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# Infant feeding practices and beliefs among women in Podor, West Africa

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INFANT FEEDING PRACTICES AND BELIEFS AMONG WOMEN IN PODOR,  
WEST AFRICA

A Thesis

Presented to

The Faculty of the Department of Nutrition and Food Science

San Jose State University

In Partial Fulfillment

of the Requirements for the Degree

Master of Science

by

Heather Lyn Schwartz

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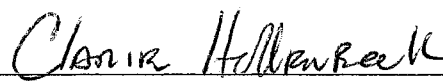
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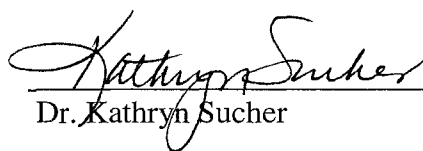
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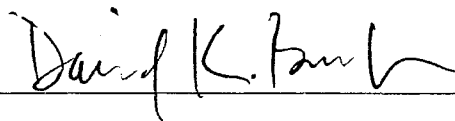


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## ABSTRACT

### INFANT FEEDING PRACTICES AND BELIEFS AMONG WOMEN IN PODOR, WEST AFRICA

by Heather L. Schwartz

This thesis determines and describes infant feeding practices and beliefs amongst women in Podor, West Africa. Structured interviews were used to gather data pertaining to demographics, breastfeeding, complementary feeding, and weaning practices and beliefs. The aim of this thesis was to assemble baseline data from which an infant feeding education intervention program could be built.

In comparison to the World Health Organization and United Nations Children Fund's guidelines, none of the infant feeding practices reported met their standard. Improvements in infant feeding in this region are vital to improving infant and child morbidity and mortality. Areas of improvement included the timing, adequacy and appropriate introduction of complementary foods, duration of exclusive breastfeeding, and the practice of abrupt weaning. An education focused on impacting the beliefs underscoring breastfeeding and weaning practices should be implemented with consideration given to the cultural, social, and traditional aspects of this region.

## ACKNOWLEDGEMENTS

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## PREFACE

Chapter III is written in accordance to the journal of Public Health Nutrition, the journal to which this chapter will be submitted for publication. Chapters II and III are written in the format of the *Manual of the American Psychological Association* (6<sup>th</sup> edition, 2002).

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**CHAPTER I**  
**INTRODUCTION TO THESIS**

## Introduction

In 2001 the World Health Organization (WHO) released global recommendations for infant feeding practices. WHO recommends that infants be exclusively breastfed for the first six months using on-demand feeding and with initiation within the first hour of life. Nutritionally appropriate and safe complementary foods should be introduced after this time. Breastfeeding should be encouraged for up to two years of age or longer (Kramer & Kakuma, 2002). For HIV-positive mothers, exclusive breastfeeding for six months of age with abrupt cessation of breastfeeding and initiation of safe and appropriate weaning and other foods has been recommended (WHO, 2001). When implemented in both developing and developed countries, these recommendations have been shown to significantly reduce infant morbidity and mortality and have provided the most pronounced benefits to the mother (Butt, Lopez-Alarcon, & Garza, 2002).

Breastfeeding is the natural and optimal way of providing appropriate nutrition to infants. Breastfeeding also plays an invaluable role in the reproductive process and provides many health benefits to both mother and infant (Kramer & Kakuma, 2002). These benefits include immune enhancement, optimal cognitive and physical development, and strengthened psychosocial skills (Koletzko, Michaelson, & Hernell, 1999). In resource poor nations, breastfeeding is especially important given it confers a hygienic source of renewable energy and remains a secure source of macro and micronutrients despite economic or environmental conditions. The timing of introducing complementary foods and the types and safety of these foods are of direct impact on infants' wellbeing (WHO, 2001).

Breastfeeding is also a mode of transmission of HIV between mother and infant. WHO's recommendation for HIV positive mothers is to avoid breastfeeding when replacement feeding is an option, however, when this is not possible, WHO recommends exclusive breastfeeding during the first months of life (2000).

#### *Definitions of Terms*

*Complementary feeding:* any food or beverage that is not breast milk, including water and herbal teas which are consumed by an infant while he or she remains breastfeeding.

*Exclusive breastfeeding:* breastfeeding without giving other food or beverage, including water, but includes the provision of drops and syrups for medicinal purposes.

*Malnutrition:* undernutrition or overnutrition resulting in poor nutritional status

*Undernutrition:* low weight for height, low height for age, low weight for age and deficient in micronutrients and includes the following,

*Stunting:* low height for age.

*Wasting:* low weight for age.

*Underweight:* low weight for height

*Weaning:* the act of breastfeeding cessation using foods and beverages to replace breastmilk.

#### *Conceptual Framework*

This study assumes that infant feeding practices can be improved upon in the Podor region via behavior modification in the maternal population. The health belief model is a conceptual framework that helps predict and explain health outcomes by focusing on the attitudes and beliefs of individuals. It assumes that individuals will

modify their behavior if they think they can avoid a negative health consequence, feel confident that if they do make a behavioral change that they will avoid a negative health condition, and that they can make the necessary change successfully. This framework is commonly applied to a broad range of health behaviors and is often used in humanistic approaches to behavior change (Glanz, Lewis, & Rimer, 1990.)



**CHAPTER II**  
**REVIEW OF LITERATURE**

### *Breastfeeding*

Breastfeeding is an integral part of infant feeding and is the natural form of supplying nourishment to a mammalian infant. In a recent study titled “Preliminary Data from Demographic and Health Surveys on Infant Feeding in 20 Developing Countries,” authors Marriott, Campbell, Hirsh and Wilson determined that of the 20 countries studied, 99.6% of 0 to 6 and 87.9% of 6 to 12 month old infants were breastfed (2007). Breast milk has been optimally adapted to meet the physiological and psychological needs of both mother and child. It provides total food security for infants up to six months of age and in the case of emergencies, provides the only reliable source of nutrition for infants (United States Agency for International Development [USAID], 2001).

### *Benefits to Infant*

When breastfed appropriately, benefits to infants may include reduced risk of diarrheal and gastrointestinal illnesses, allergies, acute respiratory infections, otitis media, bacterial meningitis, atopic disease, childhood asthma, and childhood leukemia (Kramer & Kakuma, 2002; Quigley, Kelly, & Sacker, 2007). There is evidence to suggest that breastfed infants have enhanced cognitive development that is sustained throughout childhood (Anderson, Johnstone, & Remley, 1999). Breast milk’s immunological properties may also increase protection from infectious disease and may reduce risk for long-term conditions like diabetes mellitus, Crohn’s disease and lymphoma; breast milk may provide protective antibodies and may stimulate an infant’s immune system to overcome these diseases. This protective effect is enhanced with greater breastfeeding

duration and exclusivity (Kramer & Kakuma). However, exclusive breastfeeding beyond the recommended six months has been reported to be associated with a higher risk of malnutrition (Fawzi, Herrera, Nestel, Amin, & Mohamed, 1998).

