CHAPTER 2

REVIEW OF LITERATURE

This chapter assesses the contribution of the research literature relevant to the benefits of breast milk for preterm infants, breastfeeding initiation and duration in preterm infants, factors associated with breastfeeding of term and preterm infants, management of the breastfeeding promotion in preterm infants and the situational context.

Benefits of Breast Milk for Preterm Infants

The scientific and lay communities agree that human milk is the best food for most newborn infants. Breast milk provides both nutritional and immunological benefits unequaled by commercially prepared infant formulas (Bell et al., 1995). A review of existing literature showed that human milk is a highly desirable food for the preterm infant. This is primarily because of its digestibility and immunological components. Amounts of secretory immunoglobulin A (IgA) are so small in the neonate that they cannot be measured until after the first 2 to 3 weeks of life. Transfer of maternal antibody through breast milk serves an important function in bridging the immunological gap for neonates (Ogra et al. as cited in Arnold & Larson, 1993). Immunologic immaturity is of particular concern in preterm infants. Indeed, milk from mothers of preterm infants has been shown to contain significantly greater

concentrations of a number of immunologic components, such as IgA, lysozyme, interferon, and lactoferrin (Lawrence, 1994; May, 1984).

IgA is the principal immunoglobulin that is present in greater concentration in breast milk of preterm infants (Gross as cited in Bell et al., 1995). Its role in controlling the microbial environment of the intestinal tract is of great importance to the preterm infant, who is at increased risk for gastrointestinal problems, such as necrotizing enterocolitis (NEC). In a study of nearly 1,000 preterm infants, the incidence of NEC was found to be six to ten times higher in formula fed infants than in those fed only human milk (Lucas & Cole, 1990).

Some studies have also shown the nutrient composition of preterm mothers' milk to be more appropriately matched to the needs of the preterm baby (Luukkainen et al., 1994). For example, the total nitrogen concentration of preterm milk is higher, which is consistent with the protein requirements of preterm infants. These infants need more protein per kilogram of body weight to support their faster rate of growth. In addition, preterm mothers' milk provides other benefits including reduction in the risk of later allergy, improved retina function, and enhanced neurological and cognitive development (Mier & Brown, 1996). Encouraging lactation can also enhance mothers' feelings of attachment to their infants while decreasing the feelings of helplessness and isolation that arise from the need for highly skilled and technical

The benefits of breastfeeding for preterm infants have been well documented. However, breastfeeding rates for preterm infants are not well defined. Reports on the incidence of breastfeeding for this population vary widely, and

published follow – up data are minimal. Mothers of preterm infants have somewhat different concerns than mothers of full – term infants. Mothers of full – term infants are still initiating breastfeeding in the immediate post-discharge period, whereas mothers of preterm infants established lactation with a breast pump and may have had more extended contact with their infants by the time discharge approaches. These time differences may account for the fact that the major concerns for mothers of healthy full – term infants and preterm infants are different. Breastfeeding in preterm infants has many problems including initiation and duration.

Breastfeeding Initiation and Duration in Preterm Infants

Results from studies on the incidence and duration of breastfeeding in preterm infants vary widely because of the diverse groups of subjects in each study and the interventions used to initiate and maintain breastfeeding. Hill, Ledbetter, and Kavanaugh (1997) examined the feeding patterns of low birth weight infants (1,500-2,500) on the day of hospital discharge and 4 weeks after birth using a descriptive survey at eight hospitals in the Midwest. They found that of 110 infants, 54% were fed breast milk exclusively the day of hospital discharge; 71% of these infants were fed exclusively at the breast, 15% were fed at the breast and received expressed milk in a bottle, and 14% received exclusively expressed milk in a bottle. Four weeks after birth, 51% of the infants received breast milk exclusively; 40% were fed at the breast exclusively, 5.5% were fed at the breast and received expressed milk in a bottle, and 4.5% received expressed milk exclusively in a bottle. The findings also reported that at four weeks after birth, 19% of the infants were weaned to formula.

In Nyqvist and Ewald's investigation in Sweden (1999), it was reported that before preterm infants were discharged from hospital, 57 (80.3%) mother-infant pairs progressed to full breastfeeding. Irrespective of gestational age at birth, most of these infants were breastfed fully at a post menstrual age (PMA) of 35-36 wk, ranging between 33.4-40.0 weeks. This group of infants had a median age of 16 (2-68) days post delivery. Ten infants (14.1%) were discharged with partial breastfeeding and 4 infants (5.6%) were weaned before discharge.

In an investigation by Wheeler, Chapman, Johnson, and Langdon (2000) conducted in Australia, 80.2% of mothers of preterm infants intended to exclusively breastfeed and a large proportion of mothers were breast-feeding (62%) and /or either breast-feeding and bottle-feeding (81%) on discharge. Wheeler and colleagues noted that the rates observed in their study were less than the target set by the Better Health Commission for all infants (90% on discharge) and less than that generally reported in other Australian studies for full term infants (85% - 91%).

In a study conducted by Gunn et al. (2000) in New Zealand, the authors aimed to determine whether earlier discharge of preterm infants (<37 wk) from hospital was safe and whether it affected breastfeeding rates. They found that there was no significant difference between the two groups for breastfeeding rates at either discharge, or 6 weeks or 6 months after discharge. At discharge after a mean stay of 3 weeks in hospital, 83% of the routine versus 80% of the early discharge group were breastfeeding. By 6 weeks after discharge, those receiving any breast milk had fallen to 60% in the routine versus 55% in the early discharge group, and by 6 months of age it had fallen further to 36% in both groups. They also found that the rates of exclusive

breastfeeding were at 64.7 versus 54.8% at discharge, 40.5 versus 31.3 % after 6 wk and 3.6 versus 0.8 % after 6 months. In this study all subjects were given breastfeeding support and were visited or contacted via telephone by a team of visiting nurse specialists or the home care nurses. In addition, in an investigation by Pinelli, Atkinson, and Saigal (2001) the mean duration of breastfeeding was 26.1 weeks in the Supplementary Structured Breastfeeding Counseling (SSBC) group and 24 weeks in the Conventional Hospital Breastfeeding Support (CHBS) group (not statistically significant).

In conclusion, the studies reviewed above support that the feeding patterns of the low birth infant (LBW) or preterm infant are different from those of the full term infant. The preterm or LBW infant may not consume the entire feeding at breast in the early post-discharge period. Mothers of preterm infants breastfeed for a shorter period than do mothers of full-term infants. The mean duration of breastfeeding was 24-26.1 weeks. An estimated 54-80.3 % was fed mother's milk exclusively the day of hospital discharge. After 6 months the study indicated that the rate of exclusive breastfeeding decreased to 0.8-3.6 %.

Factors Associated with Breastfeeding of Term Infants

Before discussing the factors associated with breastfeeding of preterm infants, the factors associated with breastfeeding in general would be explored to get an overview picture. Many research efforts have been aimed at identifying factors that affect a mother's infant feeding decision and at predicting breastfeeding initiation and

duration. It revealed that the factors associated with breastfeeding can be categorized into 3 groups: maternal, infant and environmental factors.

1. Maternal factors

Breastfeeding problems are often multifactorial and many women faced with breastfeeding problems would have a combination of physical and psychosocial factors (Fraser & Cullen, 2003). Maternal factors affected breastfeeding are composed of sociodemographic characteristics, preparation for breastfeeding, knowledge of breastfeeding, attitude towards breastfeeding, breastfeeding experience, mother's physical health, abnormal nipple and insufficient milk supply.

1.1 Sociodemographic characteristics

The literature review according to factors associated with breastfeeding was emphasized on the characteristics of mothers, especially in relation to maternal age, level of education, socio-economic status, parity, mode of delivery, smoking habit and employment status.

Maternal age Scott and Binns (1999) found that in the studies employing multivariate analysis there was a strong and consistent association with maternal age. The percentage of mothers choosing to feed their infants breast milk differs systematically among subgroups of women, with those who are older (DaVanzo, Starbird, & Leibowitz, 1990; Grossman, Fitzsimmons, Larsen-Alexander, Sachs, & Harter, 1990; Ryan, Wysong, Martinez, & Simon, 1990), and the number of adolescent mothers choosing to breastfeed their babies is significantly lower compared with older mothers (Dennis, 2002; Ineichen, Pierce, & Lawrenson, 1997; Lee, 1998).

Level of education Scott and Binns (1999) found that there was a strong and consistent association between breastfeeding and level of education. The percentage of mothers choosing to feed their infants breast milk differs systematically among subgroups of women, with those who are more educated (Bergman, Larsson, Lomberg, Moller, & Marild, 1993; Cooper, Murray, & Stein, 1993; DaVanzo, Starbird, & Leibowitz, 1990; Grossman, Fitzsimmons, Larsen-Alexander, Sachs, & Harter, 1990; Michaelsen, Larsen, Thomsen, & Samuelson, 1994; Richardson and Champion, 1992; Ryan, Wysong, Martinez, & Simon, 1990).

Socio-economic status Ryan, Rush, Krieger, and Lewandowski (1991) reported that youth, low socio-economic class and poverty are associated with women choosing to bottlefeed. In the United Sates, during the national declines of the 1980s and the upward trend in the 1990s, breastfeeding was less common among those with low income. This is further supported by the study of Ahluwalia, Morrow, Hsia, and Grummer-Strawn (2003) who found that simply having higher socio-economic status is an enabling factor in breastfeeding decisions. Women in a higher socioeconomic class were more likely to breastfeed (Foster, Slade, & Wilson, 1996; Grossman, Fitzsimmons, Larsen-Alexander, Sachs, & Harter, 1990; Kennedy & Visness, 1997; Ryan, 1997; Ryan, Wysong, Martinez, & Simon, 1990). However, in the study by Scott and Binns (1999), it was found that there was a less consistent association between breastfeeding and socio-economic status.

