A Comparison of Reasons for Breastfeeding Cessation in Preterm and Term Infants During the First Year of Life

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A COMPARISON OF REASONS FOR BREASTFEEDING CESSATION
IN PRETERM AND TERM INFANTS DURING
THE FIRST YEAR OF LIFE

By

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ABSTRACT

The purpose of this study was to compare factors that may affect breastfeeding duration or cessation in preterm and term infants during the first year of life. A 50-question survey was administered using SurveyMonkey™ and distributed through social media platforms. Participants were able to enter a drawing for an Amazon gift card as incentive. SPSS was used for statistical analysis. Participants included mothers over the age of 18, with a child between the ages of 12 and 24 months, born in the U.S., and who provided human milk to their child at any point during the first year of life.

Of the 687 responses, 531 were completed for analysis. Fifty mothers had a child born preterm and 481 had a child born to term. Hypotheses were tested using a Chi Square test. There was no statistically significant difference in exclusive breastfeeding rates between preterm and term infants at 0 to 3 months, 4 months, and 5 months. However, there was a statistically significant difference at six months (40.0% vs 22.7%) \((x^2 (1, N = 531) = 7.4, p = .009)\). There were no statistically significant differences in overall breastfeeding rates between preterm and term infants at any time marks. There was a statistically significant difference for maternal medications \((x^2 (1, N = 531) = 6.1, p = .044)\) and multiple births \((x^2 (1, N = 531) = 11.5, p = .025)\) influencing cessation of breastfeeding for preterm and term infants. Mothers with GDM \((x^2 (1, N = 531) = 9.07, p = .008)\), T1DM or T2DM \((x^2 (1, N = 531) = 8.23, p = .020)\), GHTN or Preeclampsia \((x^2 (1, N = 531) = 7.79, p = .046)\) were more likely to experience a preterm birth. Several
factors were significantly different between preterm and term infants including gender ($\chi^2 (1, N = 531) = 4.58, p = .037$), delivery type ($\chi^2 (1, N = 531) = 9.45, p = .0003$) and the father ($\chi^2 (1, N = 531) = 15.95, p = .001$) and other family members ($\chi^2 (1, N = 531) = 8.23, p = .016$) living in the household.
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CHAPTER 1
INTRODUCTION

Breastfeeding can positively influence overall health, for both infant and mother (Lawrence, 2013; Rocha et al., 2013). The American Academy of Pediatrics (APP) (2012) and World Health Organization (WHO) (2018) recommend exclusively breastfeeding for the first six months of life. However, breastfeeding rates appear to have the steepest decline at approximately three to four months of age (Lee & Jang, 2016; CDC, 2018; WHO, 2018; Meio, Villela, Junior, Tovar, & Moreira, 2018; Luz et al., 2018; Crippa et al., 2019; Odom, Li, Scanlon, Perrine, & Grumer-Strawn, 2013). Mothers cite several reasons that contribute to declining rates, including milk supply, breast problems, infant nutritional concerns, maternal medication regimen, maternal knowledge about breastfeeding, healthcare provider recommendations, and difficulty breastfeeding when returning to work (Wheeler, 2009; Odom et al., 2013; Rocha et al, 2013; Lee & Jang 2016; Zielinska, Sobczak, & Hamulka, 2017; Crippa et al., 2019; Wang et al., 2019). Additional research revealed that factors associated with a shorter breastfeeding duration included maternal experience, age, race/ethnicity, financial situation, education level, health status, social support, and the infant’s gestational age (Ostlund, Nordstrom, Dykes, & Flacking, 2010; Odom et al., 2013; Maastrup et al., 2014; Zielinska et al., 2017; Luz et al., 2018; Crippa et al., 2019.
Statement of the Problem

There has been considerable research conducted on preterm infants regarding factors impacting early cessation of breastfeeding (Rocha et al. 2013; Maastrup et al., 2014; Lee & Jang, 2016; Luz et al., 2018; Crippa et al., 2019; Wang et al., 2019). The majority of studies evaluate breastfeeding duration for at least six months or more (Li, Fein, Chen, & Grummer-Strawn, 2008; Maastrup et al., 2014; Lee & Jang, 2016; Zanardo et al., 2017; Wang et al., 2019). Only one study was conducted solely on infants born to term (Odom et al., 2013). Five studies included both term and preterm infants, but only two differentiated results between these populations. (Wheeler, 2009; Ostlund et al., 2010; Zanardo et al., 2017; Jung, Nobari, & Whaley, 2019). Additional research is necessary to evaluate if breastfeeding duration is different between infants born preterm or term, and if there are any significant barriers that are distinguishable between these populations.