It is widely accepted that breastfed infants develop a closer bond with their mother and that this has positive implications in the psychosocial development of an infant (USAID, 2001). Furthermore, there are strong indications that the benefits of appropriate breastfeeding may not only be experienced in the short term but may extend throughout the lifespan (Fawzi, Herrera, Nestel, Amin, & Mohamed, 1998).

#### *Maternal Benefits*

The maternal benefits include an increase in duration of lactational amenorrhea, and decreased risk of developing anemia, urinary tract infections, ovarian cancer and premenopausal breast cancer (Lawrence, 1997). Improved maternal self-esteem, elevated social status, empowerment, economic efficiency and time efficiency are other advantages from which breastfeeding mothers benefit (USAID, 2001). In comparison to non-breastfeeding mothers, increased post-partum weight loss has been documented and for mothers with gestational diabetes, this may well translate into a decreased risk of type 2 diabetes later in life (Kjos, 1993).

#### *Economic Benefits*

Breastfeeding is the most cost effective and ideal nutrition source. The United States Department of Agriculture (USDA) states that the United States could save \$3.6

billion in health care costs per year if the US were to increase its breastfeeding rate by just a few percentages, and at the household level, mothers who choose to breastfeed can save an estimated \$700 per year per infant (Weimer, 2001). For resource-poor families, the World Alliance for Breastfeeding Action (1999) states that the value of breast milk accounts for much more than total household income in a year. Additional economic benefits, albeit less quantifiable, are lower maternal employee absenteeism attributable to decreased infant illness, improved productivity, enhanced employer public image which may extend into boosting employee loyalty (Weimer).

#### *Environmental Benefits*

Breast milk is a renewable and natural resource. Unlike infant formula powder, it does not require the addition of sanitary water, an advantage in areas where water sources are unsafe or inaccessible. By increasing lactational amenorrhea, breastfeeding encourages child spacing and thus lessening the strain on environmental resources and limiting population growth (American Dietetic Association [ADA], 2005).

#### *Barriers to Breastfeeding*

There are many barriers to breastfeeding which differ greatly in their cause, but include ethnic and cultural association, gender issues, and education accessibility and availability. In many developing countries, public health education is neither widely available nor accessible and mothers often rely on familial, cultural or religious traditions from which to dictate their own practices (USAID, 2001). In the western region of Cameroon, a study found that cultural beliefs about breastfeeding were the most significant barriers in preventing optimal infant feeding practices which resulted in

mothers giving food and water to their infants at too early of an age. Cultural factors that influenced their decision to introduce foods other than breast milk to their babies at a very early age included pressures by village elders and families to do this because it is a traditional practice, belief that breast milk is an incomplete food that does not increase the infants weight, belief that all family members should receive the benefit of food grown in the family farm, and the taboo of prohibiting sexual contact during breastfeeding (Kakute et al., 2005).

Similar to cultural issues, gender issues can be barriers to breastfeeding. Across the developing world women play key roles in maintaining household food security and in caring for children on a day-to-day basis, both of which are extremely important factors influencing a child's nutritional status. An emerging trend in developing countries is that of women working longer hours outside of the home, which may result in less time spent breastfeeding. In Guatemala, a study found that the most important determinant of exclusive breast-feeding was whether or not the mother worked outside the home. After controlling for infant's age and sex and mother's ethnicity, women who did not work outside the home were 3.2 times as likely to exclusively breast-feed as were women who worked outside the home (Dearden et al., 2002).

Many mothers are unaware of the maternal and infant benefits of breastfeeding and the consequences that accompany inappropriate infant feeding practices. In developing countries especially, there is a dearth of pre and antenatal care available and accessible to most mothers; the places where lactation counseling and infant feeding education programs are often centered. In 2002, WHO stated that significantly more

pregnant women are receiving pre and antenatal care, though they estimated that approximately only four percent of sub-Saharan African women were receiving antenatal care (WHO, 2003).

### *Complementary Feeding*

Of the three major components of infant feeding, (breastfeeding, complementary feeding, weaning) complementary feeding is often regarded as the most complex. A mother's complementary feeding practices are determined by a number of factors often out of her immediate control including local water and food availability and accessibility, employment, and environmental conditions. Knowledge of appropriate timing of introduction of foods and types of foods is another factor often complicated by lack of resources. Marriott et al (2007) reported of the 20 countries studies, 21.9% of mothers reported feeding 0- to 6- month old infants some type of solid food, and 80.1% of mothers reported feeding solids to 6 to 12 month olds. The same study also showed that other types of milks, other liquids and solid foods were much more commonly administered than commercial infant formulas in the countries studied.

WHO recommends starting complementary feeding from the age of six months with continued breastfeeding up to two years of age or longer. Appropriate foods should be matched with the nutritional needs of the infant so that adequate amounts of energy, protein and micronutrients are provided. Also recommended is that all foods given are hygienically stored and prepared to minimize risk of food borne pathogens. WHO's last recommendation regarding complementary feeding is concerned with an individual infant's feeding behaviors. Infants express hunger, satiety, and preferred feeding

methods through a variety of behaviors from which a mother acts upon according to her interpretation. Infants do not necessarily have the capability to choose which types of foods and beverages they should consume; this responsibility usually lies with the mother (WHO, 2001).

### *Effects on Infants*

Inappropriate complementary feeding practices are a major cause of the onset of malnutrition in infants. The incidence of malnutrition rises sharply during the period from six months to 18 months of age in most countries, and the deficits acquired at this age are difficult to compensate for later in life.

From six months onward, when breast milk alone is no longer sufficient to meet all the nutritional requirements, infants enter a particularly vulnerable period of complementary feeding during which they make a gradual transition to eating family foods.

WHO, 2001.

Poor nutrition intake during this critical period of development can increase the risk of morbidity and mortality and can result in compromised growth and cognitive function in later years (Shroeder & Brown, 1994).

In many parts of the world, lactation amenorrhea is the major factor in birth spacing, particularly in regions lacking in birth control prophylaxis or family planning programs. A positive association between the early introduction of complementary foods and the rapid resumption of ovulation has been documented (Simondon, Delaunay, Diallo, Elguero, & Simondon, 2003).

