE FEEDING METHODS

Safe feeding practices can be described as practices with the lowest risk to expose the infant to infection, diarrhoea and HIV as well as promoting adequate nutrition and growth. Globally the whole health sector is concerned with the issue of safe infant feeding practices, with exclusive breast feeding versus replacement feeding and the feasibility of either method being the main topic of discussion or a combination of both. Ensuring safe feeding practices for all infants, irrespective of the mother or infant's HIV status cannot be over emphasized. The World Health Organisation (2003b:11-50) stipulates that safe and correct infant feeding practices form the cornerstone for good infant health and need to be implemented for it unmistakably contributes to

the establishment of an adequate nutritional, developmental and growth status of the infant, indirectly contributing and facilitating the very survival of infants.

According to the WHO (2001c), all HIV-positive mothers should be counselled on available feeding options ensuring that exclusive breast feeding is protected, promoted and supported for the first six months among women with an HIV-negative or unknown status. Each mother's individual circumstances must be taken into account when determining the feasibility of a proposed feeding method (Jackson *et al.* 2003:125). The mother should be advised to avoid breast feeding should she be HIV-positive, willing that her individual circumstances allow her to adhere to the criteria of replacement feeding being safe, acceptable, feasible, affordable and sustainable (WHO, 2001c). This will include easy access to a clean water supply within close range, the formula feeds being affordable or provided on a regular basis by the governmental health institutions and the chosen formula feeding method being accepted by the family, thus providing the mother with the necessary support to practice safe formula feeding.

The risk of mother-to-child transmission (MTCT) via breast feeding increases is exceptionally high in case of unsafe feeding practices. The risk increases with almost 50% in cases where the mother is newly infected, for the viral load is very high shortly after initial infection (UNICEF, 2003:7). In the absence of protecting interventions, the MTCT rate of HIV among breast feeding mothers is estimated to be in the range of 25% to 45%, in comparison with the reduced rate of 15% to 25% in mothers who do not breast feed but opt for safe milk substitutes (Petropoulou, Stratigos & Katsambas, 2006:538).

In a review of breast feeding and HIV Transmission conducted by Coutsoudis and Rollins (2003:435), one of the main gaps identified is the lack of sufficient information on the classification of breast feeding practices. It became evident that in very few studies have the researchers attempted to define the feeding pattern clearly, thus specifying the duration as well as the type of breast feeding practiced by participants. Researchers made use of their own definitions and not accepted and standardized WHO definitions, which made comparisons between studies very difficult. The report derived from a prospective cohort study on the natural history of vertically transmitted HIV-1 infection in a large urban hospital in Durban, South Africa, is an excellent example of this. Although the study results suggested that the mortality rate of HIV infected infants were highest in the "exclusively breast fed" group, being 50%, compared to 0% in infants on "exclusive formula" feeding (Bobat, Moodley, Coursoudis & Covadia,

1997:1629) the researcher failed to use clear definitions distinguishing between exclusive and mixed feeding practices. The findings animated a new direction in research, namely to investigate the real effect of different feeding methods, being very precise with regards to exclusive and mixed feeding practices.

A study conducted by Leroy, Newell, Dabis, Peckham, Simonds, Wiktor, Metsellati and Ghent International Working Group, (1998:597) confirmed the importance of correct use of definitions to be true. The study results strongly suggest that vertical transmission of HIV depends on the pattern of breast feeding rather than breast feeding *per se* with exclusive breast feeding possibly holding a lower risk of HIV transmission via breast milk.

The safety of infant feeding is greatly compromised by mixed feeding practices and this should be avoided at all costs. Mixed feeding and the risks associated with this feeding practice will now be discussed.

2.5.1 Mixed feeding

Mixed feeding can be defined as feeding practices where the mother gives other fluids or food in addition to breast milk or giving breast milk for otherwise exclusive formula fed infants, even if the additional fluid is as small as 5ml of glucose water and was only administered once (Suryavanshi et al. 2003:1328; UNICEF, 2003:v).

Due to the infant's intestinal mucosa that is permeable to certain proteins before the age of 6-9 months, the high quantity of proteins, especially casein as found in cow's milk or formula can act as allergens. The epithelial layer of the intestinal mucosa is easily damaged by bigger molecules, often present in other substances than breast milk. This leads to inflammation of the intestinal mucosa which increases the permeability to potential harmful elements, such as the HI-virus. During exclusive feeding, especially in the case of breast milk, the risk of damage to the intestinal mucosa is less than in the case of mixed feeding practices, thus preventing symptomatic infection and inflammatory diseases during infancy (Coutsoudis *et al.* 2001:18; Lawrence & Lawrence, 2005:237). An increased risk of infection exist, should the infant be exposed to mixed feeding practices, receiving both substitute feeds and breast milk from the HIV-positive mother.

Despite worldwide efforts and specified health education given throughout pregnancy with continuation into the postnatal period to endorse exclusive feeding methods, irrespective of the type of feeds, mixed feeding is still the socially and culturally practiced method of infant feeding in many areas of Southern Africa (Charmers, 1990:80; Bland *et al.* 2002:709; UNICEF, 2003:54-58).

According to Bland *et al.* (2006:54-58), situations exist where infants are exclusively breast fed only for a certain period of time, like in the case of a household running out of commercial formula milk at the end of the month due to inadequate finances and are “forced” to exclusively breast feed the infant. In addition, sick infants are also often exclusively breast fed for the duration of the illness. Although exclusive feeding practices are partly implemented by the mothers, it irreversibly results in mixed feeding which again is the main culprit in the whole issue surrounding safe feeding practices. These practices may also lead to misclassification, for the mother does not reflect the entire feeding history of the infant as she may choose not to mention the other feeding method whilst practicing the current exclusive feeding method.

The mother’s own belief that she has “insufficient milk” and an “unsatisfied baby”, especially during the first few days after birth may also result in mixed feeding (Bland *et al.* 2006:709). Another point of issue is that of physical abuse. Many mothers with newborn infants are subjected to the possibility of rejection or even physical abuse by male family members should they refuse to breast feed in addition to formula feeding (Seidel *et al.* 2000:31).

2.5.2 Breast feeding practices

Human milk is of great value for breast milk is specifically designed to meet the infant’s needs. The unique composition of breast milk provides the ideal nutrients to ensure optimal growth of the brain and body, as well as protection against infection and supporting the development of the infant’s immune system as mentioned previously (Lawrence & Lawrence, 2005:237; International Council of Nurses, 2007). Breast milk has a delicate balance of macronutrients and micronutrients, each in the proper proportion to enhance optimal absorption according to the infant’s needs and energy supply, as growth and development takes place (Lawrence & Lawrence, 2005:238). Despite these facts, opposing evidence does exist with regard to nutritional benefits of breast milk, especially energy supply.

Breast feeding an infant entails more than one method and this contributes to its status of being viewed as a safe and beneficial feeding method. The infant may be breast fed in the traditional manner by latching to the mother for feeds, or receive exclusive breast milk by means of expressed milk from his mother, a breast milk donor or milk from a milk bank (UNICEF, 2003:10).

The different breast feeding options will now be discussed with regard to the safety benefits of breast milk as well as pointing out the potential risks it may entail.

2.5.2.1 Exclusive Breast feeding

Exclusive breast feeding is advisable in all HIV-negative situations as well as in cases of unknown status. Exclusive breast feeding is advised should it take place in a safe and optimal environment, keeping in mind that the safety lies in the exclusive feeding method.

The different exclusive feeding methods will now be discussed in more detail, presenting the benefits and risks associated with each chosen method.

One of the principal gains in maternal and child health during the past few decades has been the revival of breast feeding as it proves to be a major determinant of infant health and survival. Exclusive breast feeding is viewed as a safe and adequate feeding method due to the various beneficial characteristics of human milk, but only a small percentage of mothers practice exclusive breast feeding. Reports from a study conducted in Zimbabwe (Tavengwa *et al.* 2007:101) point out that only 12.9% in the population group of 2595 mothers practiced exclusive breast feeding for the first three months. Even in developed countries such as the UK, less than 2% of mothers with infants being newborn up to age six months practice exclusive breast feeding (Reilly & Wells, 2005:869). Taking the tendency of mixed feeding practices especially in Southern Africa into account, one is faced with the question whether the WHO recommendations related to exclusive feeding are plausible.

In the study conducted by Bland *et al.* (2006:780) on the duration of exclusive breast feeding practices by mothers, with special attention to HIV positive mothers situated in the rural areas of South Africa in northern KwaZulu Natal, more than 46% of infants received other fluids or feeds in addition to breast milk in the first 48 hours of life. Only 17% of the infants were exclusively breast fed at age two weeks and a mere 10% at age six weeks. Suryavanshi *et al.* (2003:1329)

report similar high rates of mixed feeding among breast feeding mothers in India, taking place especially during the first three days after birth. As the study also took place among mothers situated in rural areas, the possibility exists that the high mixed feeding prevalence rate may be associated with low-socio economic environments as often found in rural areas.

The worldwide revival towards breast feeding support has significantly contributed to the reduction of child morbidity and infant deaths (Seidel *et al.* 2000:30). It is well documented that breast milk provides protection against gastrointestinal infections and reduces the occurrence of upper and lower respiratory system and urinary tract infections, especially in the first 6 months of life (WHO, 2001c; Suryavanshi *et al.* 2003:1326). A report by Huffman, Zehner & Victora (2001:80-92) on breast feeding practices in the first month of life and neonatal mortality found that breast feeding significantly reduced the occurrence of hypothermia and hypoglycemia in newborn infants, especially among low birth weight infants. Exclusive breast feeding practices also proved to have protecting characteristics against infections such as sepsis, acute respiratory tract infections as well as diarrhoea.

As breast milk requires no preparation, is naturally at the right temperature and needs no sterilization, the potential risks connected with poor hygiene and contamination as frequently found with formula and mixed feeding practices are excluded (Royal College of Midwives, 2002:11). These characteristics notably lower the risk of exposure to infectious diseases. According to the WHO (2001c), exclusive breast feeding for the first four to six months, in contrast to mixed feeding practices, provides important and significant protection against infectious diseases other than HIV. Statistics provided by the WHO (2002) indicated that as many as 55% of infant deaths in 2002 could be attributed to diarrhoeal diseases as well as acute respiratory infections, indirectly being caused by unsafe feeding practices, yet again pointing out the vast number of infants and young children exposed to inappropriate feeding methods. Exclusive breast feeding not only holds nutritional benefits for the infant, but also psychological and cognitive benefits, even if it was only practiced for the first six weeks after birth (Lawrence & Lawrence, 2005:239).

The advantages of breast feeding do not stop with the infant, but also prove beneficial to the mother of the infant, which is of great importance when making an informed decision regarding an infant feeding method. Exclusive breast feeding facilitates the process of the mother's body to return to the non-pregnancy state more promptly and contributes to a lower incidence of

obesity in later life. The risk of developing osteoporosis, ovarian and breast cancer is significantly reduced in mothers who breast fed (Lawrence & Lawrence, 2005:240; Royal College of Midwives, 2002:15). Exclusive breast feeding also leads to an increased period of anovulation and amenorrhoea which in turn decreases the chances to fall pregnant soon after the birth of the baby. It plays an important role in family planning, especially for HIV positive women whose health status is strained by each pregnancy (Latam & Preble, 2000:1658).

The protecting and overall beneficial characteristics of breast milk can be considered as a safety net against poverty and general diseases provided that it's practiced in a safe way taking every mother's individual situation into account. Despite the general benefits that breast feeding provide, some risks do need to be considered which may compromise the safety of the infant. This includes risks such as MTCT of the HI-virus.

No definite answer has yet been found to the question whether exclusive breast feeding practiced by a HIV-positive mother holds the same advantages for both her and the newborn infant as in the case of a HIV negative mother. Breast milk of HIV-positive mothers has been tested for the presence of the HI-virus and it has been detected in both the cellular and cell-free components of breast milk. The importance of mother-to-child-transmission via breast milk cannot be over emphasised, as more than 95% of mothers in Sub-Saharan Africa breast feed their infants at some time or other (Hoffman *et al.* 2003:1209).

The WHO Global Strategy for Infant and Young Child Feeding (2003b:12) summarizes the current situation well by stating that "The HIV pandemic and the risk of mother-to-child transmission of HIV through breast feeding pose unique challenges to the promotion of breast feeding, even among unaffected families. Complex emergencies, which are often characterized by population displacement, food insecurity and armed conflict, are increasing in number and intensity, further compromising the care and feeding of infants and young children the world over. Refugees and internally displaced persons alone currently number more than 40 million; including 5.5 million children aged under-five".

Research indicates the possibility that exclusive breast feeding may expose both infant and mother to more health risks than previously perceived. A study by Nduati, Richharson, Mbori-Ngacha, Mwata, Ndinyachola, Bwayo, Onyanga & Kreiss (2001:1651) reported that a strong association exists between maternal death among HIV-positive mothers who practiced

exclusive breast feeding, opposed to mothers who opted for formula feeding. The likelihood of early mortality among infants of deceased mothers also significantly increased. A three-fold higher mortality rate in HIV-infected mothers who breast fed existed. Despite this evidence being communicated to the WHO, no changes in the current policies on infant feeding by HIV-positive women were warranted.

More recent information supports previous study results suggesting that the mother's status with special regard to the progression phases of HIV/AIDS has the potential to increase the risk of mother-to-child transmission via breast milk, thus compromising the health of the affected infant. Such factors include a high blood virus load usually associated with recent infection, a low CD4+ count and breast pathology like mastitis or breast abscess (Nduati *et al.* 2001:1654; Hoosen *et al.* 2007:1115).

2.5.2.2 Traditional breast feeding

Traditional breast feeding entails direct transmission from the mother's breast to the infant. Substantial evidence strongly implies that milk production will increase when the hormones prolactin and oxytocin are produced. This is stimulated by regular and intermittent suckling of the infant during breast feeding, thus providing in the infant's nutritional needs (Bennet & Brown, 2002:709). It is, however, possible that a breastfed baby can have malnutrition. A study by Reilly *et al.* (2005:871) reports that the assumption held by the general society that milk production will increase to supply in the infant's energy needs is untrue as the possibility exists where some mothers experience situations of insufficient breast milk production to supply in the infant's energy needs. As a result of insufficient milk energy transfer, the mother may find herself with a hungry and distressed baby which may in the long term lead to malnutrition. Malnutrition impairs the infant's immunity against diseases and the infant is, therefore, more susceptible to life threatening illnesses such as diarrhoea.

The issue surrounding breast health has also been brought to attention for evidence points out that some breast conditions including mastitis, breast abscess and nipple fissure may increase the risk of HIV transmission when the mother continues to breast feed her infant (Nduati *et al.* 2001:1654). Until more clarity is reached surrounding the adverse effects that these conditions may have on infant health, breast feeding women, especially women with a known HIV-positive status, are recommended to practice a good breast feeding technique to prevent such

conditions in the first place. Prompt treatment is strongly advised should any breast problems arise (WHO, 2001a).

2.5.2.3 Expressed and pasteurised breast milk

The first method deviating from the traditional method of breast feeding, namely the infant latching to the mother's breast for feeds, is expressed breast milk. This method is specifically advised for HIV-positive mothers.

The mother's own breast milk is expressed and pasteurised before being given to the infant. Breast milk can be expressed manually or with the aid of a breast pump, but needs to be pasteurised. Pasteurisation does not include boiling the expressed milk. Should the expressed milk be boiled, changes in the composition of breast milk takes place, destroying some valuable components, although all pathogens present in the milk are also instantly destroyed. Pasteurisation can be done industrially or according to the Pretoria pasteurisation method being a low technological procedure which can be practiced by mothers without the use of expensive equipment. Pasteurisation is of great value, especially in the case of HIV-positive mothers who practice breast feeding as all HIV-bodies present in the milk are killed during the pasteurization process (Bateman, 2007:170). Mothers practicing exclusive breast feeding may choose to make use of pasteurisation in case of a temporary problem such as a premature infant, cracked nipples or candida.

Expressing and pasteurising breast milk unfortunately also have potential risks, for protective cells are damaged should the milk reach boiling point, causing alterations of essential enzymes and vitamins to take place. Another disadvantage lies in the fact that although many women when separated from their infants do express breast milk they do not heat-treat the milk and, therefore, expose the infant to an increased risk of diseases such as diarrhoea. If the process of pasteurisation is not carried out with the necessary hygienic techniques the risk of contamination increases significantly. Pasteurisation of breast milk during the period of cessation of breast feeding can make a significant difference to decrease the risk of MTCT, but it's still unsure whether this method is practiced by HIV-positive women, especially during the period of transition (UNICEF, 2003:54).

2.5.2.4 Use of a wet-nurse

The second option is wet-nursing where the infant receives only breast milk but from someone other than the biological mother. It is beneficial due to the fact that the infant receives breast milk, containing all the necessary nutritional components and as wet nursing is traditional in some cultures, it may prove to be more acceptable than other proposed methods.

Special caution with regard to the risk of HIV transmission should be taken for both the infant and wet-nurse are at risk, should one of them be HIV-positive. It is of the utmost importance that a wet-nurse should be HIV-tested and counselled on topics such as breast health, correct latching techniques and safe sex practices (UNICEF, 2003:54). If wet-nursing is used it is crucial that the wet-nurse is HIV-negative.