Parity Another characteristic of a mother is parity. The associations that had previously been identified between breastfeeding and parity were less consistent in multivariate studies (Kuan et al., 1999; Littman, Medendorp, &

Goldfarb, 1994; Scott & Binns, 1999). However, most mothers with breastfeeding problems were primiparas. It seems reasonable that a mother with her first baby is more inclined to ask for professional help when troubles arise than an experienced mother. The second-born has more chance to be breastfed longer than the first-born. This hypothesis, which was confirmed by a study in 1993, is also consistent with the findings reported by Richardson and Champion (1992).

Mode of delivery For mode of delivery, a study found that women who had a cesarean section experienced a significant delay in initiating breastfeeding compared with women giving birth vaginally, with or without instrumental assistance (Rowe-Murray & Fisher, 2002). The findings indicated that women who gave birth by cesarean section experienced a longer elapsed time between birth and putting their baby to the breast than women giving birth vaginally. This remained an important barrier to early initiation of breastfeeding. Furthermore, evidence suggested such interventions as epidural anaesthesia, general anaesthesia and vacuum extraction on breastfeeding in labor may delay or disrupt neonatal suckling pattern (Crowell, Hill, & Humenick, 1994). However, associations that had previously been identified between breastfeeding and mode of delivery were less consistent in multivariate studies (Scott & Binns, 1999).

Smoking habit Scott and Binns (1999) also identified a consistent negative association between maternal smoking habits and breastfeeding duration. Women who smoke during pregnancy are less likely to breastfeed (Grossman et al., 1990), but are more likely to terminate breast feeding early (Hill & Aldag, 1996).

Employment status It has been found that other demands on the woman's time and energy will influence a woman's infant feeding decision (Hoddinott & Pill, 1999b; Murphy, 1999) and also pose a major barrier to breastfeeding (Hannon et al., 2000; Hoddinott & Pill, 1999b; Raisler, 2000). International studies have identified that employment affects breastfeeding intentions (Houghton & Graybeal, 1999). The consensus was that going back to work makes breastfeeding almost impossible. (Stewart-Knox, Gardiner, & Wright, 2003). These findings have been further corroborated by recent quantitative studies indicating that anticipated return to employment is associated with non-initiation of breastfeeding (Noble, 2001). Previous research has also demonstrated a negative association between duration of lactation and maternal employment (Gielen, Faden, O Campo, Brown, & Paige, 1991; Lindberg, 1996). Many mothers will eventually stop breastfeeding because of circumstances such as going back to work or school (Roe, Whittington, Fein, & Teisl, 1999). Reasons to explain these findings included limited maternity leave and inadequate facilities and support for breastfeeding within the work environment (American Academy of Pediatrics, 1997; Lindberg, 1996, Yimyam & Morrow, 2003).

Work has been the most cited reason for early weaning from breastfeeding (Arlotti, Cottrell, Lee, & Curtin, 1998; Dykes & Griffths, 1998; Kuan et al., 1999). Because women had to return to work so early in the postpartum period, the participants and their spouses believed this type of supplementation was necessary from birth so the transition would be easier for both infant and mother. They believed that perhaps it was expecting too much of the infant to learn both ways of feeding (Tarrant, Dodgson, & Tsang, 2002). However, maternal employment has been related

inconsistently to breastfeeding in several other studies (Lindberg, 1996; Lizzarraga, Maehr, Wingard, & Felice, 1992).

1.2 Prenatal breastfeeding intention

Studies showed that women tend to make their infant feeding decisions prior to pregnancy (Earle, 2002; Hoddinott & Pill, 1999b) or before delivery (Romero-Gwynn, 1989). When mothers were asked to rank the importance of factors that had influenced their first infant feeding intention, their own decision (53.5%) was ranked the most important. Personal feelings of responsibility, self-worth and closeness to the infant enhanced the decision-making in favor of breastfeeding (Kong & Lee, 2004).

Previous study reported a strong positive association between planned and actual length of lactation (Schy, Maglaya, Mendelson, Race, & Ludwig-Beymer, 1996). Other researchers have recognized the concept of commitment to breastfeeding. In her phenomenological study, Bortorff (1990) found commitment to be important to persistence in breastfeeding, arguing that the more a woman commits herself to breastfeeding the more she will be able to do so, even in the face of difficulties. Commitment was also seen as a need to be prepared mentally for the experience of breastfeeding; that is, a need to believe and feel confident that they could successfully breastfeed (Sheehan, Schmied, & Cooke, 2003). Similarly, Hoddinott and Pill (1999b) found that commitment and confidence were important to breastfeeding decisions.

1.3 Preparation for breastfeeding

The literature revealed that appropriate preparation for breastfeeding enhanced success in lactation (Kistin, Benton, Rao, & Sullivan, 1990; Pugin, Valdes, Labbok, perez, Aravena, 1996). Hoyer and Horvat (2000) found that written instructions as well as personal encouragement by the nurse helped better prepare mothers and exerted a favourable influence on breastfeeding practices. Similarly, the study of Pugin et al. also indicated that prenatal group education with hands-on skills reinforcement was a significant and additive component of breastfeeding support, especially among those who had no previous breastfeeding experience. Therefore, preparation for breastfeeding through education and counseling greatly increase the possibility of success.

1.4 Knowledge of breastfeeding

One of the elements to empower a woman to breastfeed was that she has sufficient knowledge to make decisions (Shelton, 1994). Breastfeeding choice and success were usually associated with higher breastfeeding knowledge (Wallance, 1992). Having knowledge about and an appreciation for the multiple benefits of breastfeeding reasonably correlated with a positive attitude (Spear, 2004). In addition, the findings in the study by Kong and Lee (2004) found that mothers did not know enough about breastfeeding, and those who knew less tended to choose bottle feeding. The findings suggested that more breastfeeding knowledge would influence mothers to choose breastfeeding. Similarly, lack of information and information that was given too late were regarded as obstacles to breastfeeding (Nyqvist, 2002).

Lack of knowledge needed to be addressed (Arora, McJunkin, Wehrer, & Kuhn, 2000; Earle, 2000). Therefore, health care providers should heed this

message and value the importance of giving breastfeeding advice to mothers (Kong & Lee, 2004). Wallance (1992) also argued that education of potential breastfeeding problems can positively influence outcomes.

However, another study found that some mothers chose to bottlefeed despite asserting the benefits of breastfeeding (Earle, 2000). This meant that both breastfeeding and bottlefeeding participants share similar perceptions of infant feeding; breastfeeding is definitely the best. However, if participants share similar perceptions and reach their decision at a common time, this still revealed very little about why some women may still choose to bottlefeed.

1.5 Attitude towards breastfeeding

Even after a decision to breastfeed, many mothers failed to reach their own breastfeeding goals because many factors discourage them. One common factor identified in previous studies was personal perceptions (Chan, Nelson, Leung, & Li, 2000).The main barriers to breastfeeding were the perceived lack of convenience, freedom and independence. Breastfeeding was viewed as tiring and associated with difficulty in establishing a routine. It ties mothers to the home and restricts freedom to go about everyday activities. A breastfed infant is perceived as more dependent than one who is artificially fed and this in turn adds to the mother's perceived lack of freedom and her own feelings of dependency (Stewart-Knox, Gardiner, & Wright, 2003).

Foster et al. (1996) interviewed pregnant women who had decided not to breastfeed. These women described breastfeeding as distasteful as they feared over an adverse effect on their body, particularly the breasts. Some mothers expressed their

desire to share the load of infant care by involving the fathers in feeding their infant to relieve the daily grind and ensure paternal involvement (Earle, 200).

Another barrier to breastfeeding is embarrassment (Hannon, Willis, Bishop-Townsend, Martinez, & Scrimshaw, 2000; Hoddinott & Pill, 1999b; Kong & Lee, 2004; Raisler, 2000) both for self and as perceived in others. Women are embarrassed to breastfeed even in front of family and friends. Embarrassment is perceived not only by the women themselves but also in others (Stewart-Knox et al., 2003). This is not surprising given that in western cultures the breast is largely fetished as a sexual object and one of the reasons given for not breastfeeding is embarrassment (Dykes & Griggths, 1998).

1.6 Breastfeeding experience

Breastfeeding is not an instinctive behavior but a learned skill, and the establishment of successful breastfeeding cannot be assumed to occur easily for all women (Spencer & Jones, 2002). The findings showing that previous infant feeding experience is a strong predictor of the decision to breast or bottlefeed the child are consistent with previous studies (Perez-Escamilla, Segura-Millan, Pollitt, & Dewey, 1993; Tuttle & Dewey, 1994). Multivariate analyses indicated that breastfeeding the previous child was positively associated with breastfeeding initiation (Perez-Escamilla et al., 1998), but mothers who experience breastfeeding difficulties with their first infant and give up breastfeeding are less likely to breastfeed subsequent infants than mothers who do not experience such difficulties (Ingram, Woolridge, & Greenwood, 2001).

1.7 Mother's physical health

It has been found that a mother's physical health will influence an infant feeding decision (Hoddinott & Pill, 1999b; Murphy, 1999). However, the study by Kong and Lee (2004) found that half of the respondents did not agree that the physical pain and discomfort associated with breastfeeding had discouraged them from breastfeeding.