Increasing the length of time between births is important given that a newborn often takes a mothers' time away from other infants. This concomitantly results in

cessation of breastfeeding of existing infants or introducing inappropriate foods too early, which has been known to lead to increased morbidity and mortality in infants (Jacobsen, Sodemann, Molbak, & Aaby, 1996).

#### *Common Deficiencies of Complementary Foods*

Complementary foods are often deficient in energy, protein and micronutrients including calcium, iron, zinc, vitamin A, riboflavin. Poor bioavailability of these micronutrients further compounds this problem (Hotz & Gibson, 2001). Complementary foods are often used as substitutes instead of supplements to breast milk, and are most always of lesser nutritional quality. For example, gruels are commonly given as one of the first complementary foods in many parts of the world. These are grain powders mixed with animal milks or water which are high in carbohydrates but low in protein and micronutrient quality. In addition, water and animal milks may be unsafe or contaminated and complementary foods are often not stored nor prepared in a safe manner (Gibson, Ferguson, & Lehrfeld, 1998).

#### *Weaning*

Mothers choose to wean their infants for a variety of reasons including traditional beliefs, nutritional status of the infant, new pregnancy or onset of illness. When weaned too early, there is a possibility the infant cannot ingest enough food to attain adequate macro and micronutrients which can lead to under nutrition, failure to thrive and death (WHO, 2002). When weaned too late, breast milk may delay consumption of foods that are more nutritionally appropriate for the infant's need and may also result in poor nutritional status (Brown & Dewey, 1998). WHO and UNICEF recommend weaning



infants at two years of age or older based upon studies that indicate breast milk is not an adequate source of nutrition beyond this age and that prolonged breastfeeding can reduce total food intake and thus predispose to malnutrition (WHO, 2001).

The amounts of iron, zinc, copper, and potassium decline in women's breast milk over time (Dewey, Finley, & Lonnerdal, 1984; Simmer, Ahmed, Carlson, & Thompson, 1990). Both UNICEF and WHO recognize the additional benefits to infant and mother from gradual weaning, meaning the slow cessation of breastfeeding rather than an abrupt switch. Gradual weaning allows adequate time for an infant's immune system to become familiar with microbial pathogens whereas abrupt weaning can expose an infant to harmful amounts of microbial pathogens that its body has not yet been prepared to confront. Safety and sanitation of foods, beverages, and utensils used to feed infants is of utmost importance given that microbial pathogens are the leading causes of infant morbidity and mortality from gastrointestinal and diarrheal diseases in children under the age of five (Motarjemi, 2000).

#### *Infant Feeding and Human Immunodeficiency Virus (HIV)*

The issue surrounding breastfeeding and HIV is of complex nature and is subject of current debate. Africa accounts for 10 percent of the world's population, but roughly 90 percent of the world's HIV positive children (USAID, 2001). In Malawi, the prevalence of HIV was approximately 30% among women who attended antenatal clinics in a study done in 1997 (Taha et al., 1998). As estimated by UNICEF in 2001, the prevalence of HIV in Senegal was less than one percent (1996).

#### *Breastfeeding and Mother-to-child-transmission*

Currently USAID estimates that 15-30 percent of infants born to HIV infected mothers will be born HIV positive. An additional 10-20 percent will become infected when partially breastfed for 18-24 months (USAID, 2001). WHO reports there is a 29 percent risk of transmission to the infant if the mother has a primary HIV infection during lactation (Fowler & Newell, 2000). Inappropriate consumption of complementary foods can expose an infant to bacteria and other gastrointestinal irritants that can aggravate and inflame intestinal mucosa; allowing HIV and other pathogens to infect the infant (Coutsoudis, Pillay, Kuhn, Spooner, Tsai, & Coovadia, 2001).

#### *Current Recommendations*

WHO and UNICEF recommend that HIV positive mothers should not breastfeed but rather consider replacement feeding when it is acceptable, feasible, affordable, sustainable and safe (Fowler & Newell, 2000). In many resource-poor nations where replacement feeding is not an option, alternatives such as using home-modified animal milks, heat-treated expressed breast milk, milk from breastfeeding banks or wet nursing are encouraged. If replacement feeding is not a safe or viable option, then UNICEF recommends that the mother shorten the duration of total breastfeeding to six months since evidence exists that the risk of mother-to-child-transmission increases with duration of breastfeeding (WHO, 2001).

The Joint United Nations Programme on HIV/AIDS (UNAIDS), a global advocate for HIV/AIDS health concerns, currently suggests “that the decision regarding breastfeeding should be the individual choice of the HIV infected woman after weighing all available information” (Fowler & Newell, 2000). However, in many resource-poor

settings where the prevalence of HIV is high and breastfeeding predominant, and where infant feeding education is scarce, the need for more specific and culturally appropriate recommendations is imperative and pressing (USAID, 2001). The balance of overall risk versus benefit of breastfeeding deserves continuing analysis and review.

#### *Documented Beliefs and Practices of Infant Feeding in Sub-Saharan Africa*

Breastfeeding and infant feeding is one of the most decisive factors in infant health, particularly in the resource-poor settings of Sub-Saharan Africa (Kramer & Kakuma, 2002). The more resource-poor the family, the more vital the role breastfeeding plays in the protections of an infant's health (UNICEF, n.d.). The majority of the countries in the world, 85%, do not adhere to the WHO's recommendations for infant feeding, evidence that infant health in Sub Saharan Africa is vulnerable to poor health outcomes (Butte, Lopez-Alarcon, & Graza, 2002; Obermeyer & Castle, 1997).

#### *Breastfeeding Practices*

UNICEF reports that 55% of the world's infants are breastfed though 23 months of age (2001). In West Africa, breastfeeding duration is similar. In Guinea Bissau, Jakobsen, Sodemann, Molbak, and Aaby reported average breastfeeding duration to be 22.6 months (1996). Data from year 2000 suggests that breastfeeding duration in Mauritania lasts through 20-21 months (Moujtaba, 2000).

While breastfeeding initiation rates are high in African countries, the duration of exclusive breastfeeding is typically low. Exclusive breastfeeding rates for the first four months of life in urban Africa vary from 2% in Nigeria, 7% in Senegal, 17% in Zimbabwe, to 90% in Rwanda (WHO, 2003; UNICEF 2003). In a peri-urban community

in South Africa, by the first month of an infant's life, one third of mothers has stopped exclusive breastfeeding and had begun to introduce complementary foods (Sibeko, Dhansay, Charlton, Johns, & Gray-Donald, 2005). Data from Mauritania suggests that 28% of infants are exclusively breastfed through three months of age (Moujtaba, 2000).