2.5.2.5 Human milk bank

The third option is a human milk bank. A human milk bank works on the principle of healthy lactating mothers donating milk for infants in need of breast milk, such as in the case of sick or low birth infants. According to a report in the South African Medical Journal (Bateman, 2007:170), new evidence clearly showed that HIV-infected infants who received breast milk from milk banks had a lower incidence of mortality and morbidity compared to infected infants receiving formula milk. Although facilities in South Africa are still limited to areas such as Cape Town, Johannesburg and Pretoria, the value of this system is being recognized internationally and will hopefully be established in all areas of South Africa in the near future.

Milk banks may prove to be an excellent way to fight infant morbidity, but for this method to be successfully implemented, the potential risks should be taken into consideration. These include functioning according to established standards with regard to hygiene, correct storage and other factors such as screening donors to exclude HIV contaminated milk (Bateman, 2007:171).

2.5.2.6 Potential health risks during cessation of breast feeding

The risk and timing of mother-to-child transmission of HIV-1 in the postnatal period is important for the development of preventive public-health strategies.

Non-initiation of breast feeding and involuntary weaning due to preceding maternal or infant ill health must be distinguished from early voluntary weaning. In relation to this Brahmhatt & Grey (2000:1370) strongly advise that the focus should be on the risks of infant death

attributable to voluntary weaning when estimating the risks and benefits of early weaning to prevent Mother-to-child-transmission (MTCT).

Although HIV-negative mothers are encouraged to breast feed their infants for as long as possible as breast milk can continue to provide nutritional value to the child's diet in addition to other feeds from six months, the recommendations for HIV-positive mothers differ. According to the Inter-Agency Team on Mother-to-Child Transmission of HIV, Conclusion and Recommendations (WHO, 2001d), exclusive breast feeding should be discontinued as soon as feasible, preferably at three to four months, but not extending after the age of six months, in order to minimize HIV transmission through MTCT. The feasibility is determined by taking every mother's individual circumstances into account with regard to her local situation, the risks of replacement feeding which may compromise her ability to prevent life-threatening diseases, including infections other than HIV and malnutrition. In the case of cessation of breast feeding, all mothers should be provided with specific guidance and support on the choice and implementation of a healthy and affordable feeding method for at least the first two years. This in turn will favour the implementation of safer replacement feeding practices, especially in the case of HIV-infected mothers and families (WHO, 2001e).

The WHO (2001b) further recommends the transition period between cessation of breast feeding and the implementation of replacement feeds to be as short as possible to avoid the increased risk of HIV transmission through breast milk (Ross & Labbok, 2004:1174). It is strongly advised to stop breast feeding if an HIV-positive mother develops symptoms of AIDS or in cases where CD4+ or viral load count for this indicates an increased risk of transmission via breast feeding. In such cases the health status of the mother is also compromised should she continue breast feeding, for it may significantly enhance the progression of HIV/AIDS initially leading to death (UNICEF, 2003:56).

In some circumstances, the risk of malnutrition and other morbidity may still hold a greater risk than the transmission of HIV through breast feeding. Specific guidance and support to the mother is thus essential to ensure prompt cessation of breast feeding in order to reduce or even prevent harmful consequences such as negative nutritional and psychological effects on both mother and infant as well as avoiding cases of breast pathology.

As breast milk alone does not meet all the nutritional demands of a baby older than six months, exclusive breast feeding is not safe after this age. While exclusive breastfeeding is safe for all babies younger than six months irrespective of their mother's HIV status, the situation changes thereafter. HIV negative women must continue breastfeeding adding other types of food to their baby's diet, while a HIV positive mother has to abruptly stop breast feeding as soon as her baby begins to take anything other than breast milk. It is, therefore, very important that every new mother must know her HIV status by the time her baby is six months old (WHO, 2001a).

2.5.3 Breast milk substitute

Various types of breast milk substitutes exist. The different options will now be discussed with regard to safety, focusing on each option's imposed benefits and potential health risks.

2.5.3.1 Formula milk

Formula feeding first of all offers protection against mother-to-child-transmission of HIV via breast feeding (UNICEF, 2003:38) as well as providing in the infant's basic nutritional needs. Although formula milk lacks some natural components of breast milk, such as immunoglobins, it is artificially fortified with vitamins and micro-supplements like minerals which are adequate and beneficial for the infant. Formula feeding often proves to be a safe alternative to breast feeding for mothers in special situations such as being HIV-positive.

The International Code of Marketing of Breast milk substitutes (UNICEF, 2003:62) defines formula feeding as a substitute for breast milk, produced industrially in accordance with applicable Codex Alimentarius standards. These standards were developed to ensure that formula milk satisfies the nutritional requirements of the infant as well as adhering to the physiological requirements such as increased energy needs, changing with development and growth.

Fortified formula milk is advised for mothers opting to formula feed their infants. This is due to the fact that fortified milk has a high amount of milk acid bacilli which prevents contamination and can, therefore, be considered a suitable feeding method among mothers not having access to a refrigerator to store the formula milk. Another important benefit is that it is digested more easily and quicker than other breast milk substitutes, which in turn decreases the occurrence of

gastro-intestinal infections. Despite this being true, the occurrence of diarrhoea is significantly higher in the case of formula fed infants opposed to breast fed infants (Pretorius, 1998:54).

Safe formula feeding practices can only be achieved if the mother has access to an adequate supply of breast milk substitutes, adequate utensils for feeding, sterilizing equipment and knowledge on how to prepare the milk substitute safely and correctly. The provision of free formula to HIV-positive mothers does not necessarily ensure safe and exclusive replacement feeding practices (UNICEF, 2003:11-50). If safe formula feeding practices are to be implemented, they should adhere to the WHO guidelines (UNICEF, 2003:11-50) stating that infant feeding practices should be safe, accessible and adequate to supply in the nutritional needs of the infant. Only then can one make a positive contribution in the fight to decrease the high infant mortality and morbidity rate globally, but especially in developing countries.

Cup-feeding is recommended to ensure a safer and more hygienic way of formula feeding, for cups proved to have a lower risk of contamination than infant feeding bottles (WHO, 2001b; Bergstrom, 2003:32). Unfortunately most mothers do not adhere to this recommendation and use bottles instead. The high risk of bottle contamination can be decreased when the mother owns several bottles, instead of just one or two as became evident in the study conducted by Bergstrom (2003:33). Findings from the Bergstrom study (2003:33-34) also indicated that water boiled directly before preparation of each milk feed significantly decreased contamination when compared to cases where the water was boiled and stored in a flask or covered container.

Bergstrom's findings also pointed out that the use of a sterilizing method in general, whether it was before or after rinse/wash, had a protective effect, but the risk of contamination increased again when the mother used a cloth to clean the bottle. Poor living conditions may also contribute to the risk of contamination of the prepared formula milk due to limited access to clean running water or sanitation systems. The access to clean water and good sanitation is vital to protect the infant against the risk of diarrhoea that is one of the leading causes of infant deaths. The reality is that in many rural areas the mother does not have easy access to clean water supplies necessary to prepare the formula feeds in a safe way. The absence of this basic life supply may cause the mother to follow dangerous practices in the preparation and sterilization process connected with formula feeding (Jackson *et al.* 2003:120). Assessment of the mother's living conditions would be ideal, for only then could one truly determine if formula feeding would be the safer option.

The reasons for incorrect preparation methods of formula feeds are many and complex and are commonly followed by serious health risks and in some cases it may even prove to be fatal. As incorrect preparation of formula feeds can be classified as an unsafe feeding practice, special attention is paid to this topic.

Bergstrom (2003:8) conducted a study in several PMTCT sites in South Africa on the safety of formula feeding. She reported that more than half of the participants made mistakes in the cleaning process of utensils, despite seemingly good quality counselling on formula feeding. The over-dilution of formula feeds also posed to be a significant problem.

According to the WHO (2002), 55% of infant deaths caused by diarrhoeal diseases and acute respiratory infections, may be related to inappropriate feeding practices. The tendency among mothers living in developing countries to leave their infants with care givers or family members due to other responsibilities further contributes to the problem of poor hygiene and bacterial contamination, especially in the case of formula feedings, which again increases the risk of life-threatening diseases (Bergstrom, 2003:12).

2.5.3.2 Modified animal's milk

The composition of cow's milk is not ideal for human infants and, therefore, need to be modified for consumption by infants less than six months. These modifications include increasing the fluid content with added boiled water; increasing the energy content with sugar; boiling the milk to improve protein digestibility and providing a micro-nutrient syrup or powder. Modified cow's milk (or goat milk) may be an option for HIV-positive mothers that have access to animal milk, for example having cows or goats. Should the mother choose to make use of this feeding method, the importance of adhering to the mentioned modifications must be emphasised to the mother, for the infant is at great risk of malnutrition and severe anaemia in the case of non-compliance (UNICEF, 2003:54).

2.6 CONCLUSION

In this chapter a thorough overview of the literature regarding infant feeding practices was presented. The relevant topics of discussion included the importance of safe infant feeding, nutritional needs of the infant, factors influencing choice and safe infant feeding practices versus unsafe feeding practices.

With the rise of the global HIV epidemic general health problems have been complicated with emphasis on the issue of establishing safe infant feeding practices. The aim should be to create and sustain an environment that encourages appropriate feeding practices for all infants, while scaling-up interventions to reduce HIV transmission. Appropriate infant feeding practices must become the norm ensuring food security for HIV-affected families. Special attention will still be needed in the case of HIV-positive mothers, as to empower them to select and sustain the best feeding option (WHO, 2003:50).

No more than 15 years ago, breast feeding was advised and accepted as the best way to feed an infant, but this has changed significantly since the high infant morbidity and mortality rate ascribed to diseases such as diarrhoea and HIV. With the arrival of the HIV epidemic and its globally destructive and fatal effect on all infected human beings, the natural way of infant feeding, namely breast feeding, now finds itself under a magnifying glass of questioning and scrutinization. This creates a difficult and threatening situation. Breast feeding which was previously accepted as the norm must now be practiced with the utmost care and even altered in special circumstances. As the HI-virus can be transmitted from mother-to-child during pregnancy, labour or delivery, or through breast feeding, it is a public health responsibility to prevent HIV infection in infants, especially in countries with a high prevalence rate, as is the case in most of the African countries.

A conference organised by the National Institute of Child Health and Human Development, the National Institute of Health Office of Dietary Supplements and the US Department of Agriculture Children's Nutrition Research Centre (Raiten, Kalhan & Hay, 2007:578s) acknowledges the problems associated with HIV/AIDS with regards to breast feeding and MTCT and identified several key research topics in an attempt to address these problematic issues surrounding safe infant feeding practices. The effect of severe maternal under-nutrition on health, lactation

performance and milk composition, as well as the need for well-designed randomized clinical trials to assess the effect of differing durations of exclusive breast feeding on critical short and long-term health outcomes, are only a few of the identified priorities. As Sub-Saharan Africa is classified as third class world, the above mentioned priorities are a reality experienced on a daily basis and are, therefore, definitely applicable to the current situation in South Africa.

Safe, optimal feeding practices must be endorsed whenever possible, given the need to reduce the risk of HIV transmission to infants as well as minimizing the risk of other causes of morbidity and mortality such as diarrhoea and respiratory infections. This can only be done if both health care providers and mothers of infants take hands and make a uniform attempt to overcome the obstacles barring the way to safe infant feeding practices.

CHAPTER THREE

RESEARCH METHODS AND PROCEDURES

3.1 INTRODUCTION

The literature review in Chapter Two provides a detailed description of the topic of interest, namely safety of infant feeding practices. The background foundation facilitates the process of investigation and exploration of the theoretical context in which the study took place.

Previous studies have been conducted focusing on the importance of health education especially during the antenatal period as well as the identification of problems existing in the execution of health education to mothers (Chopra *et al.* 2005:359; Khoury *et al.* 2005:65; Minnie & Greeff, 2006:19). It would, therefore, be of great value to further expand the research focus to establish whether the implementation of the research recommendations regarding safe feeding practices are in fact realistic, feasible and practiced by the general society.

To reach the aim, this chapter will focus on explaining the detail of the research design and method, validity and reliability as well as the ethical aspects relevant to the study.

3.2 RESEARCH DESIGN

In this study a cross-sectional, descriptive research design was used to answer the research question. This specific research design was chosen, as one of its most important characteristics identifying problems within current practices, thus providing a clear picture on the research topic. The descriptive design, therefore, directly supported the research aim of the study which was to examine the current safety of baby feeding practices (Burns & Grove, 2005:232).

3.3 SAMPLING

Sampling will now be discussed in detail, including the research context, study population, sample and setting used during the research project.

3.3.1 Context and setting

The research took place in the context (of a semi-urban community) within the health clinics, situated in the North West Province. This semi-urban region comprises of a variety of living conditions, thus providing an opportunity to include participants in different circumstances.

These clinics were planned to ensure an even allocation of health services to all the areas of the district, including farm communities in the immediate area as well as more secluded neighbourhoods. The number of mothers visiting the clinics on the designated days varies from 30-80 mothers with their infants per day, depending on the location of the clinic and time of month, i.e. at month end, most mothers collect their child support grants and do not comply with their pre-arranged clinic appointments, resulting in overcrowding the following week. Data collection took place in Augustus 2007 at five of the primary health clinics in the sub-district.

The HIV prevalence of the women in this region is unknown because of the perceived low uptake of counselling and testing. The primary health clinics are participating in the PMTC programme, where exclusive breast feeding is promoted if the HIV status of the mother is unknown and she is not willing to be tested.

The breastfeeding patterns in the specific study population are not known. What is known, however, and what may also be characteristics of this particular study population, are the following:

- 1 All mothers receive health education regarding safe infant feeding practices with the aim to empower and encourage them to make an informed and feasible decision.
- 2 Complicating safe infant feeding practices is the low level of compliance to exclusive feeding practices. The South African Demographic and Health Survey (SADHS)

reported that only 10% of 0-3 month's old babies are exclusively breastfed (SADHS 1998).

- 3 A number of studies indicate that in South Africa early introduction of supplementary foods is the rule rather than the exception (Delpont *et al.* 1997:58; Kassier, Maunder and Senekal, 2003:14).

3.3.2 Study population

The study population consisted of mothers with babies attending the health clinics for their postnatal visits, being mothers with infants in the age group of six weeks up to three months. As an average of 305 babies are born monthly in Potchefstroom Hospital (Potchefstroom Hospital, 2006), it can be expected that a similar number would be brought to the health clinics. Postnatal visits take place on Thursdays and Fridays and the weekly attendance ranges from 30 to 80 post-partum mothers. The study population was extended from mothers with infants of six weeks to include mother's with infants up to three months to ensure that a large enough sample would be selected. This could be done without threatening the validity of the results, as the research questionnaire was specifically developed by the WHO (2001a) to include infants from birth, six weeks, every month for the first six months, and every three months after six months of age. As a cross-sectional research design was used, the focus was on women during either their first or second post-partum visit to limit the recall-time period as far as possible.

3.3.3 Sample

The five clinics in die Potchefstroom sub-district allocated Thursdays and Fridays for post-natal visits. Due to the mobility of the mothers between clinics it was not possible to construct a sampling frame prospectively. A convenience sample was used and to compensate for bias with certain elements being overrepresented or underrepresented as is often the case with convenience sampling, some specific measures were taken.

The sampling method made use of specific inclusion criteria, thus narrowing down the sampling population. The participants included in the research exceeded the preceding total of participants as calculated by the statistician, therefore, presenting a larger sample group representative of the target population. The sampling method also included various clinics for

data collection, situated in different areas of the Potchefstroom sub-district to ensure an even distribution of participants presenting the target population

The following inclusion criteria were used to choose participants:

- Mothers visiting one of the five clinics in the Potchefstroom district.
- Mothers with babies of six weeks up to three months.
- Ability to communicate in English, Afrikaans, SeTswana or SeSotho.
- Willing to participate and thus giving voluntary and informed consent.

The HIV status was not used as criterion as the focus of the study was to describe the safety of infant feeding practices in general.

3.3.4 Sampling size

As a further measure to limit bias in this convenience sample, the sample size was determined in collaboration with a statistician with the specific aim of eliminating the probability of a too small sample size. A too small sample size may result in a type 1 error, meaning that the researcher concludes that the sample tested is from different populations, when, in fact, the sample is from the same population (Burns & Grove, 2005:754). A sample size of 80-120 participants was estimated to render data that could be analysed in a reliable manner. To provide for spoiled questionnaires, the sample size reached a total of 155 participants.

3.4 DATA COLLECTION

Detail on how data collection was done will now be discussed, including the data collection method, instrument as well as all applicable procedures.

3.4.1 Data collection method

Data were collected by means of a questionnaire which was completed with the aid of a fieldworker recording the answers. The method of completing the questionnaire verbally was implemented to avoid misinterpretation of questions due to English being a second or third

language for the study population. Open-ended questions were used to ensure that further explanations could be given as well as validating the reply, making use of the participant's mother language when necessary.

Completion of the questionnaire took place within the waiting area of the clinics among the seated mothers. If the participant preferred a more private setting, a consulting room within the clinic was made available. The completion time of the questionnaire was between 10 to 15 minutes.

3.4.2 Data collection instrument

The instrument used in this study was adapted from an instrument developed by Ellen Piwoz from the Academy for Educational Development, with the Support for Analysis and Research in Africa (SARA) Project of the Bureau for Africa, of the Office of Sustainable Development of the U.S. Agency for International Development, Washington D.C., USA., in co-ordination with the WHO team, based on a variety of research instruments and technical input from experts (WHO, 2001a:1-33). The original questionnaire was piloted in eight different developing countries in Africa, Asia and South America and accordingly adapted for the research project.