Purpose

The purpose of this study was to compare factors that may affect breastfeeding duration or cessation in preterm and term infants during the first year of life. Participants in the study included mothers of infants 12 to 24 months of age who have provided human milk to the infant at any point since birth. Outcomes measured include length of time human milk was provided and reasons for discontinuation of breastfeeding, which consist of maternal, infant, and environmental factors. Maternal-related factors include milk supply, breast health issues, general health issues, medication regimen, and perceived knowledge regarding breastfeeding. Infant-related factors include latching or sucking problems, growth concerns, and health issues. Environmental factors include
maternal support at home, time constraints, workplace barriers, and healthcare provider recommendations. Other outcomes measured include the child’s gestational age at birth, birthweight, type of delivery, if a multiparous pregnancy, and the number of children in total. Outcomes related to the neonatal intensive care unit (NICU) included admittance, length of stay, and reason for admittance. Related to lactation, outcomes that were measured include previous breastfeeding experience, if lactation assistance was received, prenatal breastfeeding education, postpartum breastfeeding education, source of breastfeeding education, any support for breastfeeding, and Special Supplemental Program for Women, Infants, and Children (WIC) participation. Demographic information obtained included maternal age, relationship status, race/ethnicity, region of residence, education level, and employment status.

Hypotheses

The following hypotheses were to be tested:

1. There will be no significant difference in exclusive breastfeeding rates at 0 to 3 months, 4 months, 5 months, and 6 months between preterm and term infants.

2. There will be no significant difference in breastfeeding rates at 7 months, 8 months, 9 months, 10 months, 11 months, and 12 months between preterm and term infants.

3. There will be no significant difference in identified infantile, maternal or environmental factors impacting reasons for cessation of breastfeeding between preterm and term infants.

Justification

While breastfeeding rates are increasing in the United States within the past several years, rates remain lower than other developed countries (CDC, 2018; WHO,
Breastfeeding barriers that exist must be identified in order to address them effectively to increase breastfeeding rates. Minimal research has been conducted comparing term and preterm populations to identify whether different barriers exist for mothers or infants born at varying gestational ages. If this study indicates differences between these groups, healthcare providers may need to take a more individualize approach to promote breastfeeding among mothers. In turn, infants may experience improved health outcomes during the first year, reducing health-related costs for hospital NICU stays, office visits, or medication prescriptions. Federal programs, such as WIC, which provide formula to needy mothers may need less government funding. This study may influence more hospitals and clinics to adopt the “Baby Friendly Initiative” for breastfeeding promotion and support.
CHAPTER 2
REVIEW OF LITERATURE

Term newborns and neonates have very different nutritional needs. Current evidence supports breastfeeding over formula use for the many benefits and few contraindications. In the United States, breastfeeding rates vary by race or ethnicity and socioeconomic status. Many steps are being taken to promote breastfeeding including education during the hospital stay, workplace support, and programs such as WIC. Breastfeeding duration can be impacted by several factors including maternal, infantile, social or environmental.

**Nutrient Needs for Term Infants**

Infancy is a time of rapid growth and development in which nutrition can play a large role (DiMaggio, Cox, & Porto, 2017). By six months, infants are expected to have doubled their birth weight. Within the first year, height is expected to increase by 10 inches and head circumference by 5 inches (DiMaggio et al., 2017).

**Macronutrients**

Term newborns need an average of 108 kilocalories (kcal)/ kilogram (kg) for the first six months and 98 kcal/kg from 7 to 12 months (Brown et al., 2014). Protein recommendations for term newborns average 9.1 grams (g)/day for the first six months and 11g/day from 7 to 12 months (Abrahamse et al., 2012). Term newborn lipid needs range from 2.5 to 3.5 g/kg/day (Abrahamse et al., 2012). Infants less than one
year of age should have 30 g per day of fat minimum to meet the demands of growth and development (Brown et al., 2014). Infants require the essential fatty acids linoleic acid (LA) and alpha linolenic acids (ALA) that include Arachidonic acid (ARA), Eicosapentaenoic acid (EPA), and Docosahexaenoic acid (DHA) (Brown et al., 2014).

Vitamins/Minerals

Some vitamins and minerals are particularly essential for infants. For exclusively breastfed infants, term or preterm, recommendations are to supplement a minimum of 400 international units (IU) of vitamin D daily, beginning during the first few days of life. Supplementation should continue until consumption of vitamin D fortified formula or whole milk is at least one liter per day; which should not be introduced until age 12 months (Wagner & Greer, 2008). For term-born infants, starting at four months of age, iron recommendations are 1 mg/kg/day until six months of age when iron-containing complementary foods such as fortified cereals and soft meats are introduced (Baker & Greer, 2010).

Nutrient Recommendations for Preterm Infants

Immature organ function, limited subcutaneous fat stores, and body temperature instability all increase a neonate’s nutrient needs (Smith, 2015). Preterm infants are at increased risk for comorbidities, growth failure, feeding difficulties, and poor developmental outcomes of which adequate nutrition can lessen (Smith, 2015).

Macronutrients

Energy recommendations for infants born preterm range from 90 to 140 kcal/kg (Ziegler, 2011; Berseth & Uauy, 2013; Kleinman & Greer, 2014). For preterm infants, protein recommendations range from 2.7 to 4.5 g/kg/day (Ziegler, 2011; Berseth & Uauy,
Lipid recommendations for preterm infants range from 3 to 7 g/kg/day (Kleinman & Greer, 2014). All infants need essential fatty acids, but preterm infants additionally require tyrosine, cysteine, and taurine (Abrahamse et al., 2012).