#### *Colostrum Provision*

The practice of giving infants colostrum differs among African countries and likely within each country as well. A study conducted in Nigeria found that 54% of mothers withheld their colostrum due to their belief that it was of no use to their infant (Okolo, Adewunmi, & Okonji, 1999). In North-West Cameroon, the women wait for at least 2 days to breastfeed their babies, citing that colostrum is considered to have no nutrients and is thought to be a "bad" color; they prefer to give cow's milk. They also give Viindi water which is "water that has been used to wash off passages of the Koran written in charcoal on a tablet" (Kakute et al., 2005). Conversely, a study in Mali indicated that most all infants were given colostrum (Dettwlyer, 1987).

#### *Complementary Feeding Practices*

Because most African countries begin introducing complementary foods before four months of age, the safety, sanitation, and appropriateness of the foods introduced are of much importance to the infant's health (UNICEF, 2001). In a study conducted in rural Cameroon, more than 38% of the 320 mothers surveyed reported giving their infant water in the first month of life, and all had given their infants water and food supplementation prior to six months of age (Kakute et al., 2005). In Malawi, East Africa, Hotz and Gibson

determined that by four months of age, all of the 163 mothers in their study group had begun complementary feeding (2001).

Common first beverages given to infants in sub-Saharan Africa include water, animal milks, herbal teas and sugar water and are commonly given from birth and continue even after breastfeeding has been well established (Okolo, Adewunmi, & Okonji, 1999). The most common solid foods introduced are carbohydrate based staples such as rice, cassava, potatoes, millet, maize and other roots and tubers. There are usually mashed or pre-chewed for ease of ingestion and then mixed with water or animal milk. During the first six months of age gruels are regularly given, however after this age family foods are usually substituted. Protein sources including fish, beef, goat, chicken and eggs are rarely given to infants as these are usually reserved for the head(s) of the household or guests. To note, these are usually the first foods to disappear from the table when a household's resources become restricted (Onofink & Nnanyelugo, n.d.).

#### *Weaning Practices*

Data from Mauritania in 2000 indicates that 11% of infants were weaned by the age of 12-15 months, and 54% weaned by the age of 20-23 months (Moujtaba), though data on whether the weaning was abrupt or gradual is not available. In Mali, Dettwyler documented that most mothers abruptly wean their infants between the ages of 18-24 months, with an average age of weaning of 20.8 months (1987). The reasons given for weaning abruptly, rather than gradually, included the infant being able to ask the mother to nurse, and the infant choosing to decrease its own nursing frequency. Qualitative data collected suggest mothers let their children decide their own breastfeeding duration and

that breastfeeding is often continued for up to five years of age. Similar data were found in rural South Africa, along with a high prevalence of compromised weaning diets “due to poor complementary food choices, preparation practices and limited variety” (Kruger & Gericke, 2003).

In a study done by Jakobsen, Sodemann, Molbak, and Aaby (1996) in Guinea Bissau, the most common determinant of weaning was the infant’s ability to eat family foods. Secondary reasons for weaning were that the mother became pregnant again and that the mother or child became ill. In Ethiopia, 97% of women studied believed it was best to stop breastfeeding when the mother became pregnant, and 75% preferred to stop breastfeeding when the mother or child fell ill (Woldegebriel, 2002).

#### *Changes in Infant Feeding*

Long-held infant feeding beliefs and practices of many populations are beginning to change. As people migrate to and from urban centers, and as information becomes more available and accessible via computers and other mediums, ideas are exchanged between people from all over the world. In Africa, the Western ideas of formula feeding and alternative breast milk options are becoming more and more widespread (Dettwyler, 1987). Economic changes affect infant feeding also. For example the increasing demand for African women to work outside the home has been shown to decrease the duration of exclusive breastfeeding and to expedite the early introduction of complementary foods (Woldegebriel, 2000). As women’s roles in society change, one can extrapolate that so does their role in the household and their role in parenting, which likely can affect their infant feeding beliefs and practices.

*Beliefs and Practices of Infant Feeding in Senegal, West Africa*

UNICEF's estimated rate of exclusive breastfeeding for the first four months of age is less than 7%, one of the lowest rates in sub-Saharan Africa (n.d.). However, 49% of Senegalese infants are breastfed for up to 23 months of age, the same as the world's breastfeeding duration (2003). In the setting of a shortened duration of exclusive breastfeeding with a long duration of complementary feeding, one would assume the amounts, variety and safety of complementary foods become of utmost importance to Senegalese infants' health.

Little is known about complementary feeding practices and beliefs in Senegal, though common foods given to infants are cassava, millet gruel, and rice gruel. The grains are mixed with animal milks or water and are given to the infants around three months of age via on-demand feeding. Lacking in vitamin A, iodine and iron, these foods represent protein poor sources and are considered inappropriate complementary foods when they are the primary source of nutrition (Simondon, Delaunay, Diallo, Elguero, & Simondon, 2003). Because only 78% of the total population and 65% of the rural population use "improved drinking water sources," water in Senegal is often a source of a gastrointestinal disease (UNICEF, 2003). It is common practice to introduce gruels first and then begin to offer foods from the household's usual menu. Nutrient-dense legumes are a common staple, though, due to their indigestibility, they are usually given after six months of age (Onofink & Nnanyekugo, 2005).

In another study by Simondon, Simondon, Costes, Delaunay, and Diallo (2001) in Senegal, researchers examined the maternal criterion used to determine when an infant

should be weaned. Qualitative data suggested that an infant's age was the strongest determinant, but mothers in the study also reported that "tall and strong" or "ate family food well" were other determinants critical to determine the start of weaning. Some mothers mentioned that the end of the rainy season played an important role in the timing of weaning.

There has been no published research on breastfeeding and infant feeding practices in this specific region of the world. Counterpart International, a private volunteer organization that operates in Ndioum, Podor, has recently completed a regional Knowledge, Practice and Coverage (KPC) survey in order to create a database on maternal and child healthcare including infant feeding practices. The KPC survey has collected data on several infant feeding indicators, though the data has not been analyzed at the time of this study's completion (Rudert, 2005).

### *Summary and Conclusions*

As evident from the many studies cited in this review of the literature, there is much room for improvement in breastfeeding practices in Africa, with special emphasis on complementary feeding and weaning practices. Though supportive data does not yet exist, it is assumed that this holds true in the Podor region of Senegal. Therefore, conducting formative research on infant feeding practices and beliefs in this region is a critical step in the development and implementation of an intervention program to make the needed improvements.