The questionnaire was developed to enable researchers to compare core results with existing research findings. Comparison between research studies is of great value for it contributes to the process of identifying concurring problems and facilitating the development and implementation of guidelines and interventions. The questionnaire also provides for research to be done in different settings thus ensuring that an overall picture of the current situation regarding infant feeding practices is created. In the light of the global proportions of the HIV epidemic and other life-threatening diseases such as diarrhoea and respiratory infections, all possible efforts of prevention and minimizing mortality and morbidity amongst infants are vital. Research results from *developing countries* can make a decisive contribution in the fight against these life-consuming epidemics.

The original questionnaire contained core questions and made provision for additional questions to be added if relevant to the research (see Appendix E). The choice to use the cross-sectional approach was justified by the aim of the study as well as the time and resources available to the

researcher. This study focused on the safety of baby feeding practices at a specific point in time, namely six weeks up to three months postnatal. It is an ideal time to question participants about baby feeding practices as the time period of feeding is still relatively short and, therefore, facilitates the process of recollecting details correctly concerning practiced feeding patterns.

The contents of the different sections of the adapted data collection questionnaire are now discussed.

3.4.2.1 Section One

The questions in section one on demographic data, environmental information, number of deaths in the family and whether the participant is aware of her HIV status, were included to enable the researcher to draw a clear picture of the socio-economic situation and mean age-group of the participating population. As the study's focus was not directly HIV related, but all factors that may contribute to unsafe baby feeding practices among mothers of infants, the HIV status of the participant was not asked for specifically.

3.4.2.2 Section two

Section two includes feeding patterns with the specific aim to determine whether mixed feeding patterns are practiced by the participants. The methods of wet-nursing as well as expressing breast-milk were addressed, as this may greatly affect the safety of baby feeding practices.

3.4.2.3 Section three, four and five

Section three, four and five focused on maternal and infant health, including breast health and breastfeeding difficulties experienced by the participant. It is important information with regard to feeding practices, for in the presence of ill health or difficulties, feeding methods may be altered by the participant and lead to an increased risk of unsafe feeding practices which in turn increase the risk for MTCT.

3.4.2.4 Section six

Section six directly addresses the topic of cessation of breastfeeding, again important in the light of mixed feeding practices as well as identifying possible reasons for cessation of breastfeeding.

3.4.3 Data collection

The selection and training of the fieldworkers, the pilot study as well as the data collection procedure is discussed in the following section.

3.4.3.1 Selection and Training of Fieldworkers

Fieldworkers of the same ethnic group as participants were used to promote willingness to disclose information. No specific criteria were used to select the fieldworkers, for the original WHO questionnaire specifies that it is not necessary for fieldworkers to have prior health care experience or education. The only requirements were that the fieldworker be informed and trained with regards to all terms and concepts that are used within the questionnaire, thus making good communication skills and basic literacy a prerequisite.

Three fieldworkers were used and each one was informed about the research project and their expected role during the data collection process. All three fieldworkers agreed to participate and a training date was decided upon as to equip them to collect data in an ethical and reliable manner.

Thorough training with regards to the research, sampling and informed consent procedure was done by the researcher the day prior to the pilot study to limit the occurrence of bias as far as possible, which may influence the results if present. The training process was facilitated by the fact that the appointed fieldworkers were all three qualified in-service training instructors and had previously assisted during data collection of other research projects. This provided them with firm basic skills and facilitated the process of data collection as they were experienced and able to approach the participants in a relaxed but confident manner.

The training session consisted of orientation with regards to all terms and questions present in the questionnaire to ensure that each fieldworker had a thorough understanding and knowledge of what was expected during data collection, thus enabling them to complete each questionnaire in a standardised way by means of accurate recording. The understanding and insight of the fieldworkers were tested by means of role play and explanations and corrections were done as needed by the researcher.

3.4.3.2 The Pilot study

The questionnaire was tested during a pilot study prior to data collection. The total sample size for the pilot study was nine participants (n=9). The pilot study was done to ensure that all questions were clearly understood by both the fieldworkers and the participants as well as to rule out the existence of any discrepancies. Each fieldworker completed three questionnaires in three different clinics and gave feedback on their experience in completing the questionnaire.

The feedback from the fieldworkers was positive communicating that all approached participants understood the consent procedure and seemed to welcome the interest in the topic of infant feeding practices. No content changes were necessary, but the format of the questionnaire was edited to exclude misinterpretations and to facilitate easy completion of the questionnaire.

3.4.3.3 Data Collection Procedure

Permission from the necessary committees was obtained before any data collection commenced (Appendix A and B). (See 3.7.1).

The researcher visited all the clinics two days prior to the pilot study, approaching the sister in charge of each clinic, known as the head facilitator, providing the necessary information with regards to the study aim and data collection procedures. Permission to continue was then requested to ensure co-operation between the research team and clinic staff as well as to secure positive relationships and maintain good will. The head facilitator in each clinic was very helpful and gladly offered support should it be needed in any way.

The researcher accompanied the fieldworkers during the pilot study and on the three following occasions of data collection. The adequacy of their skills and correct completion of the questionnaire were continuously evaluated, ensuring that data collection took place in a reliable manner. The presence of the researcher during data collection sessions also made it possible to handle any unforeseen problems, such as running out of questionnaires immediately.

The researcher introduced the fieldworkers and clinic staff to each other on each occasion of data collection and orientated the fieldworkers within the setting of the clinic. The clinic staff was open and supportive of the research project and welcomed the researchers.

The researcher rotated between the different clinics during data collection so as to supervise the completion of the questionnaires. The three fieldworkers each had free access to a cell-phone, should they encounter any situation requiring the researcher's immediate attention.

Each potential participant was approached by a fieldworker in a friendly manner, introducing herself and then describing the aim of the study and nature of what would be expected from the participant, as well as explaining possible harm and risks involved, anonymity, confidentiality and the right to withdraw without giving a reason at any stage. After this, the consent form was completed (Appendix C) and the participant was given the choice whether she was comfortable to take part in the interview as presently situated or whether she preferred a more private and secluded area. In most cases the participants chose to remain as presently seated to answer the questions while waiting in the queue. No participant that was approached refused or wished to withdraw during the completion of the questionnaire. In the few cases where the participant appeared to be uncomfortable, the completion of the questionnaire was done in a vacant room as provided by the clinic staff. Each questionnaire was completed within 10 to 15 minutes. As all the fieldworkers could communicate in the participants preferred language, mainly Tswana, potential misunderstandings were eliminated and answers were validated by repeating them to the participant in her mother tongue.

3.5 DATA ANALYSIS

Detail regarding the data analysis process will now follow.

3.5.1 Data analysis method

A statistical data analysis method including frequency statistics and cross referencing was used, for it allows the researcher to organise the data in such a manner that the results can be viewed from various angles and with new insight (Burns & Grove, 2005:461). As the current situation surrounding the safety of baby feeding practices requires to be viewed from all possible angles, one needed to employ a data-analysis method that would convey a true reproduction of the information gained from the participants. Data analysis was done with the help of a statistician to ensure that the raw collected data was processed into information that could be presented in a meaningful manner.

3.5.1.1 Preparation of data for analysis

All completed questionnaires were carefully checked and examined to search for any problems such as missing data, items in which the participant provided more responses than was requested as well as items in which the participant marked a response between two options.

The raw data were then entered into the Microsoft Excel computer programme, carefully coding the different variables so as to ensure that clear designated analysis printouts would follow. Data entering was done systematically by the researcher with as few possible interruptions and limiting the entering periods to two hours at a time, thus reducing errors due to fatigue or distractions. The completed, cleaned data set was saved on the PC hard disk drive as well as several backups on CD-ROM and flash drive and kept in a safe place by the researcher.

The computer file was cross-checked with the original data for accuracy and all errors were corrected. After all the identified problems were solved accordingly, a copy of the original data was forwarded to the statistician for further analysis.

3.5.1.2 Description of the sample

A complete picture of the sample was obtained by making use of descriptive statistics. Calculating measures of central tendency as well as measures of dispersion relevant to the sample were used.

3.5.1.3 Computer programmes used for analysis

The data was processed by making use of StatSoft, Inc. (2006) and the results are presented in table and graphic format, of which a detailed discussion and interpretation of the analysed data will follow in Chapter Four.

3.6 VALIDITY AND RELIABILITY

The researcher adheres to the standards of validity and reliability as well as being scientifically grounded in order to ensure that the results are trustworthy. According to Burns and Grove

(2005:302), validity and reliability must be assessed at the aggregated level rather than the individual level.

3.6.1 Validity

As the study was not experimental of nature, strategies to ensure validity as explained by Burns and Grove (2005:384-385) were implemented:

3.6.1.1 Validity of the data collection instrument

Two aspects of the validity of the data collection instrument are discussed, namely the face validity and the content validity.

➤ Face validity

To enhance face validity, the questionnaire was tested during a pilot study after which the necessary alterations were made before the actual data collection took place.

➤ Content validity

The questionnaire is based on an existing questionnaire, developed and approved by the WHO, already tested in various settings where its appropriateness was confirmed. The researcher adapted this questionnaire and it was approved by the study leaders. A qualified statistician was involved with the data analysis process and the research project on the whole was done under the close supervision of two experienced study leaders, all factors contributing to the content validity of the research findings.

3.6.2 Reliability

Reliability was achieved by ensuring that the following elements were in place:

3.6.1.2 Limitation of fieldworker effects

The presence of a fieldworker can alter behaviour of the participants which again may lead to invalid measures (Brink, 2006:167).

One of the strategies implemented to limited such effects was ensuring that the fieldworkers were females with the hope that the participants would be more at ease. The fact that all three fieldworkers were fluent in the regional languages, namely Tswana and Sesotho helped the participants to feel more at ease and secure during the completion of the questionnaire and willing to share their experiences within their mother tongue.

3.6.2.2 Training of fieldworkers

The reliability of the study findings were increased by taking special care to ensure that all the fieldworkers received thorough training, thereby establishing a standardized way of conduct during data collection. Insight and thorough understanding of the fieldworkers were tested and further strengthened by means of role-play. This provided the opportunity to clarify any uncertainties as well as building their confidence to complete the questionnaire successfully.

3.6.2.3 Test procedure

A pilot study was conducted to limit the risk of any misunderstanding or incorrect use by the fieldworkers. It also ensured that the questions asked were all clear and easily understood by the participants.

3.6.2.4 Data analysis

The data analysis was conducted with the help and under guidance of a statistician to ensure that the raw data could be analysed and presented in a meaningful manner.

3.6.2.5 Even distribution of sample

Sampling took place among various clinics within the Potchefstroom sub-district, presenting a well distributed sample of the area.

3.6.2.6 Process of data collection

To ensure reliability during data collection, the questionnaire was administered in a consistent way during each data collection session. This was achieved by avoiding the possibility of factors that may compromise the consistency, such as participants completing the questionnaire by themselves, taking questionnaires home to complete them in the presence of others, which in turn may lead to bias and alter the true measure of the variables. All the fieldworkers received the same training and practice via role play to ensure a consistent technique of data collection.

3.6.2.7 Avoiding response influence or bias

As the questionnaire consists of lead-in questions and a response set the questions needed to be carefully designed to avoid the response influence. Special precaution was given to this, as lead-in questions were asked with the fieldworker specifically advised not to prompt, thus ensuring that the response is that of the participant and not words put in the mouth by the fieldworker.

3.7 ETHICAL CONSIDERATIONS

Considerations of issues were taken into account to ensure that the data collection took place in an ethical manner, always striving to protect the rights of the individual participant. Such considerations include voluntary and informed consent, confidentiality and anonymity (Burns & Grove, 2005:188-192).

3.7.1 Informed and voluntary consent

All participating mothers were asked to give voluntary and informed consent before data collection started. Each participant was approached by the fieldworker in a friendly and open manner, explaining that the aim of the interview was the completion of a questionnaire in aid of a research project. The consent form which is attached to the questionnaire was then completed with the help of the fieldworker if the approached mother agreed upon participation (Appendix C).

3.7.2 Confidentiality and anonymity

Confidentiality as well as anonymity was ensured throughout the duration of the research. This was accomplished by never recording the participant's personal details, such as name and surname, but allocating a code to each completed questionnaire. All completed questionnaires were safeguarded in a private filing system with only the researcher having access to the collected data.

3.7.3 Sensitive issues

The nature of the research involves personal questions that some individuals may experience as violation of their privacy. Such issues include questions regarding the participant's HIV status. It was handled in an accepted ethical manner, thus protecting the participant's confidentiality, anonymity and right to refuse disclosure, ensuring that the very human right to privacy and freedom of choice would be committed. Therefore, as the aim of the study did not specifically focus on HIV positive women only, no participant was asked to disclose their status, but only to share whether they knew their status and if they would be willing to share it.

3.7.4 Privacy

The right to privacy of each participant is imperative and should be protected at all times. The concept of privacy is relative and may, therefore, differ from one person to the next and this was taken into account during data collection sessions.

As data collection took place within the setting of the local health clinics with the participants sitting in an open waiting area, privacy with regard to individual space was rather limited. Each participant was, therefore, given the choice to complete the questionnaire within a private room allocated by the clinic staff should they feel intimidated by the immediate environment. Despite the availability of a more private setting, not one participant communicated the desire to complete the questionnaire within a private room.

3.7.5 Compensation

Each participant received an orange after the completion of the questionnaire as a token of gratitude for their time and willingness to participate. The participant was not aware that she

would receive any compensation at the time of agreeing to participate, thus excluding any form of bias that could exist.

3.8 CONCLUSION

In this chapter a detailed discussion was given on the research method used during the study. The specific research design was thoroughly explained and special attention was paid to the research sampling, research setting, data collection methods, data analysis as well as validity and reliability. The ethical aspects that could have a possible influence on the findings were discussed. In the following chapter the results of the research will be presented.

CHAPTER FOUR

RESULTS

4.1. INTRODUCTION

In the previous chapter the research design and method were discussed in detail. In this chapter attention is paid to the realisation of data collection as well as analysis, presenting the questionnaire's results in table and figure format.

4.2 REALISATION OF THE RESEARCH STUDY

The safety of infant feeding practices was investigated among a population group set in a semi-urban, sub-district in the North West Province, South Africa. The population group comprised of mothers with infants between ages six weeks up to three months, visiting the health clinic for their appointed post-natal visit.

The questionnaire used for data collection is based on a WHO assessment tool (WHO, 2001a) adapted with existing literature. A total of 160 questionnaires were duplicated and divided among the fieldworkers who assisted the participants with completion of the questionnaire after informed consent was given. The researcher rotated between the different clinics, assisting whenever necessary, for example answering arising questions. The researcher gathered all the completed questionnaires being a total of 155. The completed questionnaires were read into Microsoft Excell by the researcher and then handed to the Statistical and Consultation Department of the North-West University at Potchefstroom where they were analysed with the aid of StatSoft, Inc. (2006).

4.3 THE RESULTS AND DISCUSSION OF THE RESEARCH STUDY

The results of the study will now be discussed according to the different topics covered by the questionnaire. Data will also be presented in table and figure format in order to create a realistic and visual picture of the study results.

4.3.1 The sections of the questionnaire

The questionnaire consists of six different sections, describing (1) the socio-demographic characteristics of the participants, (2) the feeding patterns exercised by the participants, (3) special focus on maternal well-being including breast health and breast feeding related difficulties, (4) infant health as well as (5) the topic of cessation of breast feeding among participants.

4.3.1.1 Section one: Socio-demographic characteristics of the participants

The results of the questions on socio-demographic factors are included to enable the reader to have a clear picture of the population which participated in the study. (see table 4.1).

(a) Level of education, number if people living in the same household, number of deaths in the household, parity of participants

Table 4.1 Socio-demographic characteristics of participants attending the postnatal clinics

Descriptor	Participants	Frequency n=155
Completed level of education		
➤ > Gr. 7	6.45%	n=10
➤ Gr. 7	16.12%	n=25
➤ Gr. 8	12.9%	n=20
➤ Gr. 9	7.74%	n=12
➤ Gr. 10	24.0%	n=24
➤ Gr. 11	14.19%	n=22
➤ Gr. 12	27.09%	n=42
One or more deaths in a household during past 12months	21.98%	n=33
Reproductive health history		
➤ Parity 1	47.09%	n=73
➤ Parity 2	23.87%	n=37
➤ Parity 3	20.0%	n=31
➤ Parity 4	4.51%	n=7
➤ Parity 5	4.51%	n=7

The sample seems relatively young as the mean age of the participants was 25 years. Although it was anticipated that the majority of participants would have been exposed to minimal school education, the results proved otherwise as more than 50% of the participants completed Grade 10. This being said, one must keep in mind that although the literacy level was relatively high, most participants mainly communicated in SeTswana with only a small group able to communicate in broken English.

The fieldworkers often needed to explain the questionnaire in more detail in order for the participant to have real insight and give a true and adequate reply.