1.8 Abnormal nipple

Poor nipple protractility causing an inverted or non-protractile nipple may result in problems with establishing and maintaining beastfeeding (White, Freeth, & O Brien, 1990). Usually, there is an antenatal examination of the nipples of the women who intend to breastfeed in order to give antenatal treatment of inverted and non-protractile nipples. This will allow time for the protractility of some nipples to improve spontaneously and yet leave several weeks for treatment to be instigated should it be considered necessary (Alexander & Campbell, 1997).

1.9 Insufficient milk supply

Many mothers give up breastfeeding because of feeding difficulties, and the most common is a perception of insufficient milk (Dykes & Williams, 1999). Maternal perception of insufficient milk supply leads women to supplement with other liquids or foods. This supplementation interferes with establishment of an adequate milk supply, frequently leading to unplanned and premature weaning. Early recognition and intervention can help prevent lactation difficulties that lead to real or perceived insufficient milk supply (Neifert, 1999).

2. Infant factors

Infant factors have both positive and negative influences on breastfeeding in the literature review. These factors are infant health and feeding behavior.

2.1 Infant Health

Associations that had previously been identified between infant health and breastfeeding were less consistent in multivariate studies (Scott & Binns, 1999). Some studies found that the health of her infant will influence a woman's infant feeding decision (Hoddinott & Pill, 1999b; Murphy, 1999). Ahluwalia, Morrow, Hsia, and Grummer-Strawn (2003) noted that the mothers whose infants have low birth weight or are admitted to the NICU show lower overall rates of breastfeeding initiation. The authors commented that serious infant illness would affect the infant's feeding behavior.

John and Martorell (1989) found birth weight positively associated with the decision to breastfeed among Mexican-American women. This is similar to findings by Adair and Popkin (1996) indicating that the possible reasons are that low birth weight children in their study are not readily accessible to their mothers for breastfeeding in the maternity ward, or that women have specific perceptions about feeding infants who seem vulnerable at birth. Alternatively, low birth weight neonates may not have the optimal strength and coordination needed for an effective suck, and without proper lactation management, this may cause problems that deter successful initiation of lactation.

However, Ford and Labbok's study (1990) conducted in the United States found that birth weight was inversely associated with breastfeeding duration. The inverse association between child age and likelihood of being breastfed might reflect the upward trend in the rates of breastfeeding in the United States.

2.2 Feeding behavior

For term infants, an incorrect sucking technique at the breast (i.e., superficial nipple sucking) was mentioned. It is much more common among mother-infant pairs with a variety of nursing problems than among those breastfeeding without problems (Righard, 1998).

3. Environmental factors

Breastfeeding is also dependent on the factors related to the support available and some barriers in the environment. These are significant others, society, culture, facilities, health professionals and health service.

3.1 Significant others

Social support from significant others is crucial for breastfeeding success (Tarkka, Paunonen, & Laippala, 1999; Whelan & Lupton, 1998). It is also an important factor in the duration and success of breastfeeding (Kaewsarn & Moyle, 2000). The support and encouragement of one person can make a difference in whether a woman weans her infant from breast milk or successfully continues to breastfeed (Tarrant, Dodgson, & Tsang, 2002). The significant others of mothers could be infants' fathers, family/friends, and other children.

Infants' fathers Feeding decisions are strongly influenced by infants' fathers. A review of the descriptive literature revealed that breastfeeding decisions are

often influenced by the expectant fathers (Sharma & Petosa, 1997). Across studies, about 75% of mothers reported that fathers are important to the decision. Indeed, the father's approval/support is a significant predictor of the mother's choice to breastfeed (Littman, Medendrop, & Goldfarb, 1994).

The temporal relationship of a father's influence on initiation and particularly duration of breastfeeding is also supported in postnatal studies (James, Jackson, & Probart, 1994; Littman et al., 1994). Fathers play an important role in the breastfeeding decision and that intended duration is a strong predictor of actual duration (Earle, 2000; Scott & Binns, 1999). However, a study showed that fathers appear to have little influence upon feeding decisions (Stewart-Knox et al., 2003).

Family/friends Studies have consistently shown that family support is critical for breastfeeding women (Humphreys, Thompson, & Miner, 1998; Schafer, Vogel, Viegas, & Hausafus, 1998; Tarkka et al., 1999). In addition, women's infant feeding behaviors are strongly influenced by the way in which family members and close friends feed their infants, as well as by the advice of family and friends (Dykes & Griffiths, 1998). Practical support from the extended family is considered important to breastfeeding success. Breastfeeding is facilitated by social support yet at the same time breastfeeding itself is perceived as a barrier to practical support from the family (Stewart-Knox et al., 2003).

Other children It has been found that the needs of her other children will influence a mother's infant feeding decision (Hoddinott & Pill, 1999b; Murphy, 1999). Other children are perceived as a barrier to breastfeeding, even for those who breastfed previously (Stewart-Knox et al., 2003).

3.2 Society

In the United State, breastfeeding in public is not a welcomed practice, and there is evidence that the perception that breastfeeding is socially inconvenient has a negative influence on the choice to breastfeed (Tuttle & Dewey, 1994). International studies have also found that social attitudes affect breastfeeding intentions (Robin, 1993). This is supported in the study by Perez-Escamilla et al. (1998) which found that a major reason for choosing not to breastfeed is that women feel socially uncomfortable doing it.

3.3 Culture

It is well known that individual health behaviors are embedded in significant cultural pattern exchanges that are reinforced by the strong family ties and tradition (Yimyam, 2003). The culture profoundly influences health knowledge, attitudes and behavior, and this is particularly true of infant feeding practices (Wilmoth & Elder, 1995). There is accumulating evidence that early cessation of breastfeeding is largely due to negative influences within the cultural and social environment (Bick, MacArthur, & Lancashire, 1998).

Culture can be viewed as a system of socially transmitted behavior patterns that link human groups to their environmental setting (Leininger, 1995). Individual health behaviors are embedded in cultural pattern exchanges and are usually transmitted from generation to generation (Yimyam, 2002). The amount of activity that new mothers assume when they go home depends on her circumstances (Kaewsarn, Moyle, & Creedy, 2003b). The detection of an inverse association between the mother's length of residence in the United States and breastfeeding

initiation strongly suggests that acculturation plays an important role in the infant feeding decision (Balcazar, Ttrier, & Cobas, 1995; Rasssin, et al., 1994). These findings supported the need for culturally appropriate breastfeeding promotion and support programs, and it is an approach that has been found effective at increasing the rates of breastfeeding initiation among Native Americans (Long, Funk-Archuleta, Geiger, Mozar, & Heins, 1995). In Yimyam's study (2002), the author suggested that it is essential that breastfeeding promotion campaign integrate cultural beliefs and practices, and the program modify negative beliefs and practices as well as improve attitudes and knowledge of health personnel, and use public and social support for supporting and empowering all women to establish and continue breastfeeding.

3.4 Facilities

International studies have identified the lack of public facilities for breastfeeding and lack of privacy for breastfeeding in public places as a barrier to breastfeeding (James et al,, 1994; Yimyam & Morrow, 2003). Where such facilities exist, they are often crowded and inadequate (Stewart-Knox et al., 2003).

3.5 Health professionals

Several studies have shown those health professionals (including physicians, midwives, community health nurses and advisors from voluntary organizations) influence infant-feeding decisions (Burglehaus, Smith, Sheps, & Green, 1997; Fraser, 1999). International studies have identified that the available standard and content of advice given to mothers by health workers affect breastfeeding intentions (James et al., 1994; Yimyam, 1997).

In the study of Kong and Lee (2004), over half of the respondents reported that they were convinced to breastfeed by health care professionals' advice. Humenick, Hill, & Spiegelberg (1998) found that primiparous women were more likely to decrease their level of breastfeeding if encouraged by health professionals to give supplementary feeds or wean during the previous week. These findings highlight the importance of health care providers and their role in promoting and perhaps reinforcing women's decisions made in the prenatal and early postpartum period to breastfeed. Trials comparing professional support with usual care in preventing the cessation of any breastfeeding showed professional support to be effective overall (Sikoski, Renfrew, Pindoria, & Wade, 2003).

Hannon, Willis, Bishop-Townsend, Martinez, and Scrimshaw (2000) reported that health professionals frequently miss opportunities to provide positive encouragement for mothers to persevere with breastfeeding. Efforts to promote breastfeeding as the preferred method for infant feeding are less than successful among nurses and other health care providers. Lack of knowledge, non-supportive behaviors and attitudes of maternity nurses, inconsistent advice (Beeken & Waterston, 1992; Chalmers, 1991; Green, Coupland, & Kitzinger, 1998; Rajan, 1993) and minimal prenatal encouragement to breastfeed (Patton, Beaman, Csar, & Lewinski, 1996; Sable & Patton, 1998) have been cited as barriers to breastfeeding. Similarly, some women, especially first-time mothers, complain of inadequate help with breastfeeding (Vogel & Mitchell, 1998).

Health professionals' attitudes may be ambiguous, inconsistent and occasionally harmful to the initiation of breastfeeding. Some staff may provide inaccurate and confusing information regarding infant feeding (Wilmoth & Elder,

1995). Unfortunately, some health professionals have been found to support formula feeding for any perceived breastfeeding complication (Vogel & Mitchell, 1998; WHO, 1993). Some nurses and physicians tend to encourage mothers to supplement with formula or to give up altogether if they experience difficulties in breastfeeding. Humenick, Hill, and Spiegelberg (1998) noted that across disciplines, inadequate professional support for breastfeeding has been identified in the literature. They also stated that the adequacy of health professionals' performance in the promotion of breastfeeding has been questioned repeatedly.

The above shows that health professionals can have an impact on breastfeeding. Futhermore, some studies have focused on factors associated with breastfeeding specifically related to physicains and to nurses.