Despite the abundance of research that has been conducted on breastfeeding and infant feeding practices in Africa, it would be unwise and inappropriate to apply findings



from one country to another or even from one part of a country to another, such as from the urban to the rural sector. This is especially true when using baseline data from one country to develop intervention programs in another. After developing, implementing, and evaluating breastfeeding programs for over the last 20 years, USAID reports that some of its lessons learned include designing breastfeeding and infant feeding intervention programs for specific audiences, taking into account each audience's social and cultural beliefs, collecting baseline data for each community to identify specific action-oriented behaviors, and lastly suggesting steps to overcome barriers to change (USAID, 2001).

Therefore the purpose of this research is to describe breastfeeding and infant feeding practices and beliefs in the Podor region of Senegal in order to create baseline data from which an education intervention program may be developed.

**CHAPTER III**  
**JOURNAL ARTICLE**

Journal: Public Health Nutrition

Title: Infant feeding practices and beliefs among women in Podor, Senegal

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## **ABSTRACT**

*Objectives* The study's objectives were to define and describe infant feeding practices and beliefs of lactating women in the Podor region of Senegal, West Africa.

*Design* Data were gathered via structured interviews pertaining to demographics, breastfeeding, complementary feeding and weaning practices and beliefs.

*Setting* Northeastern Senegal, West Africa. Of the 272 rural villages in the Podor region, a random sample of 15 villages was used.

*Subjects* Three women from each village were randomly selected (n=45); inclusion criteria required all participants to have at least one child  $\leq$  24 months of age.

*Results* Breastfeeding initiation within the first hour of the infant's life occurred with half of the participants. Colostrum was given by 39/45 of the mothers. There was no reported use of infant formula or bottles. Mean breastfeeding duration was  $21 \pm 4.3$  months. Exclusive breastfeeding was reported by 25/45 of participants, though the duration varied from two weeks to 7.2 months. The mean duration of exclusive breastfeeding amongst these 25 participants was  $4.7 \pm 2.5$  months. Most participants believed that breast milk was the healthiest nourishment for infants. Introduction of foods/beverages other than breast milk before four months of age was reported by 18/45 participants. Reasons for the introduction of other foods and/or beverages included a belief that food/beverage was complementary to breastfeeding and for religious reasons. Most mothers intended to abruptly wean their infants around 24 months of age.

*Conclusions* Most infant feeding practices did not comply with the World Health Organization's (WHO) guidelines, including the early introduction of complementary

foods/beverages, the type and safety of foods/beverages given, the duration of exclusive breastfeeding and the practice of abrupt weaning. To improve maternal and infant health in this region, education interventions should focus on supporting beneficial beliefs and addressing adverse practices and barriers to recommended practices with consideration given to the cultural, social, religious, and traditional characteristics of this region.

## **INTRODUCTION**

Despite the well-established benefits of breast milk and WHO recommendations for appropriate infant feeding practices, global estimates reveal that less than 15% of mothers do not follow the recommended infant feeding guidelines.<sup>1</sup> Breastfeeding, especially exclusive breastfeeding for the first six months of life, can significantly reduce childhood morbidity and mortality, enhance cerebral development, and decrease the risk of developing widespread acute and chronic diseases. Breastfeeding can also benefit the mother by improving her health and survival through reducing the risk of certain diseases and promoting economic stability at the household and national sectors, as well as the hospital and public sectors.<sup>2</sup>

Although initial breastfeeding rates are very high in developing countries, the practice of introducing complementary foods too early is a prominent practice and can have a negative impact on the nutritional status of an infant.<sup>3</sup> Complementary foods are often comprised of nutrient-poor starches which are unsuitable replacements for breast milk and can be vehicles for life threatening food borne pathogens. Early resumption of menses can result from breastfeeding cessation and infant age at the time at the time of

introduction of complementary food, suggesting that early introduction of these foods could impact child spacing and reduce breastfeeding time with preceding children.<sup>4</sup>

Based on this and other evidence, WHO developed international infant feeding guidelines. These guidelines recommend that, “Infants should be exclusively breastfed for the first six months of life to achieve optimal growth, development and health. Thereafter, to meet their evolving nutritional requirements, infants should receive nutritionally adequate and safe complementary foods while breastfeeding continues for up to 2 years of age and beyond.”<sup>5</sup> Infant feeding guidelines differ slightly for women infected with the human immunodeficiency virus (HIV) or for women who are at risk with unknown HIV status.

Breastfeeding and infant feeding takes place in a cultural context with many factors to consider when developing an intervention program. These factors include cultural beliefs, religion, knowledge, attitude, social traditions, socio-economic status, gender roles, social support, and the advice of family, friends, and health professionals.<sup>13</sup> An understanding of infant feeding practices, including how and why mothers breastfeed, is required to create change in these practices.<sup>14</sup>

Few data have been collected on infant feeding in Senegal. This exploratory study was designed to define and describe infant feeding practices and beliefs of mothers in the Podor region of Senegal. This exploratory study was designed to provide formative data to assist in capacity building activities by the private volunteer organization, a non-governmental organization, Counterpart International, as part of their maternal and child healthcare and education programs in Podor.<sup>15</sup>

## **METHODS**

### **Participant Selection**

The study was conducted during spring of 2005 in the rural, northeastern area of Senegal, West Africa. The Podor region has four districts with an estimated population of 36,000. Village populations ranged from 337 to 2,973. Of the 272 villages in this area, 15 were randomly selected for this study.<sup>16</sup> The majority of people in these areas engaged in subsistence farming.<sup>17</sup> Electricity was only available in the larger villages like Ndioum and most families are unable to afford electrical appliances. Most people lived in earthen floored, mud-packed wall houses with an outdoor latrine. Several houses are built close together to form a communal living space for nuclear and distant family members. Water was obtained from community wells, which were commonly a half a day's walk away; water quality is unknown in this region and may be unfit for infant consumption. In order to obtain representative data, the geographical locations of the villages where the study activities took place were chosen to represent each of the four regions in Podor.

The village selection was made in collaboration with Counterpart International, which has offices in Dakar and Ndioum (near Podor) in Senegal. Both areas were utilized in this study to obtain region-specific information, research team trainings, and other resources to implement the research.

The study participants were randomly selected on-site; three participants were interviewed from each of the 15 villages (n=45). Inclusion criteria required all participants to have at least one child less than 24 months of age. Informed oral and

written consent was obtained from each participant and all participants received a copy of the signed consent form upon initiation of the study. No compensation was provided to participants or their villages.

Approval for the study was granted by San Jose State University Human Subjects Institutional Review Board and Counterpart International's Program Review Board. Before the interviews took place, each district's supervisor was asked for their permission to conduct the study in their area, as well as the chief of each village. To ensure confidentiality, all interviews took place in a private setting and no identifying information was collected from the participants. Participant responses were coded for evaluation.