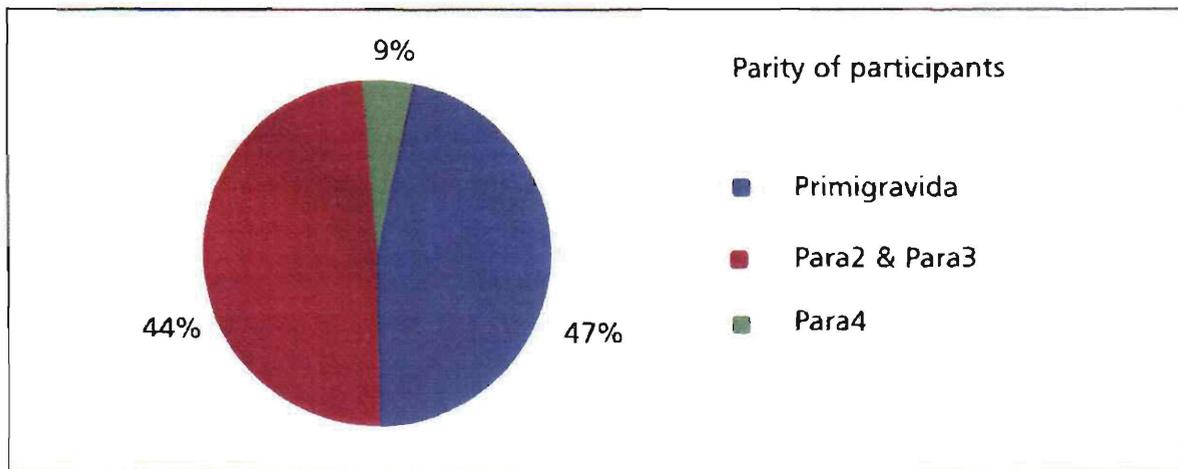


Figure 4.1 Parity of participants

Almost half of the participants were primiparas and the rest were multiparas as depicted in the above figure. Being a first time mother may contribute to insufficient knowledge regarding safe and correct infant feeding practices, especially in the absence of adequate and sufficient health education. A mother who has previous children may continue unsafe practices and if she does not receive the necessary health education regarding safe infant feeding practices, the possibility exists that she may carry on practicing unsafe feeding methods.

(b) Marital status

The marital status is an important factor for it may have a strong influence on feeding practices with regard to financial, emotional and physical support of the mother and infant.

The majority of participants were single mothers with only 14% being married. Although the questionnaire did not inquire directly about the financial status and support network of the participants, it may be speculated that the single marital status of the participants could be a contributing factor leading to unsafe infant feeding practices due to the lack of financial and emotional support.

(c) Access to water and electricity

Access to clean water and electricity plays an important role with regard to practicing safe infant feeding, especially when preparing substitute feeds. Recent results from a study on the effectiveness of the WHO/UNICEF guidelines on infant feeding for HIV-positive women,

identified criteria that are associated with improved infant feeding practices, especially when the mother opts for formula feeding (MRC, 2007:2). Piped water supply and access to electricity were among the identified criteria, thus again pointing out the important role the environment plays in maintaining appropriate infant feeding practices.

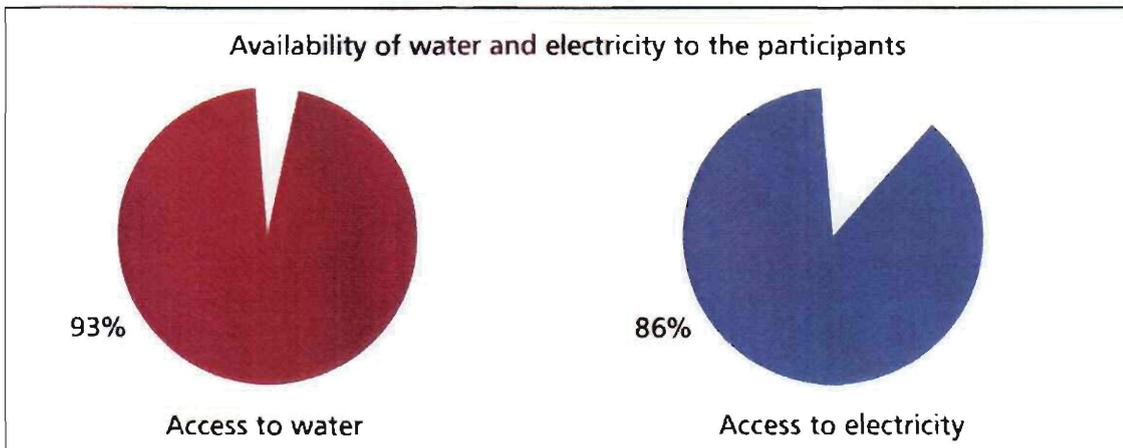


Figure 4.2 Availability of water and electricity to the participants

Although the target population was situated in a semi-urban area with a relatively low income, most participants do have access to water and electricity. This can be seen as a positive result for it is impossible to maintain safe feeding practices in the absence of access to basic necessities such as clean water.

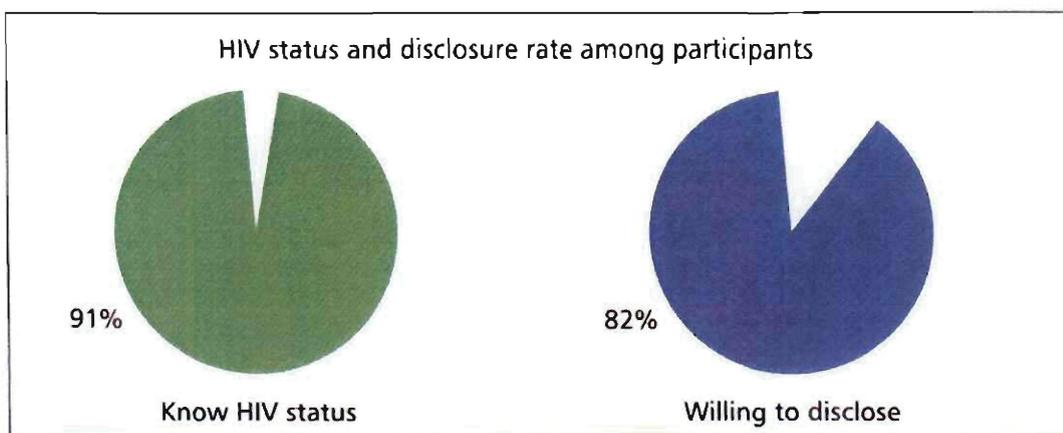


Figure 4.3 HIV status and disclosure rate among participants

4.3.1.2 HIV status

During the literature review it became evident that many studies emphasized the low uptake rate for HIV testing as well as disclosure of status. During the study on Infant feeding practices of HIV-infected and uninfected women in Zimbabwe, Gottlieb *et al.* (2004:45) indicated that HIV positive women who did not know their status more often made incorrect decisions with respect to infant feeding practices than women, either HIV-negative or positive, being aware of their status. These decisions often led to mixed feeding practices. The unknown HIV status of women impedes both the health care worker and the mother's ability to make an informed decision regarding the safest feeding method, given that she could be HIV-positive. It is surprising and gladdening to see that more than 80% of the participants knew their status and were willing to disclose, although the study did not determine the percentage of HIV-positive mothers.

The high testing and disclosure rate may indicate that health education and the PMTC programme are starting to have a positive effect, for it encourages all women to consent to HIV testing, especially pregnant women, for their health status also affects that of the infant. If the participant knows her status she can be counseled with regards to the different options to safe infant feeding practices, equipping her to provide in the best interest of both her and the infant.

The question does arise why the majority of participants continued to practice unsafe feeding methods, more specifically mixed feeding, despite the fact that most of them were aware of their HIV status in the light of the fact that one may presume that $\pm 30\%$ of participants were HIV-positive as this is the prevalence under pregnant women in the North West Province (Department of Health, 2006).

4.3.1.3 Section two: Feeding Patterns of participants

The classification of current feeding practices of the participating mothers as well as a description of the different types of substitutes and specific reasons as given by the mothers are described in Table 4.2.

(a) Supplement feeds before the first breast feeding

Table 4.2 The use of supplements or breast milk substitutes

Type of substitute/substitute	Proportion of participants using substitutes before putting the baby to the breast for the first time		Proportion of participants using substitutes after breast milk from day one up to day of participation	
Water/glucose water	30.32%	n=47	73.1%	n=115
Tea or juice	0.64%	n=1	25.6%	n=40
Milk formula	19.87%	n=31	60.8%	n=95
Cereal or porridge	1.28%	n=2	44.8%	n=70
Vegetable or fruit	0%	n=0	32.6%	n=51
Traditional medicine	1.28%	n=2	16.0%	n=25
Other....	0%	n=2	3.2%	n=5

A total of 74% participants had practiced breast feeding or were still breast feeding their infants at the time of data collection (question 2.1-2.2). Among the participants opting for breast feeding, 45% reported that their infants received other substitutes before being put to the breast for the first time, as well as after feeding the infant breast milk, thus minimising the total of participants practicing exclusive breast feeding. The results indicated that most participants practiced mixed feeding, irrespective of their parity.

Water/glucose water and milk formula were the most common substitute given by the mother to the infant before putting the infant to the breast for the first time. Substitute feeding significantly increased after the introduction to breast milk from day one up to the day of data collection. The participants were asked to specify the reason for substitute feeding and the majority of participants gave "other reasons" than the provided choices of ill health experienced by the mother, infant or both (question 2.3-2.9). Among these reasons, wanting to have a healthy baby was the most common reply given by the participants, ranging from 2% to 69% for the different substitutes. Substitute feeds increased significantly after the infant was first introduced to breast milk and may indicate that although almost all infants of the participants do receive breast milk, it is not done exclusively.

One may wonder what the "other reasons" for mixed feeding practices may be, not excluding the lack of adequate knowledge as knowledge is a decisive factor in the process of choosing

and maintaining safe infant feeding practices as discussed in Chapter Two (2.4.3.1). The tendency of participants to begin with mixed feeding even before the first breast feeding, is strongly contradicted by the WHO and UNICEF's policy of the Baby Friendly Hospital Initiative. Health education during pregnancy and directly after delivery is of the utmost importance in order to eliminate harmful cultural and traditional beliefs as well as ignorance with regard to safe infant feeding practices. Peer pressure, cultural beliefs as well as social influences may also be contributing factors to mixed feeding practices as reported in Chapter Two (2.4).

(b) Separation from infant

Mixed feeding practices can also occur when the mother and infant are separated, thus making exclusive breast feeding difficult if not impossible. Many participants opt for other feeding methods such as formula milk in addition to breast milk when separated from the infant, whatever the reason for or duration of separation may be. According to the questionnaire results (questions 2.10-2.15), approximately 31% of participants reported being occasionally separated from the infant since birth. Separation is defined as not being able to feed the infant on demand whether it is breast milk or another substance. Although this accounts for a relative large group, more than 90% of participants confirmed that the infant slept with them during the night and almost 70% received breast milk during the night. Among these participants, 7.25% admitted to giving the infant breast milk occasionally after deciding on cessation of breast feeding.

(c) Wet-nursing

Wet-nursing was discussed in Chapter Two as an alternative method to feed the infant exclusively, should the mother be unable to do so due to some reason or other. Only one participant reported making use of a wet-nurse, saying she did not have enough milk to satisfy the baby's hunger.

The low wet-nursing rates among participants do limit the risks attached to wet-nursing, such as the infant being exposed to HIV/AIDS, especially if the HIV-status of the wet-nurse is unknown (2.5.2.3). On the other hand it may show a lack of knowledge concerning the option for wet-nursing, especially in the case of the mother being unwell or separated from the infant for long periods of time.

(d) Expressed breast milk

The prevalence of expressing breast milk is relatively common among the study population as 48% of participants admitted to expressing their breast milk (question 2.17). Only 28% of the participants reported giving the expressed breast milk to the infant (question 2.18). The latter trend was ascribed to several reasons of which the most predominant was due to cultural beliefs that the mother must cleanse the milk after being away from the infant (17.94%). Other reasons reported by the mothers included the mother testing for milk (5.33%), the mother having too much breast milk (14.66%), painful breasts (5.33%), the baby not wanting the breast (9.33%), the first time to breastfeed (4.0%), to stop breast milk (1.33%), to dilute medicine (8.0%), the mother going to the clinic (6.66%), when separated from the infant (6.66%) and not producing enough breast milk (2.66%).

The majority of participants (94.7%) reported that although they did express breast milk, they did not give the expressed breast milk to the infant as an extra feed. The expressing of breast milk could have a positive effect if it was given to the infant. In the absence of sufficient knowledge of expressed breast milk and its benefits, it may further contribute to mixed feeding practices.

4.3.1.4 Maternal health of participating mothers and the effect on infant feeding practices

The questionnaire included specific questions (3.1-3.2) to determine whether the participants experienced any ill health after the delivery of the infant and the possible effect it had on infant feeding practices. Only a small percentage of the participants (10.96%, n=155) reported to having had difficulties with health, excluding breast related problems, of which flu and gynaecological problems were the most common problems (35%, n=17). The participants explained gynaecological problems as anything related to post-partum bleeding or menstruation being abnormal from their usual menstrual period before the pregnancy. Other conditions included skin infection, headache and elevated blood pressure. According to the responses of the participants, only 1.29% of the affected participants changed the way they fed the infant, namely by stopping breast feeding. As the percentage of participants experiencing ill health is so small it cannot be viewed as a significant factor affecting the safety of infant feeding practices, but it could be argued that it may have the potential to influence feeding practices.

However, one must consider that the results may not be a true reflection of the participant's general health, for in the case of serious illness, she would be referred and attended to at the hospital and not the primary health clinic, thus being eliminated from the sample.

Despite the low illness rate, results do point to a tendency that in the presence of illness, participants did change the feeding method (1.29%) by cessation of breast feeding and changing to formula milk.

4.3.1.5 Breast health and breast feeding related difficulties

The difficulties and problems related to breast health and breast feeding techniques as experienced by mothers are described in Table 4.4.

Table 4.3 Participants experiencing breast health problems and it's affect on infant feeding patterns.

Descriptor	Number and total % of participants (n=42 out of 155)	
Mothers experiencing nipple problems – sore, cracked or bleeding	12.25%	n=19
Mothers experiencing breast problems – red, infected or abscess	3.22%	n=5
Cessation of breast feeding due to breast problems	37.50%	n=9
Infants receiving breast milk from the infected breast	37.50%	n=9

The identified problems included sore, cracked or infected nipples as well as breasts being red, infected or the presence of an abscess. As breast pathology can increase the risk of MTCT in the case of an HIV-positive mother as discussed in Chapter Two (2.5.2.5), it is important to determine the percentage of participants experiencing breast conditions and the way they compensate for this.

As evident from the results in Table 4.4, only a small percentage of participants reported having experienced breast pathology, but did not practice cessation of breast feeding, or avoiding feeding the infant from the affected breast. This is of significance, for in the absence of adapted feeding patterns to accommodate the infant, the infant is put at great risk of MTCT if the mother is HIV-positive.

Mixed feeding practices can also arise in the presence of anticipated problems such as not having adequate milk production or difficulties with correct latching techniques. According to the results, 27% (n=155) of the participants experienced some of the above difficulties of which the various percentages are depicted in Diagram 4.3. Out of these (n=42) the percentage of participants who changed the way they feed their infant amounted to 46,51%.

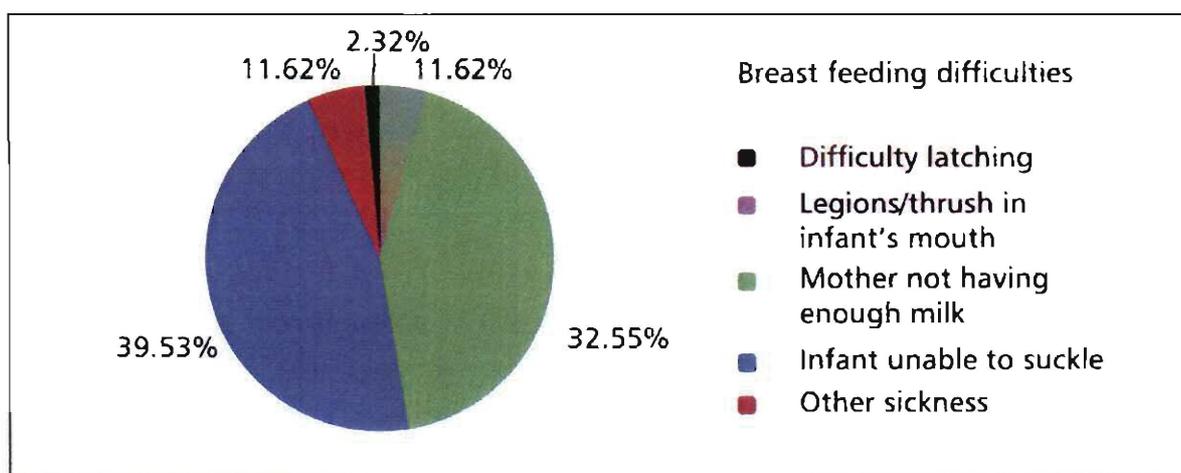


Figure 4.4 Breast feeding difficulties

Considering the above results, it can be speculated that reasons why mothers who experienced breast feeding difficulties could be narrowed down to two main problems, namely a lack of appropriate health education on the process of milk production and incorrect latching techniques. A third of the participants thought they did not have enough milk. Despite the fact that some mothers experienced breast feeding difficulties, the majority of participants did not report any problems or difficulties related to breast feeding, which is positive.

4.3.1.6 Infant health

Infant health can play a decisive role with regard to feeding methods, for if the infant experiences difficulty breathing, correct latching will be very difficult or even impossible. Conditions such as oral thrush on the other hand can lead to the infant not wanting to feed or to latch adequately and an increased risk of MTCT if the mother is HIV-positive.