Physicians It has also been found that physicians' knowledge, practice and perception of breastfeeding could significantly impact breastfeeding practices (Forrester & Dawkins, 1998). Although the potential for effective obstetrician involvement is great, anecdotal reports and small research studies have suggested that obstetricians are still unprepared for, and sometimes uninterested in breastfeeding promotion (Naylor, 1990). The study by Freed et al.(1995) indicated that most obstetricians are not well prepared to provide effective counseling for potential and current breastfeeding mothers. Young physicians who never assist a breastfeeding mother in the hospital or at a postnatal visit would have no basis for including such activity in their regular practice. The knowledge deficits seen among both residents and practitioners may exert potentially deleterious effects on breastfeeding initiation and duration. Lack of understanding of and belief in the health benefits of

breastfeeding may discourage physicians from actively recommending breastfeeding to expectant parents. Tepid physician advocacy may also convey to parents the message that breastfeeding is unimportant to infant health. Inexperience or lack of knowledge regarding management of common lactation problems may result in incorrect advice from obstetrician gynecologists.

The study has questioned hospital staff regarding their knowledge of breastfeeding and found it limited (Fraser & Cullen, 2003). Freed et al. (1995) reported that many medical practitioners in the USA do not have the knowledge or skills to help women with common breastfeeding problems. Several studies indicated that many staff groups have a poor understanding of the practical aspects of infant feeding (Anderson & Geden, 1991; Bernaix, 2000; Lewinski, 1992) while other knowledge deficits were also identified. General knowledge concerning the immunological and nutritional value of human milk remains poorly understood (Cantrill, Creedy, & Cooke, 2003). Parallel to the findings of Lewinski (1992) and Karipis and Spicer (1999), a number of the participants (41.1%) held to the outdated practice.

Nurses Nurses are commonly reported to be the largest group of health professionals influencing breastfeeding (Segovia, 1998). Both education and personal experience have been found to influence nurses' attitudes and behavior in promoting breastfeeding (Patton, Beaman, Csar, & Lewinski, 1996). Mothers' capacity for simultaneous breastfeeding is dependent on adequate support from nurses that enable them to handle their infants by themselves and to feel in control of the situation. Breastfeeding is easier when there are an adequate number of nurses available who

could answer questions and give practical assistance when needed. The latter, in particular concerned transferring infants to and from the mother before and after a breastfeeding session. A good nurse is defined as a person with adequate knowledge, who is sensitive to the mother's needs and psychological reactions, pushes her to try to breastfeed, encourages and praises her. Limited access to assistance from a nurse causes problems in connection with breastfeeding (Nyqvist, 2002).

In Australia, midwives are the health professional most likely to be with women at the time of breastfeeding initiation and need to be knowledgeable in this area and midwives' general breastfeeding knowledge is adequate overall (Cantrill, Creedy, & Cooke, 2003).They demonstrated a better understanding of most concepts than medical physicians (Freed et al., 1995), three areas of knowledge deficits were management of low milk supply, immunological value of human milk and management of a breast abscess. However, while nurse-midwives were more likely to report being very effective in meeting clients' needs, the number of incorrect responses to questions revealed their knowledge deficiencies on breastfeeding management decisions (Cantrill et al., 2003). Similarly, other authors have concluded that nurses' knowledge is not always superior to that of other health professionals who gained breastfeeding knowledge from personal or on the job experience (Pantazi et al., 1998).

3.6 Health service

In 1991, WHO and the United Nations Children's Fund (UNICEF) jointly launched the Baby-Friendly Hospital Initiative aimed to give every baby the best start in life by ensuring a health-care environment where breastfeeding is the

norm (Li, Kong, Hotta, Wongkhomthong, & Ushijima, 1999). To be accredited as a "Baby Friendly Hospital", the requirements of each of the Ten steps must be satisfied. The Baby Friendly Hospital Initiative for breastfeeding represents the worlds' first major initiative for breastfeeding that cuts across all regional, linguistic, economic, and political boundaries (UNICEF, 1998). A recent systematic review of the literature to evaluate the effectiveness of interventions to promote the initiation of breastfeeding included only two studies relating to Baby Friendly Hospital Initiative interventions (Fairbank et al., 2000). A more randomized trial in the Republic of Belarus, however, showed that a Baby Friendly Hospital Initiative intervention was significantly associated with greater duration of breastfeeding, a greater proportion of infants breastfed exclusively, and with lower rates of infant infection and atopic eczema in the first year of life compared with a control group (Kramer et al., 2001).

The Ten steps for successful breastfeeding are described as follows:

1) Have a written breastfeeding policy that is routinely communicated to all health staff.

2) Train all health care staff in skills necessary to implement this policy.

3) Inform all pregnant women about the benefits and management of breastfeeding.

4) Help mothers initiate breastfeeding within one half hour of birth.

5) Show mothers how to breastfeed and how to maintain lactation even if they should be separated from their infants.

6) Give newborns no food or drink other than breast milk, unless medical indicated.

7) Practice rooming-in—allow mothers and infants to remain together—24 hours a day.

8) Encourage breastfeeding on demand.

9) Give no artificial teats or pacifiers (also called dummies or soothers) to breastfed infants.

10) Foster the establishment of breastfeeding support groups and refer mothers to them on discharge from the hospital or clinic.

To pinpoint the actions and the responsibility, the ten steps are categorized and displayed as described below.

Steps 1, 2, 7 and 10 are mainly the responsibility of the administrators. Practice rooming-in—allow mothers and infants to remain together—24 hours a day is mentioned in step 7. It is known that successful breastfeeding is influenced by different factors and among these rooming-in is of particular importance (Hoyer & Horvat, 2000). Another study showed that rooming-in of the mother prior to elective discharge was also associated with a longer duration of breast milk feedings (Killersreiter, Grimmer, Buhrer, Dudenhausen, & Obladen, 2001). Moreover, in this category, steps 10: foster the establishment of breastfeeding support groups and refer mothers to them on discharge from the hospital or clinic was supported by the study of Schafer et al.(1998) showing that breastfeeding women indicated that peer counseling was an invaluable resource for breastfeeding advice and support. Peer

counselors have been associated with an increase in both breastfeeding initiation rates and breastfeeding duration. Several studies have also demonstrated improved initiation rates and breastfeeding duration among WIC Participants who received breastfeeding advice or participated in a peer counseling program (Long, Funk-Archuleta, Geiger, Mozar, & Heins, 1995; Caufield et al., 1998).

Steps 3 through 5 are largely under the responsibility of health care providers. Step 4: help mothers initiate breastfeeding within one half-hour of birth was supported by the study of Killersreiter et al. (2001). They found that early mother-infant contact increases the duration of breastfeeding by as much as 50%, and nursing should be initiated immediately after delivery when possible. In another study, the infant's age at the first breastfeeding had an impact on breastfeeding initiation and duration. This effect was apparent at discharge, and at 3 days after discharge. The infants most likely to be breastfed at discharge began breastfeeding earlier (Kliethermes, Cross, Lanese, Johnson, & Simon, 1999).

The early postpartum period is a critical time for education and assistance to ensure appropriate positioning and latch-on to avoid breast soreness and/or engorgement (Kuan, Britto, Decolongon, & Schoettker, 1999). In situations where separation after delivery is unavoidable for medical reasons, in the maternity unit the infant can nevertheless be stimulated to suck actively and correctly. A faulty pattern could easily be corrected at this early stage (Righard & Alade, 1992).

Although faulty sucking technique can be corrected later, the findings of one study suggested that late results are not always optimal, particularly if supplementary bottlefeeding is already introduced before remedial measures are taken. It may be preferable to opt for early prevention rather than late intervention.

Early prevention entails the adoption of hospital routines that do not interfere with the delicate mother-infant bonding process. Therefore, step 4 is an example of a means for the early prevention of breastfeeding problems (Righard, 1998).

Steps 6, 8 and 9 fall within the responsibility of mothers and health care providers. Step 6: give newborns no food or drink other than breast milk, unless medical indicated and step 9: give no artificial teats or pacifiers (also called dummies or soothers) to breastfeeding infants were supported by several studies. Michaelsen et al. (1994) indicated that the problems of supplementary feeding are already being common practice in the maternity hospital. Early introduction of infant formula has been shown to decrease the duration of breastfeeding (Armotrading, Probart, & Jackson, 1992), and specifically, supplementing with artificial formula milk in the first month is associated with shorter breastfeeding. Infants who were already introduced to a bottle before referral were less likely to be stilling breastfeeding at subsequent follow-up one month or more lately.

Several explanations for this are possible. Infants accustomed to bottlefeeding at an early stage might develop a preference for the bottle teat (Gale, 1989). Another explanation is that stimulation of milk production by the sucking of the infant may be less effective as soon as a bottle is introduced (Howard et al., 1999). The most interesting explanation concerns the sucking technique. Some of the mixed-fed infants may develop an incorrect sucking technique at the breast. As noted in one study, the difference in sucking technique between exclusive breastfed and mixed-fed infants may explain why more infants with mixed feeding at referral had stopped breastfeeding at follow-up (Righard, 1998).