## **INTERVIEWS**

Previously validated questionnaires from the Knowledge, Practice and Coverage Survey<sup>18</sup> were adapted to develop a structured personal interview. The interview questions were developed in English, translated into French and Pulaar (native language of the Podor region), and then back-translated into English. Both the French and Pulaar translations were pilot tested and modified for clarity before use.

The research team consisted of three local interviewers who had previous experience with health-related interviews. All were literate in French and Pulaar. Three-day training was facilitated by a team of Peace Corps volunteers in French and Pulaar and completed by all research team members.



Each interview required approximately one hour to complete. Mothers were asked for demographic information about themselves, their household, and their youngest child. Infant feeding practices and beliefs were queried through open-ended, pre-determined questions. The interviewers documented the mother's response on a standardized answer sheet. Daily cross checking and member-debriefing periods followed the interview sessions and allowed the research team to ensure inter-observer reliability and validity of the responses. In addition to the formal interviews, informal observations helped to assess the validity of the information received.

## STATISTICAL ANALYSES

Responses were coded for entry into a spreadsheet (Microsoft Excel, 2003) and imported data analysis into SPSS (version 11.0, Windows). Descriptive statistical analysis was conducted on discrete and continuous data to determine counts, percentages, means and standard deviations. All summary statistics are expressed as means  $\pm$  standard error of the mean (SEM).

## RESULTS

### Participant Characteristics

Characteristics of the study participants are summarized in Table 1.

Table 1. Demographics of Women in Podor, West Africa with  $\geq 1$  Child

Demographics	n	Mean $\pm$ SEM Percent (%)
Age (years)		28 $\pm$ 7

Marital Status Married		100%
Parity		4.4 ±2.2
Ethnicity		
Tukulor	18	40%
Peuhl	24	53%
Other	3	7%
Religious Affiliation Islamic (Tijaniya)		100%
Number of persons living in household area (includes nuclear family, distant family, visitors, friends)		16 ±9
Income/household/week		
Don't know	34	76%
US\$ 6-14	6	13%
US\$ >14	5	11%
Years of school		1 ±3
Literacy		
Ability to Read	6	13%
Ability to Write	7	16%
Occupation		
• Housewife	32	70%
• Housewife + farmer	11	24%
Age of youngest child, in months		10.4 ±6.1
Gender of youngest child (male/female)	20/25	44%/56%
Birth location of youngest child		
• House	31	68%
• Public Hospital (urban)	7	15%
• Dispensary (rural)	8	17%

The mean age of the mothers at the time of the interview was  $28 \pm 7$  years. The mean parity was  $4.4 \pm 2.2$  births. One participant was monoparous at the time of the study. Twenty-four of the 45 reported their ethnicity as Peuhl (53%), 18 reported Tukulor (40%) and the remaining three reported other ethnicities (7%). All participants were married and considered themselves to be of the Tijaniya brotherhood of Islam. All participants

spoke Pulaar and received health care for their youngest child at their nearest dispensary (pharmacy).

### Breastfeeding Practices

Table 2 summarizes the breastfeeding practices captured in this study.

Table 2. Breastfeeding Practices in Podor, West Africa for Youngest Child

Practices	n	Mean $\pm$ SEM Percent (%)
Breastfeeding initiation within 1 hr after birth		51%
Colostrum given to infant		
Yes	39	87%
No	4	9%
Don't know	1	4%
Breastfeeding Duration (months)	42	21 $\pm$ 4 M
% of mothers who exclusively breastfed*	25	56%
Duration of exclusive Breastfeeding		
1-3 months	11	44%
3-6 months	10	40%
6-9 months	3	12%
>9 months	1	4%

\*for any amount of time, data on youngest child

All participants reported breastfeeding on-demand. No bottles, artificial nipples, or formulas were used. Twenty-five of the 45 participants (56%) reported exclusively breastfeeding although the length of duration varied from two weeks to 7.2 months; 12 (48%) of those did so between three to six months of age, 4 (16%) exclusively breastfed beyond six months of age, with two participants continuing for seven months, one for nine months, and one for twelve months.

Nine (44%) of the 20 mothers who did not exclusively breastfed their infants introduced complimentary foods from birth onward. These mothers reported giving their newborns similar foods as were given to infants aged three months and older and three

participants gave their infants water before breast milk. The most common complementary foods given were animal milks (primarily goat, cow, and sheep's milk) by 24 (54%) of the participants and drinks made by the village traditional healer (a Moslem marabout) by 10 participants (21%). It was common practice for the marabout to make the drink from water that has been used to wash off charcoal-written passages from the Koran (written on a wooden slate) with his saliva and various herbs.

### Breastfeeding Beliefs

Table 3 summarizes the participants' beliefs about breastfeeding.

Table 3. Breastfeeding Beliefs among Women in Podor, West Africa with  $\geq 1$  Child

Beliefs	n	Mean $\pm$ SEM Percent (%)
Optimal breastfeeding duration, months.		20 $\pm$ 7 M
Reasons for breastfeeding		
Healthiest for infant	21	47%
Tradition/common practice	8	18%
Combinations of the above	7	16%
To save money	2	4%
Breast milk available, so should use it	1	2%
Unable to give reason	6	13%
Beliefs about exclusive BF	n=30*	
Healthiest for infant	17	57%
Breast milk available, so should use it	5	17%
Convenience	1	3%
Prevent illness	1	3%
Combinations of the above	6	20%

\*15 participants unable to provide belief(s)

Wet nursing was not considered an acceptable practice to the participants and mothers stated they would never breastfeed another woman's infant. The most often cited reason for feeding foods other than breast milk to their newborns was religious and/or tradition-

based. Of the 34 participants who responded, 15 stated they felt that they did not have enough breast milk to adequately feed their infant. Eleven of these participants said they experienced sore breasts or nipples during some point during breastfeeding and discontinued breastfeeding until the soreness resolved.

### **Complementary Feeding Practices**

The majority of the participants introduced complementary foods and beverages before their infants were four months of age, including water.