According to 14.19% (n=155) of the participants, of their infants showed signs of diarrhoea but only one infant (4.5%) presented with oral thrush. Among these (18%), less than a third of infants were subjected to different feeding methods. This again may point out the importance of mothers not changing feeding practices, even in the case of ill health.

Diarrhoea, resulting in dehydration, is one of the leading diseases in South Africa associated with infant mortality and morbidity (2.5.2.1). As poor hygiene and unsafe feeding practices play an important role in contributing to the occurrence of diarrhoea, it was vital to investigate whether the prevalence rate of diarrhoea was a problem among the study sample. The results show that infants did present with signs of diarrhoea.

It is, therefore, of concern that almost all participants (n=155) indicated that they practice mixed feeding at some point or the other.

4.4 CESSATION OF BREAST FEEDING

Cessation of breast feeding, especially in the case of HIV-positive mothers, does have a direct health implication for the infant, for the risk of MTCT increases significantly should mixed feeding take place in the process of cessation of breast feeding (2.5.2.5). The participants were prompted to specify the reason(s) for cessation of breast feeding as the answers would be helpful to determine the participant’s knowledge concerning the reasons for cessation of breast feeding, as well as the importance to persist once opting for another feeding method other than breast feeding. The results are presented in Figure 4.5.

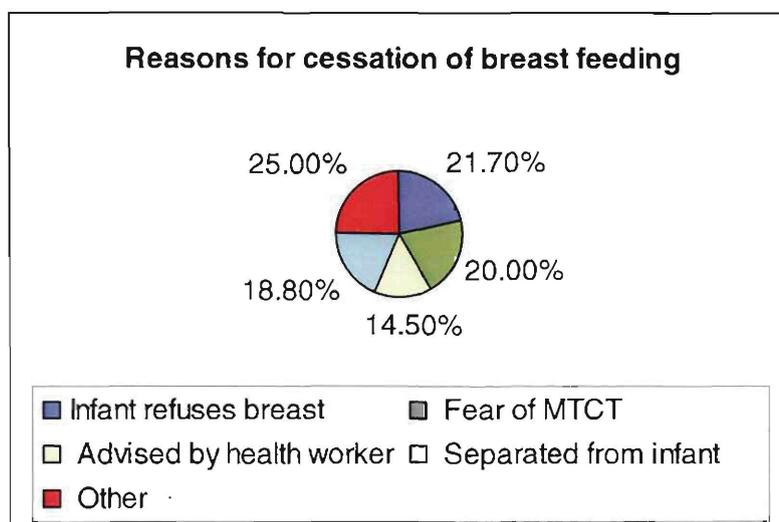


Figure 4.5 Reasons for cessation of breast feeding

According to the findings, 25.8% of participants never breast fed their infants, but started with exclusive formula feeding directly after birth. Among the participants who first practiced breast feeding and later chose to stop breast feeding, only 5.45% continued breast feeding up to three months before they started to introduce formula feeding and 27.27% stopped breast feeding completely after the infant reached the age of four months.

A total of 35.5% of participants reported that they opted for cessation of breast feeding prior to the time of data collection of which the majority referred to fear of MTCT as the major reason for their decision. It is not known whether these participants were HIV-positive. Among these participants who stopped breast feeding, only one participant admitted to occasionally putting the infant to the breast, e.g. when he starts crying, although she intended to stop breast feeding completely. Other reasons included things like the mother was too sick to breast feed, the mother feeling she does not have enough milk, the infant not latching correctly and the participant able to afford formula milk.

4.5 CONCLUSION

In this chapter the realisation of data analysis was described. The discussion of the research findings followed with regard to the socio-demographic characteristics of the participants, the feeding patterns exercised by the participants, special focus on maternal well-being including breast health and breast feeding related difficulties, infant health as well as the topic of cessation of breast feeding.

In Chapter Five the conclusions, shortcomings and recommendations will be presented, based on the data and findings.

CHAPTER FIVE

CONCLUSIONS, LIMITATIONS AND RECOMMENDATIONS FOR NURSING PRACTICE, EDUCATION AND RESEARCH

5.1 INTRODUCTION

In the previous chapter a detailed discussion and presentation of the study results were done. In this chapter conclusions will be made based on the research results. This will be followed by possible limitations of the study. Recommendations towards nursing education, nursing practice and research will be formulated. The practice-based recommendations will be focused on promoting the safety of infant feeding practices.

5.2 CONCLUSIONS

The conclusions made are based on the literature review as well as the research results. The conclusions with regard to the safety of infant feeding practices among the participants will first be presented followed by a discussion of the central conclusions.

5.2.1 Demographic information

The results indicate that more than 50% of the participants completed Grade 10. Most participants were single and first time mothers with a mean age of 25 years. It may be concluded that most participants in this study were relatively well educated, but inexperienced with regard to safe infant feeding practices due to being young first time mothers.

Although the research sample was situated in a semi-urban area with a relatively low income, most participants did have access to water and electricity. This can be seen as a positive result for these resources are necessary to ensure the feasibility of safe substitute feeding as discussed in Chapter Two.

The participants practicing formula feeding did in most cases have access to a safe environment with regards to electricity and water, enabling them to practice hygienic techniques during the preparation and storage of formula feeds. Whether the availability of these resources were used optimally to ensure safe infant feeding practices is not definite, as the questionnaire did not specifically address the issue in such detail.

5.2.2 HIV status and disclosure rate

The HIV status and disclosure rate of women were anticipated to be very low based on findings in other studies, but the results suggested the opposite to be true. More than 80% of the participants knew their status and were willing to disclose. The research did not determine the percentage of participants being HIV-positive, which would be of significance in the light of MTCT via breast feeding. Despite this, the high disclosure rate may strongly suggest that health education and the PMTC programmes are starting to have a positive effect. The fact that participants were willing to learn and disclose their HIV status strongly indicates a positive change of attitude amongst mothers with infants. This will facilitate the health care workers to provide adequate and individual health education on the different options to safe feeding practices, equipping each mother to provide in the best interest of both her and the infant's health.

5.2.3 Mixed feeding practices

The results of the study confirm the notion that mixed feeding is a common practice among mothers, which is viewed as unsafe (especially for babies of HIV-positive mothers) for it directly affects the health status of the infant (see Chapter Two). The majority of participants admitted to feeding the infant some sort of substitute of which water/glucose water were most often given.

Although the majority of participants practiced mixed feeding, the results clearly indicated that in most cases this occurred after the infant was introduced to breast milk for the first time. This may be an indication that mothers still view breast feeding as the preferred and acceptable feeding method, despite the low adherence rate to exclusive breast feeding practices.

One is faced with the question of what can be done to convince mothers that exclusive feeding practices are best, avoiding cultural beliefs and traditions that advise otherwise, such as the practice of discarding colostrum. These beliefs must be replaced by convincing facts through health education, equipping the mothers to implement safe infant feeding practices.

5.2.4 Infant feeding practices during illness

According to the responses of the participants, 26.43% (n=155) experienced ill health, including breast problems. Only 7% (n=155) of the participants changed the way they fed the infant. The changed method entailed cessation of breast feeding.

As the percentage of participants who experienced ill health is so small it is not possible to determine with certainty whether this is a general tendency among mothers. It still remains distressing that results point to the possibility that mothers do not view it important to change feeding methods in cases of illness or disease, especially when one is faced with the risk of mother-to-child transmission in HIV-infected mothers.

5.2.5 Expressed breast milk practices

Almost half of the participants admitted to the practice of expressing breast milk. It was worrying to find that only a small percentage of the participants actually gave the expressed breast milk to the infant. It seems that the main reason for this is cultural beliefs. Most participants said they discarded the expressed breast milk as a way to "purify" themselves after being separated from the infant.

This supports existing knowledge that culture and tradition play a predominant role, especially when it comes to infant feeding practices. Such beliefs have the potential to influence infant feeding practices negatively.

The fact that participants do express breast milk opens the pathway to teach them to make use of pasteurization techniques, especially if the mother is HIV-positive. This practice can contribute greatly to the safety of infant feeding practices while still protecting and promoting breast feeding. With the necessary health education on the benefits of feeding the infant expressed breast milk during periods of absence, one eliminates the need for other substitutes.

5.2.6 Cessation of breast feeding

The results strongly indicate that participants who opted for cessation of breast feeding completely stopped breast feeding once the decision was made. Almost a third of the participants reported to have stopped breast feeding before the time of data-collection. The main reasons as reported by the participants were due to the infant refusing the breast or fear of transmitting HIV.

In view of the fact that participants admitted to being afraid of MTCT via breast feeding, one may speculate that health education on the possible health risks related to breast feeding when HIV-infected, does have an impact. As the research did not determine the HIV-status of the participants, it is not possible to conclude whether the mothers who opted for cessation of breast feeding were HIV-positive and aware of their status.

In the light of infants refusing the breast, one may consider the possibility of a lack of education on adequate breast feeding techniques to be a contributing factor. This will be supportive of research results (Minnie and Greeff, 2006) reporting on the existence of inadequate health education communicated to mothers.

5.2.7 General conclusion

It became evident that most participants practiced mixed feeding methods, compromising the safety of infant feeding. The majority of participants were aware of their HIV status and willing to disclose, which is indicative of a better and positive attitude towards their own and also the infant's health status.

It also became evident that the majority of participants expressed breast milk, but due to cultural and traditional beliefs they did not feed it to infants but discarded it.

The results pointed out that participants adhere to the principles of safe cessation of breast feeding, once they opted for another substitute feeding method and that a primary reason for this decision is fear of transmitting HIV/AIDS via breast feeding.

5.3 LIMITATIONS OF THE STUDY

Although the study was planned and conducted rigorously, time was limited because of the study being part of a coursework programme. The findings of the study are, therefore, not able to be generalised.

1. The participants were part of patients visiting the local health clinics, thus excluding the rest of mothers not attending postnatal clinics during that particular week. Unfortunately the scope of the study and limited time and funds did not allow for home visits.
2. The participants were asked whether they were aware of their HIV status and if they were willing to disclose, but not to disclose their actual HIV status. This information might have been valuable, but previous studies indicated that many women are not tested, the study focused on safe feeding practices of mothers in general.
3. Specific questions on practices when preparing formula feeding could have supplied more information with regards to the safety of infant feeding practices.
4. It would have been of value to test the participants' feelings with regard to support groups. This could establish whether a need existed for an environment which could provide security and safety as well as the opportunity to give and receive advice.

5.4 RECOMMENDATIONS

Recommendations for nursing education, nursing research and nursing practice are made in this section with reference to the findings of this research, the literature, as well as the drawn conclusions. The research results should be kept in mind when looking at existing knowledge concerning infant feeding practices. This can facilitate the development of context-specific guidelines for the implementation of safe infant feeding practices.

5.4.1 Recommendations for nursing practice

Recommendations for nursing practice. The following recommendations are based on the conclusions of the research.

- Special attention should be given to the issue of exclusive feeding, stressing the importance of avoiding mixed feeding practices in the light of HIV/AIDS and the risk of MTCT in the case of unsafe feeding practices. The practice of participants not giving expressed breast milk to the infant should be addressed by providing basic health education on the benefits of expressed breast milk should the mother be unable to breast feed the infant due to separation or during illness. Health care workers should receive training equipping them to pay specific attention to educate mothers about Pretoria Pasteurization techniques which are safe and sufficient, and do not require access to expensive resources. All mothers, especially first time mothers must receive demonstrations and help with regard to correct breast feeding techniques during their stay in hospital or at local birth attending clinics. This is in the light of the results pointing to participants reporting experiencing problems with breast feeding techniques leading them to opt for cessation of breast feeding. The health education should include specific advice on the importance of avoiding substitute feeds from the very beginning, thus avoiding the practices of substitute feeds or mixed feedings before the infant even received its first breast feeding.
- Primary health clinics should pay special attention to health education with regard to the different options of infant feeding methods and the safety precautions that need to be in place.
- Establishing a good relationship and reliable communicating between the district hospital and primary health clinics to avoid situations where mothers do not receive the necessary health education and health services necessary to practice safe infant feeding.
- Develop context specific and culture specific material and provide pamphlets and posters with the necessary health education on safe infant feeding practices, with special emphasis on avoiding behaviour that could compromise the health status of both mother and infant. These educational material must make provision for the variety of cultures and different literacy levels.

5.4.2 Research recommendations for nursing education

Recommendations for nursing education are aimed at facilitating trained professional nurses, enabling them to render quality care in a comprehensive manner within the setting of the

primary health care clinics to promote the safety of infant feeding practices. The following recommendations are based on the conclusion of the research:

- Professional nurses must render quality care to mothers and future mothers to be and, therefore, need to be trained accordingly. They must assist with the necessary knowledge and skills with regards to the principles of safe infant feeding practices, which must be communicated in a practical and understandable manner.
- In-service training should take place, focusing on equipping all health care workers with knowledge of mother-to-child transmission, different feeding methods with the related risks and benefits.
- Ensuring that health care workers on all levels receive the same training with regard to counselling and health education techniques, thus enabling them to provide care according to each individual mother's situation. Training must equip the health care workers to provide cultural sensitive health education.

5.4.3 Recommendations for nursing research

From the research findings it is evident that there is potential for further research with regard the topic of safe infant feeding practices.

Research in the following areas is recommended:

- The study design was cross-sectional. A longitudinal design could generate more information regarding infant feeding practices.
- Feeding practices among mothers who specifically opted for replacement feeds, focusing on the safety within the living environment.
- The influence of the advertisements and the media with regard to choosing and practicing safe infant feeding methods.
- The effect of health education to replace unsafe cultural beliefs with safe infant feeding practices, such as expressing breast milk and feeding it to the infant instead of discarding it.
- The effect that financial income has on infant feeding choices, especially in the light of governmental grants.
- Effectiveness, including cost-effectiveness, and acceptability of specific interventions.

- Research into the relationship between HIV-positive status and feeding practices.

5.5 CONCLUDING REMARKS

The aim of the research has been achieved. The aim was to explore and describe the safety of current infant feeding practices in a semi-urban area.

Contrary to expectations, the findings indicated a high HIV testing and disclosure rate among mothers. Mixed feeding was a common practice among participants. The problem identified is that substitute feeding took place even before the infant received its first breast feeding.

It was gladdening to see that the majority of participants who opted for cessation of breast feeding abstained completely from breast feeding once they decided to stop breast feeding.

Feeding methods were not adjusted in the case of disease or illness and this may lead to an increased risk of transmission of the HI-virus, especially where the HIV-status is unknown or positive. Most participants reported to express breast milk, especially during separation from the infant, but few gave the expressed milk to the infant due to cultural believes contradicting this as being a safe feeding method.

A conclusion that can be drawn is that the most prominent unsafe feeding practice amongst the participants related to mixed feeding. Although the majority of participants were aware of their HIV status, it appears that they lacked the necessary knowledge on the risks associated with mixed feeding practices.

Recommendations were made for nursing research, nursing education and nursing practices to promote the safety of infant feeding practices.

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APPENDIX A: APPROVAL FROM ETHICS COMMITTEE



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28 August 2007

Dear Mr C S Minnie (project leader)

ETHICS APPROVAL OF PROJECT

The North-West University Ethics Committee (NWU-EC) hereby approves your project as indicated below. This implies that the NWU-EC grants its permission that, provided the special conditions specified below are met and pending any other authorisation that may be necessary, the project may be initiated, using the ethics number below.

Project title: The safety of babyfeeding practices in a semi-urban area in North-West Province.	
Ethics number:	N W U - 0 0 0 0 3 - 0 7 - A 3
Approval date: 25 July 2007	Expiry date: 25 July 2012

Special conditions of the approval (if any):

Although there is no special conditions, it is recommended that you establish the HIV status of the mothers and children. Also, you could make use of a registered dietitian in your study. It has also been noted that the method of the test sampling differs in Section 1 (p16) and 4.2 (p19).

General conditions:

While this ethics approval is subject to all declarations, undertakings and agreements incorporated and signed in the application form, please note the following:

- The project leader (principal investigator) must report in the prescribed format to the NWU-EC:
 - annually (or as otherwise requested) of the progress of the project;
 - without any delay in case of any adverse event or any matter that interrupts sound ethical principles) during the course of the project.
- The approval applies strictly to the protocol as stipulated in the application form. Should any changes to the protocol be deemed necessary during the course of the project the project leader must apply for approval of these changes at the NWU-EC. Should there be deviations from the project protocol without the necessary approval of such changes, the ethics approval is immediately and automatically forfeited.
- The date of approval indicates the first date that the project may be started. Should the project have to continue after the expiry date, a new application must be made to the NWU-EC and new approval received before or on the expiry date.
- In the absence of ethical responsibility the NWU-EC retains the right to:
 - request access to any information or data at any time during the course of or after completion of the project;
 - withdraw or postpone approval if:
 - any unethical principles or practices of the project are revealed or suspected;
 - it becomes apparent that any relevant information was withheld from the NWU-EC or that information has been false or misrepresented;
 - the required annual report and reporting of adverse events was not done timely and accurately;
 - new international rules, national legislation or international conventions deem it necessary.

The Ethics Committee would like to remain at your service as scientist and researcher, and wishes you well with your project. Please do not hesitate to contact the Ethics Committee for any further enquiries or requests for assistance.

Yours sincerely

A handwritten signature in black ink, appearing to read 'M Lowes', written over a vertical line.