In previous studies (Hoyer & Horvat, 2000; Righard & Alade, 1992), it was found that mother-infant pairs using pacifiers stopped breastfeeding earlier than non-users. An incorrect technique at discharge combined with subsequent pacifier use was also associated with unsuccessful breastfeeding outcomes (Righard, 1998). In two studies by Richard and Alade (1992), regular use of a pacifier was more common among those with breastfeeding problems. The researchers discussed nipple confusion, or rather suck confusion, and whether the sucking on a pacifier with the mouth slightly open made it difficult for some children to switch to grasping the breast with a wide-open mouth. A noteworthy finding in their later study was that infants using pacifiers had a superficial nipple sucking pattern more often when breastfeeding than non-users. Another study suggested that another reason for decreasing breastfeeding rates among pacifier users might be that getting used to sucking on an alien elastic object, such as a pacifier, might make it difficult for some infants to accept the soft tissue of the breast (Gale, 1989). Many parents have experienced their child's refusal of a new pacifier with tactile properties that are unfamiliar and different from the old and well-used pacifier (Righard, 1998).

Moreover, conclusive evidence indicated that providing free samples of formula on discharge from the hospital is negatively associated with breastfeeding duration (Armotrading et al., 1992; Perez-Escamilla et al., 1994). Milk formula advertisements have been identified in many studies as important in influencing mothers' decisions on infant feeding (Dykes & Griffiths, 1998).

Besides the Ten steps for successful breastfeeding, the hospital environment is also mentioned. It should provide mothers with a feeling of being comfortable while breastfeeding and having sufficient privacy (Mozingo et al., 2000).

The mothers preferred an armchair with a soft seat and a back that supported them in a comfortable, right-angle position. A special breastfeeding pillow and a footstool were also useful for holding the infants comfortably in an appropriate position (Nyqvist, 2002).

The findings from this analysis demonstrated that there are many factors clearly associated with increasing the incidence and duration of breastfeeding. However, the relationship between these factors and breastfeeding outcomes were inconsistent perhaps because of the conceptual, methodological, and population differences in these investigations, breastfeeding definitions and timing of assessment.

Factors Associated with Breastfeeding of Preterm Infants

There have been few studies on the factors associated with breastfeeding of preterm infants. The literature review showed that the factors associated with breastfeeding in mothers of preterm infants have some specific factors of which some of them are found in term mothers.

1. Maternal factors

1.1 Sociodemographic characteristics

There were studies exploring the influence of sociodemographic factors on breastfeeding outcome among mothers of preterm infants. One study revealed that maternal age had a short term effect on breastfeeding; older mothers were more likely to breastfeed at discharge and at 3 days after discharge (Kliethermes et al., 1999). For educational level, low levels of parent education were independent negative predictors of breast milk feeding (Killersreiter et al., 2001). However, the study of Pinelli,

Atkinson and Saigal (2001) showed that socioeconomic factors were non-significant in relation to predicting breastfeeding duration. Parity was also studied but the different researches have shown the inconsistency findings; parity was not found to be a significant factor in predicting breastfeeding duration in the study of Pinelli et al., but in VLBW infants, multiple pregnancies were associated with prolonged breast milk feeding in the study of Killersreiter et al. (2001).

For smoking habit, it has been shown that in VLBW infants, smoking during pregnancy was significantly associated with short duration of breast milk feeding. However, it was inconsistency in the studies on the impact of the mode of delivery to breastfeeding in preterm infants. A study found that mothers who delivered vaginally were more likely to be breastfeed and to continue breastfeeding at discharge, 3 days, 3 months, and 6 months after discharge (Kliethermes et al., 1999). While further study by Killersreiter et al. (2001) found that the mode of delivery had no significant impact on the duration of breast milk feeding ($p > 0.1$).

1.2 Prenatal breastfeeding intention

Mothers who plan to breastfeed are highly committed to breastfeed. A study showed that number of months a mother plans to breastfeed is a significant positive factor ($P = .003$) for predicting breastfeeding duration (Pinelli, et al., 2001).

1.3 Knowledge of breastfeeding

One study found that more breastfeeding mothers than non-breast-feeding mothers reported special benefits for mother and baby as being the main reason for selecting breast-feeding on discharge (Wheeler et al., 2000). This means

that they had some knowledge of breastfeeding, especially the benefits of breastfeeding.

1.4 Breastfeeding experience

The study by Nyqvist and Ewald (1999) found that multiple regression analyses revealed that the maternal characteristic associated with higher infant competence was breastfeeding experience. However, Adams, Berger, Conning, Cruikshank, and Dore (2001) found that 46 % of their subjects with previous breastfeeding experience had stopped earlier than planned with children in the past. The reasons given for this decision were perceived inadequate milk supply and dissatisfaction with their breastfeeding experience.

1.5 Insufficient milk supply

Mothers' insufficient milk supply was the most frequent problem found at home (Pinelli et al., 2000). It was the factor cited most frequently for stoping breastfeeding by the mothers (Adams et al., 2001).

2. Infant factors

2.1 Infant Health

In VLBW infants, Killersreiter et al. (2001) found that low gestational age at birth was associated with early emergence of efficient breastfeeding behavior and a high incidence of full breastfeeding. Gestational age less than 29 weeks was also associated with prolonged breast milk feeding. These results were supported by the study of Nyqvist and Ewald (1999). They reported that low gestational age at birth is associated with early emergence of efficient breastfeeding behavior and early

establishment of full breastfeeding. However, one study showed that gestational age was not a significant factor associated with breastfeeding duration (Pinelli et al., 2001).

Nyqvist and Ewald (1999) explored the influence of infant factors on the breastfeeding outcome. Multiple regression analyses revealed that variables associated with efficient infant performance included higher birth weight, less need of ventilator and oxygen treatment, higher hemoglobin level, absence of bottle-feeding, no need of apnea treatment with theophylline, and no suspicion of infection. On the other hand, one study showed that VLBW infants with prolonged requirements for supplemental oxygen who therefore spent more days in intensive care received their mother breast milk for longer periods of time as those without chronic lung disease of prematurity (Killersreiter et al., 2001).

2.2 Feeding behavior

Infant feeding behaviors are associated with breastfeeding of preterm infants. In the study of Hill, Ledbetter, and Kavanaugh (1997), they reported that the reasons why mothers weaned their preterm infant included resisting latching onto the breast, having a weak suck, refusing the breast, and having difficulty with latch-on.

3. Environmental factor

3.1 Significant others

In Australia, Wheeler et al.(2000) found that personal decision was the overwhelming major reason for participants' choice of feeding options and this factor remained important on including admission (99.1%) and discharge (91.1%). Other

reasons cited at the time of admission included partner's influence (4.4%), returning to work (2.2%), antenatal classes (1.1%), opinions of other family members (1.1%), and other reasons (1.1%).

3.2 Health Professionals

Another factor influencing feeding choice for preterm infants is staff nurses. There were more breastfeeding mothers than non-breastfeeding mothers who reported that a health professional (nurse) influenced their feeding choice (Wheeler et al., 2000). The most influential factors were found at the time of discharge included influence of health professional-nurse (5.1%), influence of health professional-doctor (1.3%), partner's influence (1.3%) and current medication (1.3%).

3.3 Health Service

Kangaroo care The increased incidence of breastfeeding and its continuation have been reported to result from implementation of the kangaroo care method. Hill, Aldag, and Chatterton (1999) found that a logistic regression model including a frequency of kangaroo care was predictive of mothers producing adequate versus inadequate milk volume.

Early mother-infant contact and rooming-in There was no impact of the date of the mother's first visit of the infant after birth on the duration of breast milk feeding while a positive correlation emerged between the average frequency of parental visits and the duration of breast milk feeding (Killersreiter et al., 2001). However, the age at the first breastfeeding had an impact on breastfeeding. This effect was apparent at discharge and at 3 days after discharge. The infants most likely to be

breastfed at discharge began earlier breastfeeding. Moreover, a study showed that rooming-in of the mother prior to elective discharge was associated with a longer duration of breast milk feedings (Killersreiter et al., 1999).

The factors that were not significantly associated with breastfeeding duration of preterm infants were identified in several studies. These were mother's time away from work, total amount of milk pumped in 24 hours (Pinelli et al., 2001), early discharge (Gunn et al., 2000), previous spontaneous abortions, previous induced abortions, first time pregnancy, and the infant's gender (Killersreiter et al., 2001).

Not many studies on factors associated with breastfeeding of preterm infants have been reported in recent years. Moreover, the effects of these maternal factors, infant factors and the environmental factors on outcomes of breastfeeding in preterm infants were inconsistent, perhaps because of the conceptual and methodological differences in these investigations. Although the factors influencing breastfeeding in preterm infants were partly highlighted in this study, the whole range of factors influencing breastfeeding of term mothers should not be overlooked. Because preterm mothers may face similar problems to the term mothers, in addition to their own unique problems. This calls a challenge for continuing a deeper study into the problems of breastfeeding among preterm infants.

Management of the Breastfeeding Promotion in Preterm Infants

Management of the promotion of breastfeeding in preterm infants was reviewed and described as framed by the four-phase temporal model for the management of breastfeeding (Meier & Mangurten, 1993). The model and research

findings reviewed in previous studies were integrated to provide a scientific basis for breastfeeding interventions that have substantial physiological and psychological benefits for mothers and their premature infants. These are (1) expression and collection of mothers' milk; (2) gavage feeding of expressed milk (EMM); (3) in-hospital breastfeeding sessions; and (4) postdischarge consultation. These are described as follows:

Phase one: Expression and collection of breast milk

Many factors may impinge on the decision of mothers of preterm infants' whether or not to provide breast milk. Shirima, Gebre-Medhin, and Greiner (2001) found that increased knowledge about specific breastfeeding issues was positively associated with the duration of exclusive breastfeeding. Furthermore, in another study, the mothers of preterm infants indicated that overall breastfeeding was a rewarding experience. They described the following rewards of breastfeeding: giving the healthiest nutrition for the infant; enhancing the closeness between the mother and infant; perceiving infant contentment and tranquility during breastfeeding, convenience for the mother; and giving the mother a tangible claim on the infant (Kavanaugh, Meier, Zimmermann, & Mead, 1997). An additional benefit of breastfeeding is that it is more natural, and mothers feel closer to their infants (Wheeler et al., 2000). The research results clearly showed that maternal attitude and knowledge about breastfeeding, along with sufficient social support is positively associated with the breastfeeding outcome.