Table 4. Complementary Feeding Practices, the Most Common Foods Given to Children <24 Months in Podor, West Africa

Complementary Feeding Practices	n	Percent
If food/drink was introduced before breast milk, why?	n=27	
Other food/drink more healthy for infant	5	19%
Religious reasons and/or tradition	16	59%
Other (includes combinations of the above)	6	22%
Most common food/drink given while BF	n=41	
Milk (includes cow, goat, sheep, powdered)	11	26%
Milk/Grain gruel	9	21%
Combo w/o meat (includes combo of water, milk, gruel)	10	24%
Combo w/ meat (includes combo of water, milk and gruel with fish, poultry, red meat and/or eggs)	6	14%
Water	3	7%
Most common food/drink during 0-6 months	n=26	
Milk (includes cow, goat, sheep, powdered)	10	38%
Milk/grain gruel	5	19%
Combo w/meat	5	19%
Water	3	9%
Most common food/drink during 6-12 months	n=36	
Combo w/o meat	22	61%
Milk/Grain gruel	7	20%
Combo w/meat (includes family food)	5	14%
Milk (includes cow, goat, sheep, powdered)	2	7%

Most common food/drink during 12-24 months	n=34	
Combo w/meat	16	47%
Family food (includes meat)	8	24%
Combo w/o meat (combo of gruel, water, milk)	8	24%

\*all data on participants' youngest child

As shown in Table 4, specific food groups were either increased or decreased according to their infants' age. During the first six months, 19% were given complementary foods containing meat; from six to 12 months of age, 14% and during the second year of life 24 (70%) infants were given meat either in the family foods they consume or in a mixture of gruel. Participants did not mention fruits and vegetables as common foods given to their infants. However, the research team observed small amounts of vegetables given to infants mixed in with family foods.

### Weaning Practices and Beliefs

Table 5 summarizes participant weaning practices and beliefs.

Table 5. Weaning Practices, Methods, and Beliefs Amongst Women in Podor, West Africa with  $\geq 1$  Child

Practices and Beliefs	n	Mean $\pm$ SEM Percent
Age (months) of infant at weaning	n=44	21 $\pm$ 5
Weaning method (planned or completed)		
Stop abruptly	27	60%
W/ advice from marabout	8	18%
Gradually wean	7	16%
Unable to specify method	3	6%
Infant weaned because	n=41*	
"Too old to breastfeed"	15	37%
Multiple factors given (includes infant too old, other foods healthier than breast milk, new pregnancy, infant able to walk)	13	32%

Unable to specify	5	12%
New pregnancy	3	7%
Infant able to walk	3	7%
Foods/beverages other than breast milk are healthier for infant	2	5%

\*3 participants had not yet weaned their first infants at the time of the interview

All but one participant had older children at the time of the interview. The interview was based on the participant's youngest infant, whose age averaged  $10.4 \pm 6.1$  months.

Because most of the infants were too young at the time of the interview to be weaned, the following results suggest ideal practices the participants hope to adopt. Abrupt weaning was understood by the participants to mean stopping to breastfeed within one day. Most participants said that they chose or will choose to abruptly wean their infants at the age of 21 months.

Eight of the participants reported that they would wean their infants when the marabout advised them to do so. When asked why the participants chose or would choose to wean their infant at a particular time, the most frequent reason given was that their infant would be 'too old to breastfeed,' other foods and beverages were healthier than breast milk, a new pregnancy occurred, or the infant was able to walk.

## **DISCUSSION**

The participants interviewed were relatively homogenous despite the large territory sampled. Most of the participants were of the Pulaar and Tukulor ethnicities and all reported being from the same Islamic brotherhood. Thus the researchers anticipated similarly homogenous infant feeding practices and beliefs; however, this was not always

the case, suggesting the individual women's infant feeding beliefs were of utmost importance in infant feeding practices.

Infant feeding guidelines established by WHO include breastfeeding within the first hour of life, exclusive breastfeeding for the first six months of life using on-demand feeding, followed by gradual weaning onto safe and age-appropriate complementary foods and beverages, with breastfeeding lasting for up to two years.<sup>3</sup> All of the participants reported breastfeeding for some period of time, which was the only WHO guideline that was met. All other infant feeding practices captured in this study fell short of WHO's guidelines. Colostrum provision, mean duration of breastfeeding, and age at weaning approached the WHO's guidelines; however, exclusive breastfeeding initiation and duration failed to meet the recommended ideal. Introduction of inappropriate and unsafe food supplementation before the age of four months was common practice. The most common complementary foods for this first year of life included water, animal milks, and nutrient-poor starches.

Similar data was reported in the northwestern region of Cameroon, where women surveyed reported having given water and complementary foods prior to six months of age and more than a third of those surveyed giving water in the first month of life.<sup>19</sup> Given the consistency of these findings, improving water quality and sanitation is of utmost importance. WHO data from 1999 estimates that approximately 28% of Senegalese have access to clean water sources and that the percentage is increasing; however, most of this access is only attainable in urban areas.<sup>20</sup>



In immune-compromised infants such as those infected with HIV and in those receiving suboptimal nutrition and breastfeeding, the lack of access and availability to safe drinking water is a barrier to optimal health. Poor water, sanitation and hygiene are the primary causes of diarrhea, which is responsible for the deaths of between 1.6 million and 2.5 million children under five years of age every year-more any other illness or disease. Improving water, sanitation and hygiene is essential to reduce the risk of morbidity and mortality from chronic diarrhea and is of utmost importance to maternal and infant health.<sup>12</sup>

As a region-specific example of potential health dangers incurred from unsafe water sources, a cholera outbreak occurred during this study's data collection in the areas along the Senegal River, the main and often times only source of drinking water in the Podor region.<sup>21</sup> The researchers observed mothers, infants, and other villagers drinking the river water without filtration or other means of sanitation. In severe cases, cholera causes vomiting and profuse watery diarrhea which can lead to dehydration and death, if untreated.<sup>22</sup> Increasing the access and availability of safe drinking water continues to be an issue that requires attention because of the potential for detrimental affects on maternal and infant health. An increase in local safe water as well as improvement in knowledge and understanding of water safety and sanitation is needed.

In addition to the barrier of access and availability to clean water, the study participants mentioned multiple beliefs that suggest other barriers to meeting the WHO's guidelines, including the notion that foods other than breast milk were healthier for infants, and that the advice from the marabout often determined feeding practices. Thirty

(67%) felt that exclusive breastfeeding was superior to complementary feeding, though only 25 (56%) of the participants exclusively breastfeed for any period of time. This may indicate acknowledgement of the superiority of exclusive breastfeeding over complementary or mixed feeding, but may also indicate a lack of understanding of the impact this practice has on an infant's health and survival. Increasing awareness and strategies to integrate these concepts would be essential in efforts to improve infant feeding practices.