Prof M Lowes
(chair NWU Ethics Committee)

APPENDIX B: PERMISSION FROM POTCHEFSTROOM SUB-DISTRICT



HEALTH
Department:
Health
NORTH WEST PROVINCE

Ramona Rietart Building
cnr Von Willeigh & Gerrit
Maritz Dassenland
Potchefstroom 2520
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**POTCHEFSTROOM
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Reference:
amohutsioa@nwpp.gov.za
israhama@nwpp.gov.za

3 April 2007

S.J. du Plessis
PO Box 20590
Noordbrug
2521

RE: RESEARCH PROPOSAL

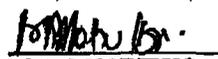
This confirms receipt of your letter dated 21 March 2007, requesting permission to conduct research.

Permission is granted to you to continue with your research in our facilities. For easy access to the facilities it would be appreciated if you communicate and organise with the following people.

- Mr. Phillip Ledimo: 018 297 5060/1-8
- The dietician – Ms. Karlien Rambenheimer: 018 297 5060/1-8

It would also be appreciated if you can communicate the results of your studies with us.

Wishing you well with your studies.


M.A. MOHUTSIOA
PHC MANAGER

APPENDIX C: INFORMED CONSENT FORM

Informed consent for completing questionnaire on “Safety of Babyfeeding practices in a semi-urban community in North West Province.”

Dear Participant

I am a M.Cur student of the Potchefstroom-campus of the North-West University. You are invited to participate in a research study regarding the safety of babyfeeding practices.

The Nature and Purpose of the study

The aim of this study is to describe the babyfeeding practices in the context of MTCT (Mother to child transmission) of HIV and other life-threatening diseases in the semi-urban community in order to develop guidelines to improve feeding practices. You are asked to participate in the phase of the study that entails completing a questionnaire on babyfeeding practices.

The participant will be asked questions by a trained fieldworker and will not need to complete the questionnaire by herself.

Approval to do research

The protocol of this study was submitted to the Ethics committee of the Faculty of Health Science of the Potchefstroom Campus of the North West University and approval has been granted. The provincial authorities and the person in charge of the clinic are also aware of this research being done in this clinic.

Risk of discomfort involved

A trained fieldworker will complete the questionnaire with the participant. Depending on the clinic infrastructure, a private setting will be used. Anonymity, confidentiality and the right to withdraw without giving a reason, at any stage will be explained to each participant and implemented. The session will be bound by ethical restrictions to uphold confidentiality of all personal information that they become aware of.

Confidentiality

Any personal information that may become known to the researcher will be kept strictly confidential. The results will be published or presented in such a fashion that all participants will remain unidentifiable.

Right to withdraw

Your participation in this research is entirely voluntary and you can refuse to participate or stop at any time without stating any reason. There will be no discrimination against you if you prefer not to participate.

Possible benefits of this research

Your contribution in this research project regarding the safety of babyfeeding practices will contribute to the formulation of guidelines to improve babyfeeding practices. These guidelines may be to the benefit of patients, health workers as well as the community as a whole.

Information

If you have any questions about the research you are welcome to contact the researcher, Miss S.J. du Plessis at telephone *****.

VERBAL PARTICIPANT INFORMED CONSENT

I, the undersigned,.....have read and have explained to the participant, named....., the patient information letter, which as indicated the nature and purpose of the research in which I have asked the patient to participate. The explanation I have given included both the possible risk and benefits of the research. The participant indicated that she understands that she will be free to withdraw from the research at any time for any reason.

I hereby certify that the patient has agreed to participate in the research.

Participant's name

Person obtaining informed consent

Witness

Date

APPENDIX D: DATA COLLECTION TOOL
QUESTIONNAIRE ON INFANT FEEDING PRACTICES

MODULE 1 - Baseline data	ANSWERS:					
1.1 Education of the mother (years of schooling)	GR.7	GR.8	GR.9	GR.10	GR.11	GR.12
	1	2	3	4	5	6
1.2 Age of mother						
1.3 Marital status	SINGLE 1			MARRIED 2		
1.4 Reproductive health history	TIMES PREGNANT			CHILDREN BORN ALIVE		
1.5 Number of people living in the household						
1.6 Do you have access to piped water supply in the house?	YES			NO		
1.7 Do you have electricity in the house?	YES			NO		
1.8 Number of deaths in the household (during the past 12 months)						
1.9 Do you know your HIV-status?	YES			NO		
1.10 If yes, are you willing to share your status?	YES			NO		
MODULE 2: Feeding patterns						
2.1 Did you ever breastfeed your infant?	YES			NO		
2.2 Did your infant receive anything to eat/drink before he was first put to the breast?	YES			NO	DON'T KNOW	

Food items given before infant was put to the breast for the first time and during the first week of life up to the 6week visit.

Reason:

- a = infant perceived unwell;
- b = mother unwell;
- c = infant and mother unwell;
- d = other reasons

Type of supplement	Before any breastmilk		
	YES	NO	REASON
2.3.A Water/glucose water			
2.4.A Tea or juice			
2.5 .A Milk formula			
2.6 .A Cereal or porridge			
2.7 .A Vegetable or fruit			
2.8.A Traditional medicine			
2.9.A Other.....			
Type of supplement	After breastmilk from day 1 up to 6week visit		
	YES	NO	REASON
2.3.B Water/glucose water			
2.4.B Tea or juice			
2.5.B Milk formula			
2.6.B Cereal or porridge			
2.7.B Vegetable or fruit			
2.8.B Traditional medicine			
2.9.B Other.....			
			YES
			NO
2.10 Have you ever been separated from the infant since birth?			
2.11 Does the infant sleep with you at night?			
2.12 Does the infant breastfeed at night?			
2.13 Do you ever put the baby to the breast (e.g. when going asleep, when your child is crying?), even if you chose only to formula feed			

your baby?		
2.14 If you are breastfeeding, has anyone else (beside yourself) ever breastfed the infant?		
2.15 If yes, why did the other person breastfeed your infant?		
➤ A) Mother ill/weak		
➤ B) Breast or nipple difficulty		
➤ C) Not enough milk		
➤ D) Work		
➤ E) Had to go out/be separated from infant		
➤ F) Advised by husband		
➤ G) Advised by other family member		
➤ H) Did not want to infect infant with HIV		
➤ I) Other		
2.16 Who beside the mother has breastfed this infant?		
➤ A) Sister		
➤ B) Mother		
➤ C) Neighbour		
➤ D) Other		
2.17 Have you ever expressed your breast milk? If yes, why?		
2.18 If yes, have you given the expressed breast milk to the infant?		
MODULE 3 - Maternal Health		
3.1 Have you ever been sick since the birth of the baby? If yes, details:		
3.2 Did you change the way you fed your child during that time? If yes, how:		
MODULE 4 - Breast health and breastfeeding related difficulties		
	YES	NO
4.1 Have you experienced any of the following problems with your breasts?		
➤ A) Nipple problem: sore, cracked or bleeding		
➤ B) Breast problem: red, infected, abscess		
4.2 If you experienced problems with your breast, was breastfeeding stopped from the affected breast during the episode?		
4.3 Did the infant receive breast milk from the affected breast during		

the episode?		
4.4 Have you experienced any difficulties breastfeeding your infant? If yes, specify the reason. (Ask the question and tick only the answers given. Do not prompt)		
➤ A) Infant was not able to suckle		
➤ B) Mother thought she did not have enough milk		
➤ C) Infant had lesions or thrush in the mouth		
➤ D) Infant had difficulty latching on		
➤ E) Infant had difficulty breathing		
➤ F) Infant had other sickness/health problem		
4.5 What did you do with regard to the difficulties? (Ask the question and tick only the answers given. Do not prompt)		
➤ A) I gave infant other milk/food/liquids		
➤ B) Nothing, I continued breastfeeding		
➤ C) I expressed milk from the affected breast		
➤ D) I consulted a health care provider		
➤ E) I consulted other person		
➤ F) I changed breastfeeding position		
➤ G) I took medicine		
MODULE 5 - Infant Health		
5.1 Has the infant shown any of the following signs		
➤ A) Diarrhea		
➤ B) Sore with white patches on the inside of the mouth which remained when scraped (oral thrush)?		
5.2 Did you change the way you fed your infant when this occurred?		
MODULE 6 – Cessation of breastfeeding		
6.1 Have you completely stopped breastfeeding your infant every day and every night?		
6.2 How old was your infant when you completely stopped (age in weeks) breastfeeding him every day and every night?	Weeks:	
6.3 Do you still put your child to the breast occasionally, e.g. when your child starts crying?		
6.4 Why did you stop breastfeeding your infant? (Ask the question and tick only the answers given. Do not prompt, except to ask "Are there any other reasons?")		
➤ A) Infant old enough		
➤ B) Infant no longer wanted to breastfeed		

➤ C) To encourage infant to eat solid food		
➤ D) Pregnancy		
➤ E) Fear of transmitting HIV		
➤ F) Mother can afford replacement feeding		
➤ G) Advised by health provider		
➤ H) Advised by husband or other person		
➤ I) Resumption of sexual relationship		
➤ J) Infant too sick to breastfeed		
➤ K) Infant not growing well		
➤ L) Mother too sick to breastfeed		
➤ M) Separation from infant due to work/other reason		
N) Other: Specify		

APPENDIX E: WHO ASSESSMENT TOOL

WHO/RHR/01.12

WHO/CAH/01.21

Distr.: General

**BREASTFEEDING AND REPLACEMENT FEEDING PRACTICES
IN THE CONTEXT OF MOTHER-TO-CHILD TRANSMISSION OF HIV
AN ASSESSMENT TOOL FOR RESEARCH**

World Health Organization

Department of Reproductive Health and Research (RHR)

Department of Child and Adolescent Health and Development (CAH)

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1 Introduction

This tool provides guidance for researchers who seek to establish the nature of the association and levels of risk of transmission between patterns of infant feeding and mother-to-child transmission of HIV (MTCT). Such a tool has not yet been developed for MTCT although comparable tools have been used in other contexts, such as childhood diarrhoea. Many indicators, including those in Demographic and Health Studies, already exist. By drawing on these existing instruments and involving many investigators in the design of this tool, it is hoped that the data may be more consistently collected from study to study, allowing improved comparison across sites and meta/joint analyses of data sets.

This tool is designed to assess infant feeding patterns and their relation with MTCT. It is not intended to collect information on nutritional adequacy of infant feeding.

Rationale for the present emphasis on MTCT:

By the end of the year 2000, UNAIDS estimated that 1.3 million children were living with HIV/AIDS and that 4.3 million children had already died of the disease. In the year 2000 alone, it was also estimated that 600 000 children were infected with HIV and 500 000 died of HIV/AIDS.¹ Almost all HIV-infected children acquire HIV from their infected mother.

MTCT can occur during pregnancy, at the time of delivery, and after birth through breastfeeding. Based on a compilation of studies, it is estimated that MTCT rates, without any anti-retroviral intervention, range from 15 to 30% in the absence of breastfeeding, to 25 to 35% if there is breastfeeding through 6 months and to 30 to 45% if there is breastfeeding through 18 to 24 months.²

Table 1. Estimated risk and timing of mother-to-child transmission of HIV

Timing	Transmission rate (%)		
	No breastfeeding	Breastfeeding through 6 months	Breastfeeding through 18 to 24 months
During pregnancy	5 to 10	5 to 10	5 to 10
During labour	10 to 20	10 to 20	10 to 20
Through breastfeeding			
Early (first 2 months)		2 to 10	2 to 10
Late (after 2 months)		1 to 5	5 to 10
Overall	15 to 30	25 to 35	30 to 45

Source: De Cock KM et al. 2000.

2 Risk factors for MTCT through breastfeeding

@ Maternal viral load and CD4-CD8 counts

High maternal viral load measured during pregnancy³ or after delivery⁴ and low CD4/CD8 ratio⁴ have been associated with an increased rate of MTCT through breastfeeding.

@ Duration of breast feeding

The risk of HIV transmission through breastfeeding is greatest in early infancy (before 6 months of age), and persists as long as breastfeeding continues.^{5,6} Some studies found that longer duration of breastfeeding is associated with increased risk of MTCT.^{3,7,8}

@ Breast milk infectivity

A randomised clinical trial in Nairobi suggested that the volume of milk ingested is an important factor in breast milk transmission of HIV.⁹

@ Infant oral thrush

A study in Kenya found that infant oral thrush before 6 months of age is a risk factor for post-neonatal infection of children.⁸

@ Breast inflammation and pathology

Some studies found that inflammatory conditions such as mastitis, assessed clinically^{3,10} or biologically (by measuring the sodium level in breast milk),⁴ fissures¹⁰ and breast abscesses³ increase the risk of MTCT through breastfeeding.

Poor breastfeeding technique (poor attachment) is a frequent cause of such conditions. A suggested mechanism for the associated increased risk of transmission is that inflammation-induced openings in the mammary epithelium, secondary to poor breast emptying and milk stasis, allow plasma constituents, including HIV, to enter the breast milk.¹¹ The elevation of sodium in breast milk is used as a proxy for assessment for sub-clinical mastitis. Other conditions associated with elevated breast milk sodium include pre-term delivery (elevated sodium in the first four weeks), low milk volume (< 400 ml/day), pregnancy while breastfeeding (during the first two months). Colostrum also has a high sodium concentration.

A retrospective study conducted in Malawi⁴ found that HIV-infected breastfeeding women with elevated breast milk sodium levels (>12 mmol/l) consistent with sub-clinical mastitis in early infancy (6 weeks post-partum) had higher concentrations of HIV in their breast milk and were more likely to have HIV-infected babies at 6 weeks and 12 months of age than women with normal breast milk sodium levels. Breast milk samples were obtained at one time point only and it is impossible to ascertain whether elevated breast milk sodium from a single sample is independently associated with breastfeeding-related HIV transmission or if it is a marker for systemic inflammation and/or poor immune status in the mother. A prospective study of HIV-infected mothers in Durban found that raised breast milk sodium:potassium ratios (>1) correlated highly with breast milk HIV viral load and frequently occurred unilaterally.

@ Infant feeding patterns and MTCT

A study conducted in Durban, South Africa found evidence that non-exclusive breastfeeding may be an additional risk factor.¹² In this study, a group of infants exclusively breastfed for at least three months had a lower transmission risk at six months (19.4%) than did those who also received other fluids or foods together with breast milk (26.1%). The difference in the cumulative probability of infection remained significant at 15 months, being 24.7% among 3

months exclusively breastfed infants compared to 35.9% among non-exclusively breastfed infants.¹³

This analysis was performed on HIV-infected women and babies participating in a vitamin A supplementation trial. Women in this study received advice about infant feeding, but self-selected their feeding practices. Other risk factors for MTCT, such as maternal CD4/CD8 cell ratio, syphilis screening test results, and pre-term delivery were controlled for in the analysis. The morbidity (diarrhoea, lower respiratory tract infection, candidiasis) in children prior to detection of HIV was similar in infants who were exclusively breastfed and in infants who were mixed fed. This addresses some of the concerns raised about this observational study, in particular the issue of reverse causality, whereby a change in infant feeding pattern may result from an infection. HIV acquisition may be wrongly ascribed to the change in feeding pattern rather than to the underlying infection that could have facilitated the acquisition of HIV infection. It is plausible that primary HIV infection in children may be associated with signs and symptoms, and result in a change of feeding pattern to which the infant HIV's acquisition can be wrongly attributed.

Potential mechanisms that could explain a reduced risk of MTCT when children are exclusively breastfed include:¹⁴

- Ⓔ Reduction in dietary antigens and enteric pathogens that may maintain integrity of the intestinal mucosal barrier and limit inflammatory responses to the gut mucosa;
- Ⓔ Promotion of beneficial intestinal microflora that may increase resistance to infection and modulate the infant's immune response;
- Ⓔ Modulation of anti-microbial, anti-inflammatory and immuno-modulating properties of breast milk;
- Ⓔ Maintenance of mammary epithelial integrity that may reduce viral load in breast milk.

3 Rationale for developing an assessment tool to record infant feeding pattern in the context of MTCT

The development of this tool has been driven by the recognition that more information on risk factors for HIV transmission through breastfeeding is needed and to ensure that research groups use the same definitions and terms. The objective of this tool is, therefore, to standardise the core information that needs to be collected and to ensure comparability between studies.

Unfortunately, the South African study did not measure breast health and the Kenya and Malawi studies did not distinguish between exclusive and non-exclusive breastfeeding, which precludes an understanding of the relative contributions of these risk factors to overall risk of MTCT of HIV. In fact, nearly all studies of transmission through breastfeeding have used customary but now inadequate methodologies based on comparisons between ever and never breastfed infants, grouping all breastfed babies into a single category and not permitting assessment of the effects of different breastfeeding patterns (e.g., exclusive breastfeeding, breast and formula feeding, predominant breastfeeding with water supplements, formula feeding alone, etc) on the risk of MTCT.¹⁵ This tool provides guidance to users on how to collect information on breastfeeding and replacement feeding practices in the context of research related to MTCT of HIV. Use of the tool within MTCT intervention studies conducted in breastfeeding populations will allow researchers to quantify the risks of HIV transmission according to various feeding patterns after adjusting for potentially confounding variables.