With few exceptions, mothers of preterm infants must initiate milk expression for several days or weeks before the infants can be fed at the breast. The work of several researchers support the clinical practices of initiating milk expression

with an electric breast pump as early as possible. First, it is physiologically easier to stimulate lactation in the early postpartum period than it is done several days later (Lawrence; Neifert & Seacat as cited in Meier & Mangurten, 1993). Second, milk produced in early lactation, especially colostrum, contains anti-infective properties that are most beneficial to the infant (Neifert & Seacat as cited in Meier & Mangurten, 1993).

When the mother of a preterm infant decides to express breast milk, the milk expression schedule should parallel the frequency with which a term, healthy infant breastfeeds-- e.g., 8 to 12 times daily. Early and frequent feeding for term infants has been shown to result in greater maternal milk supply, greater infant weight gain, and earlier maturation of mothers' milk (Neifert & Seacat as cited in Meier & Mangurten, 1993). Milk weight was significantly higher in the high frequency (HF) group where the mothers pumped a minimum of 6.25 times daily compared to the low frequency [LF] group, (Hill, Aldag, & Chatterton, 2001). In addition, mothers were encouraged to initiate pumping early (≤ 48 hours) because there is a significant interaction between frequency and initiation. Milk weight for the LF (low frequency)/EI group appeared to be positively influenced by the initiation of mechanical expression soon after birth. Furthermore, one study has suggested that the type of breast pump used for milk expression can be either the simultaneous double (SIM) breast-pump or sequential single (SEQ) breast-pump because mothers using either one can produce a similar amount of milk by weight during week 2 to week 5 postpartum (Hill, Aldag, & Chatterton, 1999).

A conservative policy based on available literature (AAP as cited in Meier & Mangurten, 1993) is that fresh or previously frozen EMM should be fed to pre-term

infants within 24 hours of refrigeration. However, if a mother is available to express milk just prior to each feeding, freezing and/or refrigeration of EMM can be avoided entirely. This approach is optimal in minimizing bacterial growth and maximizing anti-infective properties of milk received by the infant because there were no statistically identifiable common characteristics in mothers whose milk showed bacterial contamination.

Phase two: Gavage feeding of expressed breast milk

A preterm infant may receive expressed milk by gavage feedings before oral feedings are initiated. The infant may receive continuous or intermittent gavage infusions of milk. However, the lipid fraction of expressed milk adheres to the infusion syringe and tubing during continuous nasogastric tube feedings. This phenomenon of lipid loss during slow-infusion gavage feedings has been confirmed by numerous published studies (Stocks et al. as cited in Meier & Mangurten, 1993). If lipids adhere to the infusion syringe and tubing, infants may receive a more dilute, low-calorie milk and subsequently demonstrate suboptimal growth. In general, there is an inverse relationship between infusion rate and lipid loss during gavage feedings, with little or no lipid loss occurring during intermittent bolus feedings (Greer, McCormick & Loker as cited in Meier & Mangurten, 1993).

Placement of the infusion syringe in a semi-upright position results in delivery of EMM with minimal lipid losses; however, lipids can potentially adhere to the infusion tubing once expressed milk has left the syringe. Minimizing the size of the infusion tubing lumen may reduce lipid loss during continuous nasograstric tube feedings (Brennan-Behm as cited in Meier & Mangurten, 1993). In a recent unpublished study, less lipid loss was demonstrated during simulated continuous

nasograstric tube feedings of expressed milk using small lumen (0.6 ml) rather than standard lumen (5.00 ml) tubing.

Another disadvantage of administering expressed milk by continuous nasograstric tube infusion is that the bacteria in expressed milk multiply rapidly in the infusion syringe and tubing when expressed milk remains at room or incubator temperature for prolonged periods of time (Botsford et al., 1986). Thus, two major clinical implications concerning method of gavage infusion of expressed can be delineated. First, whenever possible, infants are fed by intermittent bolus infusion. The rate of administration must be sufficiently slow to minimize or prevent adverse consequences of rapid gastric filling. Second, for those infants who must receive continuous nasograstric tube infusion of expressed milk, selected safeguards must be required.

The use of human milk fortifier in the nutrition of low birth weight and preterm infants remains debatable and fortifier is not used routinely in all babies (Gross as cited in Meier & Mangurten, 1993). Hall (2001) suggested that fortification or supplementation be initiated if an infant is failing to achieve normal growth and biochemical measures of nutrition. In particular, larger, more stable, healthier preterm infants who are started on enteric feedings early and who are easily weaned from intravenous nutrition may not be candidates for human milk fortifiers.

It is well established that any drugs taken by the mother are excreted into breast milk and are bioavailable to the infant. In general, the majority of drugs do not pose a significant problem to the nursing infant, but the health care provider should be aware of which drugs are contraindicated during lactation and which drugs should be used with caution (Kacew, 1993). Therefore, a mother who is receiving a medication

or who has other environmental contaminants in her milk must be evaluated and encouraged to discuss her concerns about any medications, smoking, or alcohol ingestion with the breastfeeding specialist or the neonatologist.

Phase three: In-hospital breastfeeding

Based on the results from a study of 20 mothers of preterm infants which was conducted at home one month after discharge, a need for a private place to breastfeed in the hospital was underlined (Kavanaugh as cited in Meier & Mangurten, 1993). Mothers stressed that they wanted a private and quiet place to breastfeed while infants were hospitalized. However, they qualified this response by reporting that they did not want to be left alone in a "parent" room or a "breastfeeding" room. They wanted to be able to take their infant away from the NICU environment, while a knowledgeable nurse assisted them with lactation and assured them that they were doing the "right things" and that their infants were okay.

Results from previous studies conducted by Meier and Pugh (as cited in Meier & Mangurten, 1993), in which preterm infants served as their own controls for breastfeeding and bottle-feeding, suggested that the ability to coordinate sucking, swallowing, and breathing may occur earlier for breastfeeding infants than bottle-feed infants. Many clinically stable infants demonstrated the ability to latch onto the breast and organize sucking into short bursts (two or five sucks) and pauses at 32 weeks of gestation, even though these infants may have been much smaller and sicker at birth.

Research-based data also supported that early breastfeeding does not place an increased demand for energy on preterm infants. Studies found that the breastfed infants demonstrated a higher oxygen saturation and a higher temperature than bottle fed infants (Blaymore, et al., 1997; Dowling, 1999). Therefore, it is suggested that

breastfeeding is a more physiologically positive feeding method for preterm infants. It is probable that preterm infants should be introduced to breastfeeding before being introduced to bottle feeding.

No universally accepted criteria or tools are available for determining the readiness of a preterm infant to feed orally, either by bottle or breast. Research suggested the infant weight, ability to bottle-feed, or type of thermal support may be predictors of the readiness to breastfeed (Meier et al. as cited in Meier & Mangurten, 1993). The infant ability to coordinate sucking and swallowing of secretions during non-nutritive sucking with minimal changes in the cardiorespiratory response may be predictive of readiness to breastfeed. An immature infant will demonstrate wide variability in cardiorespiratory patterns, ranging from tachycardia (greater than 20 beats per minute above baseline) with sucking, to clinically detectable apnea and bradycardia during swallowing of secretions. Oral feeding of any type is delayed for an infant who responds in this manner.

It can be concluded that guidelines for initiation of breastfeeding in preterm infants should be based on cardiorespiratory stability, irrespective of current maturity, age or weight (Nyqvist, Sjoden, & Ewald, 1999). Other criteria considered as indicators of readiness to begin nipple feeding by NICU nurses include presence of non-nutritive sucking and a gestational age of 34 weeks or more (Kinneer & Beachy, 1994). However, it is essential to recognize that there are individual infant differences with respect to readiness and ability to breastfeed. The interpretation of the criterion for readiness to breastfeed must be individualized to the infant (Dowling, 1999).

The data also demonstrated that mean volume of intake during early breastfeeding is minimal, but that the range for volume of intake is quite high.

Therefore, test-weights using an electric scale must be performed to determine the volume of intake during early breast-feedings because clinical indices do not provide an accurate estimate of milk volume (Meier, Engstrom, Fleming, Streeter, & Lawrence, 1996). The electronic scale is recommended because test weighing with an electronic scale provides an accurate estimate of intake for preterm infants (Meier, Lysakowski, Engstrom, Kavanaugh, & Mangurten, 1990).

Many preterm infants consume adequate volumes of milk from the breast with a breast shield, and gradually make the transition to the breast postdischarge (Kavanaugh as cited in Meier & Mangurten, 1993). In addition, research suggested that nipple shields are useful in certain circumstances (Clum & Primomo, 1996), and increase milk intake without decreasing total duration of breastfeeding for preterm infants (Meier, et al., 2000).

Alternative methods of feeding with a cup, syringe or tubing have been recommended and used in selected instances to exclude bottlefeeding. Research has shown that compared with infants receiving bottle supplements, infants receiving nasogastric tube supplements were more likely to be breastfed at discharge and at 3 days, 3 months and 6 months after adjusting for confounding variables. Odds ratios showed that the group receiving nasogastric supplements was 4.5 times more likely to be breastfed at discharge and 9.4 times more likely to be fully breastfed (Kliethermes et al.,1999).