Data exists that suggest infant feeding practices and beliefs can be significantly improved upon with education and counseling.<sup>23,24</sup> In Peru an experimental infant feeding intervention demonstrated that an increase in maternal education on infant feeding was directly correlated to improved infant feeding practices and child nutrition status, regardless of the mother's socioeconomic status.<sup>25</sup>

The initiation and weaning of breastfeeding is heavily influenced by cultural beliefs. A few women mentioned that they did not start breastfeeding until more than two days after giving birth while they waited for the marabout to administer the religious elixir. More than half of the women who did not give breast milk as their infant's first food gave the elixir instead. The participants also stated they waited to wean their infants until the marabout had given his blessing to do so. In the rural eastern region of Senegal, a study revealed that more than 45% of infants were seen by a marabout on the day of weaning.<sup>26</sup> Involving marabouts and pertinent Islamic framework in infant feeding education would be an important part of community health education programs in this region.

Another important aspect to consider when developing health education programs in this region is the potential for HIV transmission from mother to child. Breast milk replacement feeding, such as using formula, may be recommended in these cases if it can be assured that it is acceptable, feasible, affordable, sustainable, and safe. These guidelines can be applied to individual mothers to determine the appropriateness of breast milk replacement feeding options.<sup>6</sup> If a mother does not meet the criteria for breast milk replacement options, then exclusive breastfeeding for six months of age with abrupt cessation of breastfeeding and initiation of safe and appropriate weaning and other foods has been recommended.<sup>7</sup>

WHO recommends that shortening the time between exclusive breastfeeding and total breastfeeding cessation as this may decrease the risk of mother-to-child-transmission (MTCT) of HIV infection. However, this shortened weaning period may have negative nutrition consequences to the infant, detrimental psychological impact on both mother and infant, and possibly compromise breast health which may increase the risk of transmission if breastfeeding cessation is not abrupt.<sup>7</sup>

Residents may be unaware of their HIV status in this region where HIV testing resources were scarce and treatment programs were essentially nonexistent.<sup>16</sup> In a study conducted in Zimbabwe, a 79% reduction in postnatal HIV-MTCT was noted when infected mothers (most of whom did not know their HIV status) were given video and print materials on appropriate breastfeeding practices and MTCT of HIV versus mothers that were not given exposure to the education intervention.<sup>26</sup> Because most mothers surveyed introduced complementary foods early and do not have formula or other breast

milk alternatives available, it may be appropriate in this setting to promote WHO guidelines, including exclusive breastfeeding for the first six months of life to all expecting mothers regardless of HIV status.

Transmission of HIV during breastfeeding is a pressing concern, especially in Africa where 90% of the world's HIV-infected children reside.<sup>2</sup> Based on a compilation of studies, there is a 15-30% risk of MTCT of HIV infection from pregnancy and labor, a 25-35% risk if there is breastfeeding through 6 months, and to 30 to 45% if there is breastfeeding through 18 to 24 months.<sup>8</sup> In contrast, a longitudinal study conducted in sub-Saharan Africa indicated that breastfeeding amongst 2000 women infected with HIV was not associated with an increased risk of maternal mortality or morbidity; it was associated with highly significant reductions in mortality and morbidity among their infants.<sup>9</sup> Other studies have shown that exclusive breastfeeding for the first six months of life may cut the potential HIV MTCT rate in half.<sup>10</sup> However, there is evidence to suggest that nipple lesions and mastitis significantly increase the risk of MTCT.<sup>11</sup> Because of the varying environmental, economical, cultural, and social differences in the world, a consortium of international health organizations including WHO, United Nations Children Fund (UNICEF), and the Joint United Nations Programme on HIV/AIDS (UNAIDS) recommend that decisions regarding breastfeeding should be the individual choice of each HIV-infected woman after evaluating all of the available information.<sup>5</sup>

## CONCLUSIONS

Pregnant and lactating women in the Podor region of Senegal are in need of clean water resources and education to improve infant feeding practices, especially with regards to the practice of exclusive breastfeeding, the duration of exclusive breastfeeding, abrupt weaning strategies, and the timing, adequacy, and safety of complementary feeding. Improving water safety, sanitation, and adequacy is a priority to improve maternal and child health especially in areas where inappropriate infant feeding practices are prevalent. An education focus on impacting the beliefs underscoring breastfeeding and weaning practices should be implemented with consideration given to the cultural, social, and traditional aspects of this region. Including religious leaders in education interventions is important because they have an effect on infant feeding practices. Finally, regional healthcare organizations should not only promote WHO and UNICEF infant feeding guidelines, but also direct their efforts toward addressing beliefs of the communities that pose barriers to safe and adequate feeding practices.

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**CHAPTER IV**  
**SUMMARY AND RECOMMENDATIONS**

### *Summary and Recommendations*

Infant feeding, encompassing breastfeeding, complementary feeding, and weaning, is a multifaceted issue that greatly impacts the health, economic growth, and overall development of societies worldwide. It has been suggested that appropriate infant feeding can greatly reduce child morbidity and mortality. In this study, infant feeding practices and beliefs in the Podor region of West Africa were determined and described.

The data suggests that pregnant and lactating women in Podor are in need of clean water resources and education to improve infant feeding practices, especially with regards to the practice of exclusive breastfeeding, the duration of exclusive breastfeeding, abrupt weaning strategies, and the timing, adequacy, and safety of complementary feeding. Improving water safety, sanitation, and adequacy is a priority to improve maternal and child health especially in areas where inappropriate infant feeding practices are prevalent. An education focus on impacting the beliefs underscoring breastfeeding and weaning practices should be implemented with consideration given to the cultural, social, and traditional aspects of this region. Including religious leaders in education interventions is important because they have an effect on infant feeding practices.

Future research in this area should be done to examine the multi-factorial dynamics of infant feeding and the education intervention best suited to address these dynamics. This study's participants were limited to mothers, but infant feeding beliefs and practices of village chiefs, elderly, religious leaders, and fathers should also be assessed. Knowledge, practices and beliefs about infant feeding with HIV-positive mothers should also be addressed. This data could help to identify barriers to infant

feeding, and also categorize areas that might be modifiable with education interventions. Research on local food availability and accessibility would also be of essential in developing an education intervention. This data could lay the framework for developing tangible guidelines for complementary feeding and weaning, including data on which foods are appropriate, when to introduce them, and the appropriate amounts. The data might also identify potentially harmful foods, indicating a need for total avoidance, or improved sanitation, preparation, and/or storage methods.

In conclusion, regional healthcare organizations should not only promote WHO and UNICEF infant feeding guidelines, but also direct their efforts toward addressing beliefs of the communities that pose barriers to safe and adequate feeding practices. The role of civil infrastructure to support breastfeeding, through public policy, private sector employers, and other organizations such as breastfeeding support groups, is essential to promote and preserve maternal and children's health and economic well-being. Implementing efficient and effective nutrition interventions is critical to decrease the prevalence rates of child morbidity and mortality and to help improve the overall health and development of populations around the world.

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