4 Definitions of breastfeeding and replacement feeding terms

In 1991, the World Health Organization convened an informal meeting to establish definitions and indicators for assessing breastfeeding practices in household surveys.¹⁶ The main purpose of promoting the use of the indicators was to have a common set of measures to assess practices and monitor the progress of breastfeeding promotion programs. Several of the following definitions are taken from this document; others are taken from the documents entitled "International Code of Marketing of Breast-milk Substitutes", "Breastfeeding Counselling: a training course" and "HIV and Infant Feeding: guidelines for decision makers".^{17,18,19}

▪ Breastfeeding

"The child has received breast milk (direct from the breast or expressed)".¹⁶

Breastfeeding practices may be further described according to timing and frequency. In terms of timing, breastfeeding may be described as on-demand (by the child) or on schedule (determined by a schedule or work/separation demands of the mother).

• Exclusive breastfeeding

"The infant has received only breast milk from his/her mother or a wet nurse, or expressed breast milk and no other liquids, or solids with the exception of drops or syrups consisting of vitamins, mineral supplements, or medicines".¹⁶

A child may be exclusively breastfed with expressed human milk from his mother, a breast milk donor or from a milk bank.

• Predominant breastfeeding

"The infant's predominant source of nourishment has been breast milk. However the infant may also have received water or water-based drinks (sweetened or flavoured water, teas, infusions, etc.); fruit juice; Oral Rehydration Salts (ORS); drop and syrup forms of vitamins, minerals, and medicines; and folk fluids^a (in limited quantities). With the exception of fruit juice and sugar-water, no food based fluid is allowed under this definition."¹⁶

▪ Breast milk substitute

"Any food being marketed or otherwise presented as partial or total replacement from breast-milk, whether or not suitable for that purpose".¹⁷

• Complementary feeding

Any food, whether manufactured or locally prepared, suitable as a complement to breast milk or to infant formula, when either become insufficient to satisfy the nutritional requirements of the infant. Such food is commonly called "weaning food" or "breast-milk supplement".¹⁷

• Partial breastfeeding

Means giving a baby some breastfeeds, and some artificial feeds, either milk or cereal, or other food.¹⁹

• Replacement feeding

^a Folk fluids are liquids used for non-nutritional purposes, oil to relieve constipation, tea for relief of colic etc.

Means the process of feeding a child who is not receiving any breast milk with a diet that provides all the nutrients the child needs. During the first six months this should be with a suitable breast-milk substitute — commercial formula, or home-prepared formula with micronutrient supplements. After six months it should preferably be with a suitable breast-milk substitute, and complementary foods made from appropriately prepared and nutrient-enriched family foods, given three times a day. If suitable breast-milk substitutes are not available, appropriately prepared family foods should be further enriched and given five times a day.¹⁸

5 Breast and infant mouth pathologies

The following descriptions are taken from two WHO documents: the breastfeeding counselling training course¹⁹ and a document on causes and management of mastitis.²⁰

@ Full breasts

Breasts that are hot, heavy, hard or lumpy, but with flowing breast milk. No fever is present in the mother. This condition is commonly experienced in the first days of breastfeeding, before the mother's milk supply has adjusted to the baby's needs and breastfeeding patterns.

@ Engorged breasts

Breasts that are over-full, partly with milk and partly with increased tissue fluid and blood. As a result, milk flow is inhibited. Engorged breasts are often painful, shiny, and diffusely red. Nipples may be stretched tight and flat. The condition may be accompanied by fever lasting 24 hours or less in the mother.

@ Mastitis

Mastitis is an inflammation of the breast. It is a condition that commonly results from inadequate or poor drainage of milk from the breast. Mastitis can be infective or non-infective in origin. Non-infective mastitis, which is most common, is usually the result of a blocked milk duct, which causes inflammation of the breast tissue. Mastitis frequently affects only one breast (whereas engorgement often occurs bilaterally) and is characterised by hard swelling, severe pain, fever (24 hours or longer) and localised redness around the affected area. Other causes include infrequent feeds or ineffective suckling; breast trauma and tissue damage; and pressure on the breasts from clothes, fingers or other sources which inhibit milk flow and cause milk stasis leading to breast tissue inflammation. Infective mastitis is the result of bacterial infection. Poor breast attachment causing nipple fissures is a common pathway to infectious mastitis.

@ Breast abscess

This is a collection of pus in part of the breast. It results in painful swelling of the breast and usually requires a surgical incision for drainage.

@ Nipple fissure or crack

It is characterised by pain during feeding and may or may not be associated with pus and/or bleeding.

@ Breast thrush

Fungal infection characterised by breast pain between feeds, very sore nipples and itchy/flaky nipples

@ Infant oral thrush

Fungal infection characterised by punctuate or diffuse erythema and white-beige pseudo-membranous plaques on the oral mucosa that remain when scraped and that may interfere with feeding.

@ Infant mouth ulcer

Mouth ulcers may provide an entry point for HIV. In addition, painful ulcers may interfere with feeding.

6 Questions to assess infant feeding practices in the context of MTCT

The questions are grouped into six modules.

Module 1	Baseline
Module 2	Feeding practices
Module 3	Maternal health
Module 4	Breast health
Module 5	Infant health
Module 6	Cessation of breastfeeding

For each of these modules, we suggest core questions that should be part of all studies investigating the relationship between infant feeding patterns and MTCT. Core questions are marked with a bullet point. A few optional questions on infant feeding and MTCT are suggested. These are written in *italics*.

The questions are presented in a generic format, and should be integrated into a questionnaire according to the specific design of each study. The layout of the questionnaire is designed for use in either prospective or cross-sectional studies.

It is intended that mothers will answer these questions during interviews by trained field workers who are not necessarily health care workers. Once the questions are integrated into the final questionnaire, field workers must undergo training specific to the study, to ensure that they understand all the questions, will deliver them in a standardised way and are able to record answers adequately.

6.1 Module 1 - Baseline data (at recruitment and/or during first visit after birth)

While many of these questions will be site specific, it is recommended that interviewers collect the following information to allow adjustment during analysis and comparison between study populations:

Socio-demographic and socio-economic data

- @ Education of the mother (years of schooling)
- @ Age of mother
- @ Marital status
- @ Reproductive health history
- @ Number of people living in the household
- @ Number of deaths in the household (during the past 12 months, per age group, and relationship to the mother)

Maternal health status

- @ Viral load during pregnancy
- @ Symptoms or definitive diagnosis of tuberculosis
- @ Clinical stage of HIV
- @ Nutritional status (BMI)

Obstetric information

- @ Duration of labour
- @ Type of delivery (vaginal, elective caesarean section, emergency caesarean section)
- @ Episiotomy or tear requiring stitches
- @ Antiretrovirals given to mothers and child (time before and after delivery, and how long after delivery they were given)
- @ Birth weight

Optional questions that may be recorded

- @ *Contraceptive practices of the mother*
- @ *Malaria status of the mother*
- @ *Stool examination (parasites)*
- @ *Gestational age*
- @ *Vacuum, forceps delivery*
- @ *Infant presentation*

6.2 Module 2 - Feeding practices

The breastfeeding indicators developed in 1991 are based on information on feeding patterns in the 24-hours period preceding the enquiry, and therefore reflect current infant feeding status.¹⁶ In the present document, assessment of feeding practices is based on whether specific items have ever been consumed and how frequently (in terms of times/day) they were consumed during the recall period. The proposed approach tries not only to record current infant feeding status, but also to capture infant feeding history.

Available data and presumed biological mechanisms suggest that even small or infrequent deviations from exclusive breastfeeding may increase the risk of HIV transmission through damage to the integrity of the mucous membranes of the gut (caused by inflammation, allergic reaction, or introduction of infectious pathogens). At present, there is not enough information to determine how much deviation from exclusive breastfeeding, or how much exposure to allergenic or pathogenic foods and liquids, increases transmission risk. Data are also insufficient to determine whether certain deviations, such as the introduction of one or more category of food other than breast milk (e.g. water, non-human milk) might influence transmission. The present questionnaire will allow such information to be recorded and will allow estimates to be made of the amount of nutrition coming from breast milk (a proxy for volume of milk consumed), how it changes over time and whether it influences post-neonatal MTCT transmission.

As stated in the introduction, this questionnaire is designed to assess infant feeding patterns and their relation with MTCT. It is not intended to collect information on nutritional adequacy of infant feeding.

The consensus of experts and from pilot testing of the questionnaire was that the maximum recall period to obtain reasonably accurate qualitative data on infant feeding patterns would be one week. This will be complemented by quantitative data recording the frequency of items given in the past 24 hours and if possible the approximate volume.

The dynamics of infant feeding are complex. An infant can be exclusively breastfed for a period, receive other food due to a change in circumstances, and then return to exclusive breastfeeding. This complexity is difficult to capture unless there is a continuous assessment of the infant feeding patterns. Most studies will only be able to do a repeated cross-sectional assessment survey of infant feeding patterns. Some specific studies might use a prospective diary given to the mother to record information on a daily basis, as an aid to recall during the interview.

6.2.1 First week of life (first visit only)

The first week of life is of special interest because of its complex feeding patterns. It is a time when both mother and infant are more likely to be unwell following the delivery, with possible mother and infant separation influencing infant feeding patterns. While the mother is in the hospital, she receives and is likely to follow health workers advice on infant feeding. When she goes back home, the way she feeds the infant is based on her own beliefs and experience, the advice she received from the health worker, and the influence of her partner, family and community. There are special beliefs and practices concerning colostrum. Colostrum may or may not be given to the infant. Other traditional practices may influence the initial feeding of the infant, such as the offering of pre-lacteal feeds to the newborn. It is unclear whether different foods carry different transmission risks in the immature gut, compared with their use later in the child's life.

Recall period: questions related to this period can be asked till one month after birth.

@ Did you ever breastfeed your infant? (yes) (no)

If no, there is no need to complete the entire questionnaire

@ If yes, how soon after delivery was your infant first put to the breast? (in hours)

@ Did your infant receive anything to eat/drink before he was first put to the breast? (yes) (no) (don't know)

@ Did the infant receive oral polio vaccine during the first week of life? (yes) (no) (don't know)

@ If yes, indicate the date (day, month, year)

The following table is designed to collect data on the type of food given before the infant was first put to the breast and if this was related to the mother's or infant's health. The same table also records all foods given to the infant during the first week of life and the reasons why they have been given. Probe all the items listed in the table.

Questions on reasons underlying actual infant feeding practices aim at ruling out reverse causality (see Section 6.3)

**Food items given before infant was put to the breast for the first time
and during the first week of life**

	Before any breast milk		Day 1		Day 2 to Day 7	
	Given	Reason	Given	Reason	Given	Reason
Breast milk						
Unsure if other food given						
Water or Glucose water						
Tea or Juice						
Formula						
Other milk						
Cereals or porridge (home prepared or commercial)						
Vegetables or fruits						
Other foods unspecified						
Other foods specified						
Pharmaceutical medicines						
Traditional medicines						

Reason: a = infant perceived unwell; b: mother unwell; c = infant and mother unwell; d = other reasons

Other food specified 1: _____

Other food specified 2: _____

Other food specified 3: _____

6.2.2 Follow-up visits - Food items given (all visits)

- ⊗ Since the last visit, has the infant received oral polio vaccine? (yes) (no) (don't know)
- ⊗ If yes, date of oral polio vaccine (day, month, year)
- ⊗ Has the child received anything else other than breast milk since the last visit? (yes) (no) (don't know)

	6 days before yesterday						Yesterday
	Answer yes/no						Quantify number of breastfeeds
	6	5	4	3	2	1	
Date (day/month)							Number of breastfeeds
Breast milk during day							
Breast milk during night							
							Number of times the item was given
Unsure of other food given							
Water / Glucose water							
Tea / Juice							
Formula							
Other non maternal milk							
Cereals or porridge(home prepared or commercial)							
Mashed vegetables or fruits							
Other foods unspecified							
Other foods specified							
Pharmaceutical medicines							
Traditional medicines							

Other food specified 1: _____
 Other food specified 2: _____
 Other food specified 3: _____

- ⊗ Was yesterday feeding pattern typical of the last week? (yes) (no) (don't know)
- ⊗ Was the last week feeding pattern typical of the way the infant was fed since last visit? (yes) (no) (don't know)

Suggested questions to assess the validity of the answers, probing for information on infant feeding practices that are not otherwise reported.

- Have you been separated from the infant? (yes) (no)
- Does the infant sleep with you at night? (yes) (no)
- Does the infant breastfeed at night? (yes) (no)
- Do you ever put the baby to the breast (e.g. when going asleep, when your child is crying?) (yes) (no)

• 

6.2.3 Notes to further explain the previous tables

Yesterday (during the past 24 hours): From the time the mother woke up yesterday until the time she woke up today.

6 days before yesterday: The 6 periods of 24 hours prior to the time described as "yesterday", and using the same definition of a day.

Breast milk during day: any breast milk given between the time the mother woke up in the morning till the time she went to bed in the evening of the same day.

Breast milk during night: any breast milk given between the time the mother went to bed in the evening and the time she woke up in the morning the following day.

Breastfeed: defined as a suckling episode that lasts two minutes or longer, with each episode separated by 30 minutes or more.

Other food: any food item that is not listed. For example, the following items should be recorded under other food: tea with milk, folk fluids.

Pharmaceutical medicines: they include liquid medicines, liquid vitamins or minerals, gripe water

Other non-human milk: includes fresh animal milk, tinned or powdered milk, fermented or sour milk, yoghurt, cheese, other fermented, home-made infant milk formula, and all other milk from a cow or other animal.

Specific studies might document:

- @ *Beliefs and practices concerning the consumption of colostrum;*
- @ *Quality of the water given to the infant, either alone, with glucose, to dilute juices, to prepare food: piped water, water from a well/bore hole, stream, rain from a tank, bought from distributed containers; whether and how the water was treated (boiled, chemicals...);*
- @ *More details on the different food items introduced;*
- @ *Reasons other than those related to maternal and infant health underlying actual infant feeding practices.*
- @ **Unit per feed during the last 24 hours:** *Only for studies recording the amount of food consumed. For these studies, a measuring unit (based on a widely used volume) can be defined (e.g. 25 ml) and a cup graduated per unit. The amount of each item given can be assessed by referring to this standardised cup that can be shown to the mother.*
- @ *Some studies might document the utensils used to feed the infant (bottle with a teat, cup with a spout, cup, cup with a spoon...), their condition, and the way the utensils are cleaned.*
- @ *Some studies might document the use of pacifiers / dummies.*

6.2.4 Wet-nursing practices (all visits)

- Ⓔ Has anyone else (beside yourself) ever breastfed this infant since last visit? (yes)(no) (don't know)

If no, go to the next module.

- Ⓔ Number of days on which this occurred? (days)
- Ⓔ Why did the other person breastfeed your infant? (*Ask the question and tick only the answers given. Do not prompt, except to ask "Are there any other reasons?"*)
- Ⓔ Mother ill/weak
 - Ⓔ Breast or nipple difficulty
 - Ⓔ Not enough milk
 - Ⓔ Work
 - Ⓔ Had to go out/be separated from infant
 - Ⓔ Advised by husband
 - Ⓔ Advised by other family member
 - Ⓔ Did not want to infect infant with HIV
 - Ⓔ Other (specify)
- Ⓔ Who beside the mother has breastfed this infant? (*Ask the question and tick only the answers given. Do not prompt.*)
- Ⓔ Sister
 - Ⓔ Mother
 - Ⓔ Other family member
 - Ⓔ Neighbour
 - Ⓔ Other (specify)

6.2.5 Expressed milk (all visits)

- @ Have you ever expressed your breast milk since last visit? (yes) (no)
- @ Number of days on which this occurred since last visit? (days)
- @ Have you given the expressed breast milk to the infant since last visit? (yes) (no)
- @ Number of days on which this occurred since last visit? (days)
- @ Have you heat treated your breast milk since last visit? (yes) (no)
- @ Number of days on which this occurred since last visit? (days)
- @ Why did you express milk? (*Ask the question and tick only the answers given. Do not prompt, except to ask "Are there any other reasons?"*)
- @ To relieve breast pain/engorgement
- @ To relieve pain due to cracked nipples
- @ Thought milk was bad/unsafe/contaminated
- @ To heat-treat before feeding
- @ Had to be separated from infant
- @ To wean/stop breastfeeding
- @ Other (specify)
- @ Infant unable to suckle on breast due to illness).

Specific studies might document the way the milk was expressed, the way it was stored and the way it was given to the infant.

Some studies might document the utensils used to feed the infant (bottle with a teat, cup with a spout, cup, cup with a spoon...), their condition, and the way the utensils are cleaned.

Some studies might document the use of the pacifiers / dummies.

6.3 Module 3 - Maternal Health (all visits)

The aim of documenting maternal health in the context of this questionnaire is to rule out reverse causality. A sick mother might change her infant's feeding behaviour due to her disease, e.g. switching from feeding her infant with breast milk to other foods. The maternal illness might be the direct cause of increased transmission through breast milk (for example if this results in an increased viral load in the breast milk). Infant HIV infection possibly occurring around this time could be wrongly attributed to the change in his infant feeding pattern.

@ Since your last visit, have you ever been sick? (yes) (no) (don't know)

For each event of sickness, record the following:

@ Specify what sickness

@ Did you seek treatment for this condition at the health centre?