Cupfeeding has been suggested as another alternative to bottle feeding to help promote breastfeeding by avoiding nipple confusion (Gupta, Khanna, & Chattree, 1999). No published research demonstrating the safety of these devices could be located, but Rocha, Martinez, and Jorge (2002) found no significant

differences between cupfeeding or bottlefeeding groups with regard to time spent feeding, feeding problems, weight gain, or breastfeeding prevalence at discharge or at 3-month follow-up. Additionally, Dowling, Meier, DiFiore, Blatz, and Martin (2002) found that mean duration of cupfeeding was 15.2 +/- 3.9 minutes (range, 11.0- 23.3), whereas mean volume of intake was only 4.6 +/- 2.2 mL (range, 1.5-8). Therefore, although infants remain physiologically stable, cup-feeding has questionable efficacy and efficiency.

Marinelli, Burke, and Dodd (2001) indicated that during cup feedings, premature infants were more physiologically stable, with lower heart rates, higher oxygen saturations, and less desaturations than during bottle feedings. However, cup fed infants took less volume over more time than did bottle fed infants for these initial feedings. The conclusion was that based on better physiologic stability and no difference in untoward effects, cup feeding is at least as safe, if not safer, than bottle feeding in this population. This study supported the use of cup feeding as a safe alternative feeding method for premature infants learning to breastfeed.

Phase four: Postdischarge management

The final component of the four-phase model for supporting breastfeeding is postdischarge management. The infant' discharge criteria can be either early discharge (infants are discharged when fully orally fed but not yet gaining weight), or routine discharge (fully orally fed and also gaining weight before discharge). Early discharge does not alter later breastfeeding rates when adequate visiting nursing support is available (Gunn et al., 2000)

The preliminary information acquired from the study by Meier and Mangurten (1993) suggested that the postdischarge period was extremely stressful for

mothers who were breastfeeding preterm infants. A second study showed that the main concern of these mothers was whether infants consumed an adequate volume of milk by breastfeeding alone, and the data also suggested that whereas some mothers became less concerned about the infant getting enough once it reached a specific weight, others became less concerned because of a sustained pattern of weight gain. Some mothers described a change in their infants' cues during breastfeeding that constituted a turning point. These cues included specific indices of infant growth, hydration, and behaviors during breastfeeding such as infants' ability to breastfeed better or longer and communicate to their mother that they were getting enough (Kavanaugh et al., 1995)

This aspect of care is based on research focused on determining which interventions during the postdischarge period are effective in preventing breastfeeding failure, and there are specific clinical recommendations generated from several studies. A postdischarge telephone follow-up program was established by Elliott and Reimer (1998). This program provided support for breastfeeding mothers whose babies had been recently discharged and helped the nursing team to develop a discharge plan. A telephone follow-up form was developed to help identify real or potential problems, plan realistic interventions, and evaluate the effectiveness of the plan. The first part of the form included information about the baby's stay in the hospital. The second part of the form was used postdischarge. Space was provided to document problems and suggested interventions. Feedback from the mothers who received the telephone follow-up was favorable.

Another program is the home visit by a registered nurse with mother-infant assessment skills and competence to provide breastfeeding education, problem

management, emotional support, and referrals to lactation consultants or physicians as needed. This program was also modified to include preterm infants, and patient satisfaction surveys following program participation were positive (Johnson, Brennan, & Flynn-Tymkow, 1999).

Pinelli et al.(2001) determined if supplementary structured breastfeeding counseling (SSBC) for both parents improved the duration of breastfeeding in very low-birth-weight infants up to 1 year old when compared with conventional hospital breastfeeding support (CHBS). The SSBC consisted of viewing a video on breastfeeding for preterm infants; individual counseling by the research lactation consultant; weekly personal contact in the hospital; and frequent postdischarge contact through the infants' first year or until breastfeeding was discontinued. The mean duration of breastfeeding was 26.1 weeks in the SSBC group and 24.0 weeks in the CHBS group. The study concluded that long-term breastfeeding counseling of parents of very low birth weight infants in this study did not demonstrate a significant difference in duration of breastfeeding. It was explained that this might be because of the high motivation to breastfeed in both groups, a relatively advantaged population, and the availability of community breastfeeding resources, which may have diminished any significant differences that could have resulted from a breastfeeding intervention.

Adams et al.(2001) evaluated the community breastfeeding center's (CBC) impact on clients' breastfeeding experiences. They concluded that the CBC is an effective community support strategy to lengthen breastfeeding duration and enhance clients' satisfaction with their breastfeeding experience. The CBC included an assessment of breastfeeding dyad, an identification of potential or existing challenges,

provision of anticipatory guidance regarding breastfeeding and parenting issues, teaching and reinforcing principles of lactation, provision of hands-on care and individual infant feeding plans as needed and collaboration with relevant community partners. Mothers could receive professional help from experts in lactation, watch a lactation video, or take part in discussions with peers as they fed their infants.

In summary, researches on preterm infant care interventions done in the settings of both community and hospital have been explored. Those interventions, including combined information, guidance and support were conducted intensively in the long term since infants were in hospital until discharge. A combination of several strategies was used during each intervention. The feasibility of these interventions in a practice setting is needed to be determined to be suitable for each setting; therefore, the research based interventions offered by this study can be applicable for developing the breastfeeding support program for preterm infants in this study.

The Situational Context

In qualitative inquiry, external validity can be described as fit. This is the degree to which the readers of the report are able to transform the research finding to contexts outside of the study situation to other settings (Guba & Lincoln, 1982). This section provides an overview of breastfeeding policy and practice in Thailand, a description of Bangkok Metropolitan Administration Medical College and Vajira Hospital and breastfeeding policy and finally detail information about the Premature Infant Unit. Therefore, the readers can decide if they can use the findings. Information in this session was obtained by several methods including reviewing the relevant

issues from journals, books, official documents, interviewing the head nurse of the PU and observing the PU circumstance.

Breastfeeding policy and practice in Thailand

In the past, due to the status of being an agricultural country, most of women in Thailand normally breastfed their babies for a long period of time but once the society had been changed to be a new industrial country (NIC), most mothers has turned to formula milk, which is valued to be a sign of the middle or high class, breastfeeding has been gradually declined. In a bid to reverse the decreasing rate of breastfeeding, the breastfeeding promotion has been included in the 3rd plan to the latest plan (9th). In addition, there are a lot of profit and nonprofit organizations who help promote women to breastfeed

The Thai government has welcomed the baby friendly hospital initiative and agreed to play an active role in making it successful. In fact, it is seen as consistent with the current policy and a way to accelerate an important nutrition initiative. To support the BFHI, a number of actions have been undertaken. A working group has been established in the Family Health Division of the Ministry of Public Health with the participation of the Nutrition Division. The Cabinet has approved the extension of maternity leave for government employees to 90 days (Ministry of Public Health, 2001).

In addition, 37 hospitals in Thailand have agreed to join the first phase of the initiative. Siriraj Hospital, the country's oldest and leading research hospital; Rajavithi, the largest hospital of the Ministry of Public Health; as well as Chulalongkorn Hospital, which is jointly under Chulalongkorn University and the Thai Red Cross were the first three hospitals to join the Baby-Friendly Initiative and

implement its activities. Further, by the end of 1996, 96% of hospitals had been designated Baby-Friendly Hospitals. The prevalence of breastfeeding has greatly increased (Chayovan, Knodel, & Wongboonsin, 1990).

The current status of breastfeeding in Bangkok, Thailand was displayed in a study of Li et al.(1999). They found that most sampled mothers believed that breast milk is the best food for their infants and acknowledged that breast milk has many advantages for infants, mothers and families. Ninety-five percent of mothers breastfed their infants up to 3 months postpartum, but the prevalence of exclusive breastfeeding was relatively low (62.4%). Multiple logistic regression analyses revealed that the following factors independently increased the risk of mixed or formula feeding during the first 3 months of life: 1) mothers with a full-time job; 2) grandmothers and other people as the main child caretakers; 3) mothers who did not have an antenatal plan of exclusive breastfeeding; and 4) newborns' non-exclusive breastfeeding in hospitals after birth. However, the mother being a housewife, mother as the main child caretaker, and antenatal plan of exclusive breastfeeding and exclusive breastfeeding in hospital were more likely to improve breastfeeding.

Bangkok Metropolitan Administration Medical College and Vajira Hospital and breastfeeding policy

Bangkok Metropolitan Administration Medical College and Vajira Hospital is the largest of the nine hospitals run by the Bangkok Metropolitan Administration (BMA). This hospital, situated in the context, provides health services to the general public around Bangkok area. People who utilize the services are in the middle to economic class. The hospital has an average of 450 to 500 deliveries per month. Currently, the hospital is joining the BFH initiative by using the Ten steps

recommended by the World Health Organization (WHO) and the United Nations Children's Fund (UNICEF).

At BMA Medical College and Vajira Hospital Routinely, breastfeeding education for mothers is given at Antenatal Care Unit. Mothers who have inverted or flat nipples would be prepared and treated for breastfeeding. After delivery, without any medical reasons, the mother would be given help to initiate breastfeeding within one half-hour of giving birth, and they would be admitted to the postpartum ward. Women with normal deliveries would be discharged from the hospital on around the third day after delivery; caesarian deliveries would be discharged on the fifth day. During hospitalization, infants are with their mothers and supported to be breastfed. Various kinds of pamphlets and leaflets are also produced and distributed to mothers freely. To the infants of caesarian mothers, formula milk would be given on the first day. Infants would be given to the mothers on the second day and only then is breastfeeding initiated.

For sick infants, they would be separated from their mothers to the special unit depending on individual medical conditions. It can be Nursery, Premature Infant Unit or Neonatal Intensive Care Unit. Premature Infant Unit (PU), located on the 10th floor of the Vachirawut Building, has an occupancy rate of 30 beds with offering the services in the areas of: 1) giving care to premature infants, low birth weight infants and sick newborn to 1-month old infants who are born at the hospital and other hospitals; and 2) giving knowledge and advice about health and how to raise an infant to fathers, mothers and relatives.

There are 15 nurses at Premature Infant Unit including a head nurse, a deputy head nurse, 11 professional nurses and 2 assistant nurses. On the morning

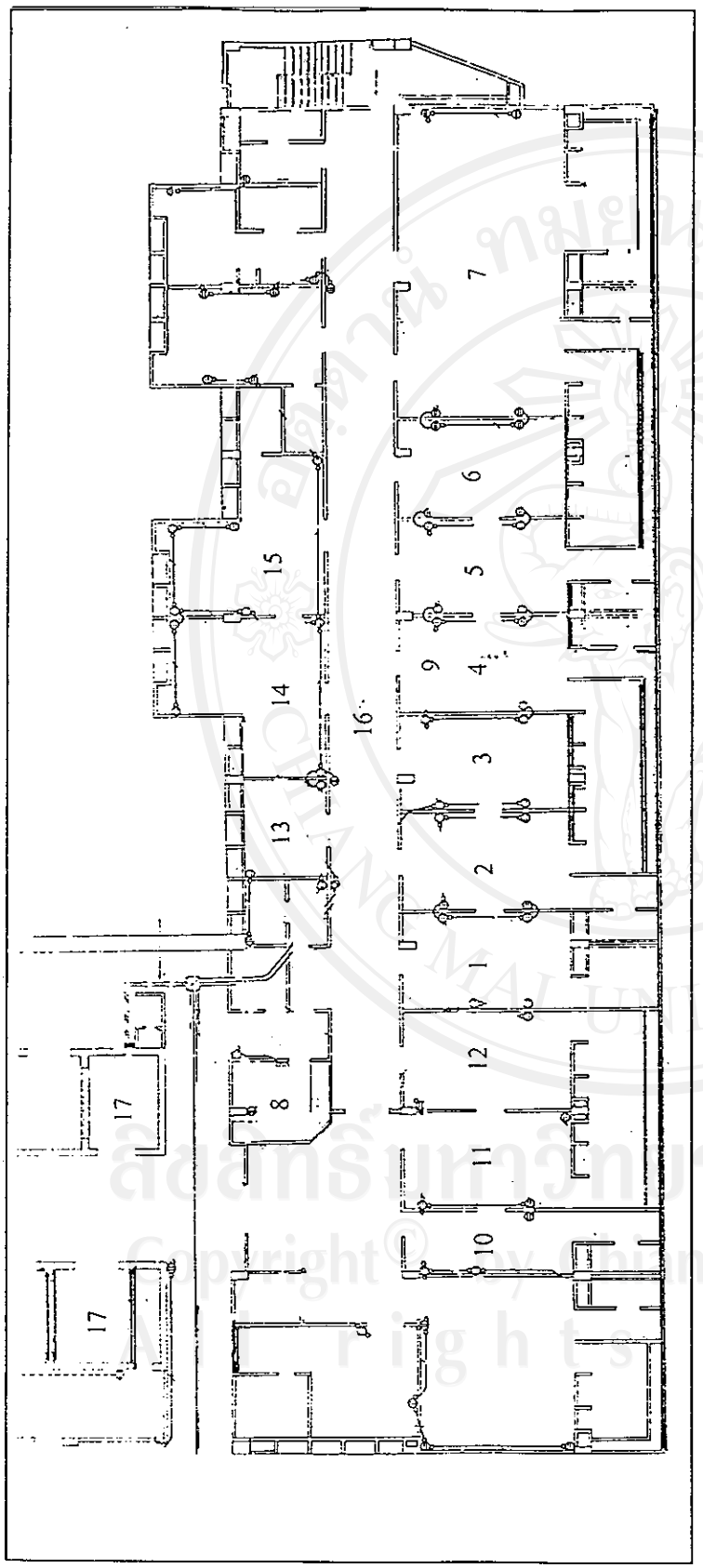
shifts of working days, there would be 4-5 staff including a head nurse, a deputy head nurse, 2 or 3 professional nurses and/or a assistant nurse. For the afternoon and night shifts as well as the morning shifts of weekends, 3 staff of professional and assistant nurses would be responsible for giving care to the patients at PU with an occupancy rate of 30 beds. The main procedures of PU are as follows:

1. Preparation for admitting patients
2. Assessment and Nursing Diagnosis
3. Planning (nursing planning, coordinating, order taking and task assigning)
4. Offering holistic care
5. Repeating assessment (surveillance, report and visit)
6. Parallel activities (keeping records, discharge planning, giving information)
7. Discharge (Preparation for continuing care at home, referring, making appointment to follow up)

The physical setting is displayed in Figure 1. There are two nurse stations situated in the front and middle of the unit. There are mainly 7 rooms in the unit. The first room is in early part of the unit named "Oon-Rak Room". This room is provided for a mother who wants to be with her infant while she or he is admitted in the unit. There are 4 beds to accommodate the mother to sleep or take a rest. Six rooms for infants named Infant 1 to Infant 6 are provided for infants depending on their medical condition: Infant 1 room for a newborn who is delivered from infected mother; Infant 2 for sick term infants who are about to go back home; Infant 3 for preterm infants whose conditions are not serious and kept warm in incubator; Infant 4, included in the

2nd nurses station, for infants who need close monitoring such as an infant who is new admitted or referred from NICU; Infant 5 for infants who have stable condition and Infant 6 for infected infants or suspected infected infant who need to be separated from others.

The nurses working in PU make efforts to promote breastfeeding for preterm infants by encouraging mothers to come to visit their preterm infants at PU as quickly as possible. As a part of the efforts, the nurses at PU would call to ask the nurses at the maternity ward if the mothers' conditions allow them to visit their newborns. When they come to PU, they would be informed about the condition and the treatment of infants to reduce their anxiety. They would be taught about the importance of breast milk and benefits of breastfeeding and encourage to have skin-to-skin contact with their babies as quickly as possible. Mothers, but not all, would be asked about milk supply and have their breasts checked. They would be instructed how to express breast milk but some nurses are not sure about the right way to express milk.



1-6 Infant Room No. 1-6
7 Neonatal Intensive Care Unit
8 Nurse's Station 1
9 Nurse's Station 2
10 Dining Room
11 Counseling Room
12 Oon-Rak Room
13 Hospital Worker's Room
14 Treatment Room
15 Storage Room
16 Passage
17 Elevator

Figure 1: Diagram of Premature Infant Unit

In addition, mothers would be told how to store milk and given advice on food suitable for mothers and applying a hot compress. However, the equipments are not ready and the nurses do not have knowledge how to massage the breasts and apply a hot compress. For those who produce little milk supply, they would be told to have their newborns suck breasts to stimulate milk flow, but this method is unsuccessful. Also, the nurses would teach, help and encourage mothers to breastfeed as well as facilitate them. At first, they would be asked whether they are yet taught to breastfeed. However, the nurses would repeat the instructions for those who are already taught. Fathers would be encouraged to get involved in breastfeeding as to support the family relationship. They would be given leaflets containing information about breast milk, milk expressing, new patient care and "Huang Yai Duj Yart" (literally means giving care like relatives) card. Having this card allows mothers to call and ask the nurses any questions. There is also a board of useful information about inverted nipples, short nipples, breast massaging and milk expressing. Some infants would be fed human milk fortifier. However, there are no follow-ups of the patients discharged from PU regarding breastfeeding.

Most of preterm infants in PU are tested fed with glucose water and routinely fed both with formula or breast milk. After that, breastfeeding would begin depending on the readiness of the infants and their mothers. These practices effectively prevent mothers from breastfeeding and therefore put their infants at risk. They are often given a bottle of sugar water before being re-united with their mothers when the vital bonding hour has already passed.

Preterm infants are often sent home with bottle feeding well established or breastfeeding only weakly initiated. In addition, on the day of discharge, mothers are

usually told to bring their infants to the sick baby clinic 2 weeks after discharge and when the baby reaches 2 months of age so he could be weighed, immunized etc. The sick baby clinic is opened every Monday.

BMA Medical College and Vajira Hospital is one of the organizations that have tried to develop themselves for hospital accreditation and expects to complete the process by 2004. The hospital has implemented the 5 S's principle and followed the procedures of hospital development by the accreditation unit. The hospital has launched the project by establishing its vision, strategic plans for every department. Consequently, present staff has to work even harder. Stress and other tension health problems are rising. These may lessen the quality and efficiency of the services. Many feel that the development of hospital accreditation would mean more work to do.

From this policy, there are several quality care strategies developed in each department or medical nursing service section. The premature infant unit has had a project called "Oon-Rak" project (literally means warm love). It aims to promote breastfeeding and infant-maternal bonding. The well furnished Oon-Rak room located in the unit is provided for mothers where they can be with their sick infants whenever they want for free of charge.

In conclusion, Thailand has launched the baby friendly hospital initiative and agreed to play an active role in making it successful. BMA Medical College and Vajira Hospital is one of the public hospitals that have undertaken that policy at PU. The PU preterm infants have faced breastfeeding problems as realized by the PU nurses and they thus need to improve the breastfeeding situation at the unit. Therefore, conducting the participatory action research in which the nurses at PU are

involved as the participant would result in the practical breastfeeding support program for preterm infants at PU.