@ Have you consulted a doctor? (yes) (no)

@ Have you been admitted to Hospital? (yes) (no)

@ What date did the disease start? (day, month, year)

@ What date did the disease finish? (day, month, year)

@ Did you change the way you fed your child during that time? (yes) (no)

@ What did you do differently? (*Ask the question and tick only the answers given.*)

- Stopped breastfeeding
- Stopped non-human milks
- Stopped other liquids
- Stopped solid foods
- Began giving non-human milks
- Began giving other liquids
- Began giving solid foods

6.4 Module 4 - Breast health and breastfeeding related difficulties (all visits)

Questions are formulated in a way that they can be asked by a trained field worker without health care experience.

- @ Since your last visit have you experienced any difficulty with your breast or with breastfeeding health problem? (yes) (no)
- @ What breast health difficulties have you experienced?
 - episode 1: (started: day/mon/yea) (finished: day/mon/yea)
 - episode 2: (started: day/mon/yea) (finished: day/mon/yea)
 - episode 3: (started: day/mon/yea) (finished: day/mon/yea)

For each episode, fill a separate form, qualify the type of breast health problem, the type of pain if any and if the infant received milk from the affected breast or not.

Appearance of the breast:

- @ Was the breast enlarged? (yes) (no)
- @ If yes, was the enlargement in one breast or both? (one breast) (both breasts)
- @ Was the skin of the breast red/hot generalised (no)(yes, localised)(yes, (or discoloured/shiny)?
- @ Was there an abscess on the breast? (yes) (no)

Appearance of the nipple

- @ Was the skin of the nipple broken (cracked)? (yes) (no)
- @ If yes, was there pus? (yes) (no)
- @ Or bleeding? (yes) (no)
- @ Was the skin of the nipple flaking? (yes) (no)

Pain

- @ Was there pain during that episode? (no) (yes, mild to moderate) (yes, severe)
- @ Was there any itching? (yes) (no)
- @ Was the pain affecting the nipple during feeding? (yes) (no)
- @ Was the pain superficial or deep in the breast during feeding? (yes, superficial) (yes, deep) (no)
- @ Was the breast pain persisting between feeds? (yes) (no)

Fever

- @ Did you have any fever during this episode? (yes) (no)

Longitudinal study

- @ Was the infant fed from the affected breast? (yes) (no)
- @ Date breastfeeding was stopped from affected breast (day/mon/yea)
- @ Date breastfeeding was resumed from affected breast (day/mon/yea)

Cross-sectional study

- @ Was breastfeeding stopped from the affected breast during the episode? (yes) (no)
- @ Was breastfeeding stopped during some or all of the episode? (some) (all)
- @ Did the infant receive breast milk from the affected breast during the episode? (yes) (no)
- @ Did the Infant receive breast milk from the affected breast during some of the episode? (yes) (no)
- @ In a longitudinal study, ask about all events since the last visit. In a cross sectional study, ask about breast health pathology since the infant was born.

- Ⓔ Since last visit, have you experienced any difficulties breastfeeding your infant? (yes) (no)

If yes, can you describe what type of difficulties? (*Ask the question and tick only the answers given. Do not prompt, except to ask "Is there any other reason?"*)

- Ⓔ Mother was sick (specify)
- Ⓔ Infant breastfed too often
- Ⓔ Infant was not able to suckle
- Ⓔ Mother thought she did not have enough milk
- Ⓔ Infant had lesions or thrush in the mouth
- Ⓔ Infant had difficulty latching on
- Ⓔ Infant had difficulty breathing
- Ⓔ Infant had other sickness/health problem (specify)
- Ⓔ Other (specify)

- Ⓔ What did you do? (*Ask the question and tick only the answers given. Do not prompt, except to ask "Is there any other reason?"*)

- Ⓔ Nothing, I continued breastfeeding
- Ⓔ I gave infant other milk/food/liquids
- Ⓔ I expressed milk from the affected breast
- Ⓔ I consulted a health care provider (specify)
- Ⓔ I consulted other person
- Ⓔ I changed breastfeeding position
- Ⓔ I took medicine (specify)
- Ⓔ Other (specify)

Some studies might:

- Ⓔ *Employ trained health care workers who have followed the WHO breastfeeding training course to conduct these surveys;¹⁹*
- Ⓔ *Refer mothers with suspected breast pathology to trained study health staff (nurses or doctors) to ascertain the diagnosis;*
- Ⓔ *Collect breast milk samples to investigate more specifically signs of sub-clinical mastitis and other biological and immunological factors related to post-natal transmission of HIV;*
- Ⓔ *Record breastfeeding techniques after observing a breastfeeding session.*

All studies should identify a referral system so that a field worker can refer any mother with a current breast health problem for treatment.

6.5 Module 5 - Infant Health (all visits)

@ Infant weight (in g) (grammes)

Has the infant shown any of the following signs since the last visit?

@ Mouth sores? (yes) (no)

@ If yes, were they painful or not? (yes) (no)

@ How many times since last visit? (times)

@ Date when event(s) occurred (day/mon/yea)

@ Sore with white patches on the inside of the mouth which remained when scraped (oral thrush) (yes) (no)

@ How many times since last visit? (times)

@ Date when event(s) occurred (day/mon/yea)

@ Fast or difficult breathing ? (yes) (no)

@ How many times since last visit? (times)

@ Date when event(s) occurred (day/mon/yea)

@ Fever? (yes) (no)

@ How many times since last visit? (times)

@ Date when event(s) occurred (day/mon/yea)

@ Diarrhoea? (yes) (no)

@ How many times since last visit? (times)

@ Date when event(s) occurred (day/mon/yea)

@ Other problem (specify)

@ Did you consult a health care worker ?

@ If yes, specify:

@ Did your infant receive any treatment?

@ If yes, specify:

@ Was your infant admitted to Hospital?

@ For each event, specify dates when started and stopped (longitudinal study only).

@ Did you change the way you fed your infant when this occurred?

@ What did you do differently? (*Ask the question and tick only the answers given*)

- Stopped breastfeeding

- Stopped non-human milks

- Stopped other liquids

- Stopped solid foods

- Began giving non-human milks

- Began giving other liquids

- Began giving solid foods

In a longitudinal study, ask all events since the last visit. In a cross sectional survey, ask the list of infant health problems since birth.

Some studies may use verbal autopsy methods) to assess causes of infant deaths .

6.6 Module 6 – Cessation of breastfeeding

If the mother has not reported any breastfeeding in the last few days, ask:

- Ⓐ Have you completely stopped breastfeeding your infant every day and every night? (yes) (no)
- Ⓐ How old was your infant when you completely stopped breastfeeding him every day and every night? (age in months)
- Ⓐ Do you still put your child to the breast occasionally (less than once per day and night, e.g. when your child starts crying)? (yes) (no)
- Ⓐ How long did it take for you to completely stop breastfeeding your infant from the day you decided and began to stop to the day he or she no longer suckled from your breasts? (number of days)

Some studies may consider adding the following questions:

- Ⓐ *Why did you stop breastfeeding your infant? (Ask the question and tick only the answers given. Do not prompt, except to ask "Are there any other reasons?")*
- Ⓐ *Infant old enough*
- Ⓐ *Infant no longer wanted to breastfeed*
- Ⓐ *To encourage infant to eat solid food*
- Ⓐ *Pregnancy*
- Ⓐ *Fear of transmitting HIV*
- Ⓐ *Mother can afford replacement feeding*
- Ⓐ *Advised by health provider*
- Ⓐ *Advised by husband or partner*
- Ⓐ *Resumption of sexual relationship*
- Ⓐ *Advised by other person*
- Ⓐ *Separation from infant due to work*
- Ⓐ *Separation from infant for other reasons*
- Ⓐ *Mother too sick to breastfeed*
- Ⓐ *Infant too sick to breastfeed*
- Ⓐ *Infant not growing well*
- Ⓐ *Other reason (specify)*

- Ⓐ *How did you stop breastfeeding your infant? (Ask the question and tick only the answers given. Do not prompt, except to ask "Are there any other reasons?")*
- Ⓐ *Put something on breast*
- Ⓐ *Sent infant to relative or friend or neighbour*
- Ⓐ *Took medicine to stop milk*
- Ⓐ *Gave infant other milk or food*
- Ⓐ *Gave infant a feeding bottle*
- Ⓐ *Did nothing special*
- Ⓐ *Other method (describe)*

- Ⓐ *Did you encounter any problems when you stopped?* (yes, no)

- *What problems did you encounter when you stopped breastfeeding your infant? (Ask the question and tick only the answers given. Do not prompt, except to ask "Is there any other reason?")*
- *Infant cried or unhappy*
 - *Breast pain*
 - *Breast engorgement*
 - *Mother became ill*
 - *Infant became ill*
 - *Disapproval by partner or family or neighbours*
 - *Disapproval by health worker*
 - *No food or milk to feed the infant*
 - *Other problems (specify)*

7 Recommended timings to apply the questionnaire

The questionnaire should, as a minimum, be first applied 4 weeks - 6 weeks after birth, when the infant is due to visit the health centre for HIV testing. However, it is recommended to conduct interviews at two-week intervals in the first two months of life, where this is acceptable and feasible. Then the questionnaire should be applied every month for the first 6 months, and every 3 months after 6 months of age.

8 Recommended timings for infant testing

The minimum timing for infant PCR HIV testing is:

- Birth - During the first 48 hours (in-utero transmission)
- 6 weeks (in-utero, intra-partum, and early post-partum transmission)
- 3 months (post-partum transmission)
- 6 months (post-partum transmission)
- 12 months (post-partum transmission)
- 18 months (post-partum transmission)
- 24 months (post-partum transmission)

9 Recommendations for presenting data

9.1 Infant feeding categories and outline of analysis

Data can be grouped under categories described in Table 2 (if you accept my comment on Page 14, change this reference to Table 4). Infant feeding patterns can be reported according to when different food items were first introduced. These categories represent a progression through the stages of introducing new risks, such as allergens or contaminants, into the infant feed. For example the addition of fruit juices or water to the infant's diet when s/he is receiving complementary foods is possibly of less relevance and interest than the addition of water or juices when the infant otherwise receives only breast milk.

Infants receiving all breast milk from a wet nurse should be excluded from the analysis.

The age categories for classifying infant feeding practices to study the risk of HIV transmission, based on the changing maturity of the infant's gut, are the following: 1st week, 1w-2m, 2m-4m, 4m-6m, 6-12m, 12-18m, 18m or more.

When describing infant diet during the previous 24 hours, feeding patterns should be defined according to the estimated amount of total intake coming from breast milk. These patterns vary from a) all intake coming from breast milk (exclusive breastfeeding), b) breast milk accounting for 90% or more, c) 50 to 89 %, d) 10 to 49 %, e) 1-9%, and f) no breast milk at all.

The data collected on infant feeding will allow analysis to examine:

- ⊗ How the incidence of infection evolves according to the amount of breast milk ingested;
- ⊗ If exclusive breastfeeding carries a lower risk of transmission compared with partial breastfeeding;
- ⊗ If this is confirmed, what type (non-human milk, water with or without glucose, complementary food, pharmaceutical medicines, or traditional medicines) and extent of departure from exclusive breastfeeding (quantity and age when first introduced) increases the risk of transmission;)
- ⊗ The impact of other postnatal risk factors on the rate of transmission, such as breast and infant oral pathology. Adjustment for these factors could be made when assessing the impact of the different feeding patterns.
- ⊗ Possible reverse causality. Exploring whether a change in infant feeding pattern, for example from exclusive to partial breastfeeding, results in an increased risk of HIV transmission or if HIV transmission and early symptoms of HIV infection result in a change in feeding pattern is extremely important in MTCT studies. However, this question is difficult to answer objectively on the basis of observational or self-reported data. To address this limitation, we have included questions to ascertain whether any changes in infant feeding pattern were preceded by any infant or maternal morbidity.

The present tool is based on incomplete knowledge and the optimum definitions and categorisation of feeding patterns for MTCT research will evolve as more information becomes available. Investigators are encouraged to explore and report on the risk of postnatal HIV transmission according to variations in the definitions of the categories presented here. For example, comparisons in the risk of transmission, according to whether exclusive breastfeeding did, or did not, include pharmaceutical medicines, could be undertaken.

Some categories of infant feeding patterns of special interest could be:

- ⊗ Exclusive breastfeeding not allowing even pharmaceutical medicines (+/- oral polio vaccine)
- ⊗ Exclusive breastfeeding allowing of pharmaceutical medicines (+/- oral polio vaccine)

@ Predominant breastfeeding (allowing water, water based drinks and juices)

As a second step, regression models for survival data could be fitted to the transmission data, using time varying co-variants to allow the impact of infant feeding patterns to be assessed while at the same time taking into account their correlation structure.

Table 2: Categories of infant feeding exposures for analysis (if you adopt my numbering this is now Table 4)

Breast milk and approximate proportion of nutrition received	Type of other feeds					Medicines	
	None	Formula	Other Non-human milk ^a	Water with or without glucose or sugar	Complementary feeds ^b	Oral vaccine and medicines ^c	Traditional medications
No BM	X	RF	RF	RF	RF		
BM < 10% nutrition	X	PBF	PBF	PBF	PBF		
BM 10%-50% nutrition	X	PBF	PBF	PBF	PBF		
BM 50%-90% nutrition	X	PBF	PBF	PBF	PBF		
BM > 90% nutrition	X	PBF	PBF	PBF	PBF		
100% BM	EBF					EBF	

EBF: Exclusive BreastFeeding; PBF: Partial BreastFeeding; RF: Replacement feeding

^a This includes animal milks other than formula. Types of milks can be subdivided.

^b This includes any other non-milk liquids, such as fruit juices, solids and semi-solid foods. Can be subdivided according to types of complementary feeds given.

^c Includes limited amounts of prescribed pharmaceutical medications and products.

9.2 Breast conditions

Data collected on signs of breast health can be grouped into the categories of breast conditions described in Table 5. It is of special importance for the analysis to differentiate whether the infant received breast milk from the affected breast during the event or not.

Table 3: Breast condition

Condition	Appearance	Pain	Skin inflammation	Itch	Fever
Full breasts	Enlarged breasts bilateral	No or Mild	No	No	No
Engorged breasts	Enlarged breasts bilateral	Mild During between feeds, often relieved during feeds as milk is removed	Generalised	No	+/-
Mastitis	Enlarged breasts	Severe During and between the feeds	Localised to affected area	No	Yes
Breast abscess	Localised	Severe During and between the feeds	Localised to affected area	No	Yes
Nipple fissure or crack	Sore/wound on the nipple	Localised to affected area During the feeds	Localised to affected area	No	No
Nipple eczema	Flaky nipple	Itching	Localised to affected area	No	No
Breast thrush	Flaky nipple	During and between the feeds, with or without itching	Localised to affected area	Yes	No

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11 Acknowledgements

The initial version of the document was prepared by **Ellen Piwoz**, Academy for Educational Development, through the Support for Analysis and Research in Africa (SARA) Project of the Bureau for Africa, Office of Sustainable Development of the U.S. Agency for International Development, Washington D.C, USA.

The questionnaire was pilot tested in the following sites:

- Burkina Faso, Bobo Dioulasso, Centre Muraz (Issiaka Siombe)
- Brazil, Sao Paulo, Ministry of Health (Marina Rea)
- Côte d'Ivoire, Abidjan, ANRS 1201/1202 DITRAME PLUS Project (Laurence Bequet, Francois Dabis, Valeriane Leroy, Katia Castetbon)
- Côte d'Ivoire, Abidjan, RETROCI project (Edith Boni-Ouattara)
- India, Pune (Anita Chankhar)
- Kenya, Kisumu, CDC project (Anja Van'Hoog)
- South Africa, Child Health Group, Africa Centre for Population Studies and Reproductive Health, Mtubatuba (Ruth Bland)
- Zimbabwe, Harare, ZVITAMBO (Naume Tavengwa)

A meeting was held in Gaborone, Botswana from 22-24 March 2001 to discuss the results of the pilot testing and comments provided by various experts. The participants to the meeting were :

- Ruth Bland, The Africa Centre, Mtubatuba, South Africa
- Edith Flore Boni-Ouattara, Projet RETRO-CI - CDC/HIV, Abidjan, Côte d'Ivoire
- Alice Desclaux, Laboratoire d'Ecologie Humaine et d'Anthropologie, Aix-en-Provence, France
- Tim Farley, Reproductive Health and Research, WHO, Geneva, Switzerland
- Olivier Fontaine, Child and Adolescent Health. WHO, Geneva, Switzerland
- Philippe Gaillard, Reproductive Health and Research, WHO, Geneva, Switzerland
- Chewe Luo, UNICEF, Gaborone, Botswana
- Ruth Nduati, University of Nairobi, Nairobi, Kenya
- Saul Onyango, Ministry of Health, Kampala Uganda
- Alex Opio, WHO, Gaborone, Botswana
- Nigel Rollins, University of Natal, Durban, South Africa
- Jacinta Sibiyi, Family Health Division, Gaborone, Botswana
- Naume Tavengwa, Zwitambo Project, Harare, Zimbabwe
- Arjan de Wagt, UNICEF ESARO, Nairobi, Kenya

The following people kindly shared their research instruments or provided technical input during the course of developing this tool: Ken Brown, Anna Coutoudis, Hilary Creed de Kanashiro, Katherine Dewey, Mercedes de Onis, Tim Farley, Mary Glenn Fowler, Sandra Huffman, Jean Humphrey, Peter Iliff, Kathy Kennedy, Mary Kroeger, Louise Kuhn, Grace Marquis, Altrena Mukuria, Gabrielle Palmer, Felicity Savage, Jay Ross, Cesar Victora, and Juana Willumsen.

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