Vitamins/Minerals

For infants born prematurely, and receiving mostly human milk, 2 to 4 milligrams (mg)/kg/day of iron is recommended beginning at two weeks of life and continuing to one year. Since term infants develop iron stores during the third trimester and formulas are fortified with iron, no additional supplementation is required for term infants. However, preterm infants usually consume smaller feeding volumes compared to term-born infants, and do not develop adequate iron stores in utero. Therefore, preterm infants require additional iron supplementation (Baker & Greer, 2010). Additional calcium and phosphorus supplementation may be required for bone development and growth in preterm infants (Kleinman & Greer, 2014). Recommendations for the first days of life for preterm infants are 25 to 40 mg/kg/day of calcium, 20 to 35 mg/kg/day of phosphorus, and 0 to 3 mg/kg/day of magnesium. Recommendations on the seventh day of life increase to 65 to 160 mg/kg/day of calcium, 50 to 90 mg/kg/day of phosphorus, and 6 to 12 mg/kg/day of magnesium (Bhatia, Griffin, Anderson, Kler, & Domellof, 2013 & Mimouni, Mandel, Lubestski, & Senterre 2014). Ranges for calcium, phosphorus, and magnesium are large due to variability in absorption rates, bioavailability, and clinical status of each individual infant. (Mimouni et al., 2014).
Special Considerations with Breastfeeding

Galactosemia is the only condition infants may have in which breastfeeding is contraindicated (Lawrence, 2013; DiMaggio et al., 2017). Mothers should not breastfeed until they receive treatment for hemorrhagic fevers, bacteremia, meningitis, osteomyelitis, septic arthritis, herpes simplex virus, varicella zoster virus, tuberculosis, and brucellosis. In developed countries, breastfeeding is contraindicated in mothers who have human T-cell lymphotrophic viruses (HTLV) or human immunodeficiency virus (HIV) (Lawrence, 2013; DiMaggio et al., 2017). Consuming alcohol in excess of 0.5 g/kg of body weight or providing human milk to the infant within two hours of alcohol consumption can decrease milk supply and potentially impact motor development (Behnke & Smith, 2013; DiMaggio et al., 2017). Maternal medications that pose risks with breastfeeding included amphetamines, chemotherapy agents, ergotamine, and statins (DiMaggio et al., 2017). Ingestion of opioids while breastfeeding has been shown to cause withdrawal symptoms in infants such as nausea, vomiting, diarrhea, irritability, crying, tremors, sweating, and seizures (American College of Obstetricians and Gynecologists, 2012). Ingestion of cocaine while breastfeeding can cause the infant to become tachypneic, tachycardiac, hypertensive, irritable, and prone to seizures (Behnke & Smith, 2013; DiMaggio et al., 2017). Infants are at increased risk for diminished muscle tone, poor sucking, poor growth, or poor motor development when mothers use Tetrahydrocannabinol (THC) while breastfeeding (Behnke & Smith, 2013). Certain maternal illnesses can affect milk production, including toxemia, venous thrombosis, thyroid disease, cystic fibrosis, multiple sclerosis, mastitis, and polycystic ovarian syndrome (Lawrence, 2013).
Breastfeeding vs. Formula Use

Through the first year, preterm infants exclusively breastfed had significantly lower $z$-scores for height at two months and higher $z$-scores for weight at five months (Meio et al., 2018). In comparison to preterm infants fed formula, breastfed preterm infants obtained goal feeding volume more quickly, had a shorter duration of parenteral nutrition, had less exposure to antibiotics, and lower peak-conjugated bilirubin levels (Cortez, 2018). Breastfeeding was also associated with a lower risk of infection for bronchitis, gastroenteritis, sepsis, pneumonia, and necrotizing enterocolitis (NEC) (Lawrence, 2013; Cortez, 2018). Even non-nutritive breastfeeding can impact nutrition. A study by Thomas & Mathew (2019) presented that preterm infants who practiced non-nutritive breastfeeding after the expression of human milk three times daily for seven days took higher feeding volumes, transitioned off enteral feedings more quickly, and had a shorter length of stay.

Rates of formula use among infants range from 7% to 8% at birth, 12% at two weeks, 28% at one month, 29 to 68% at three months, and 28 to 35% at six months (Maastrup et al., 2014; Crippa et al., 2019; Lee & Jang, 2016; CDC, 2018; Wang et al., 2019). According to the CDC (2018), approximately 17% of infants at birth received some formula supplementation within the first two days of life (2018). In one study evaluating the rates of breastfeeding in comparison to formula feeding among healthy infants born between 35 to 45 weeks, formula was the most common feeding method at age five to seven months (Shealthy, Scanlon, Labiner-Wolfe, Fein, & Grummer-Strawn, 2008). At six months, 8.6% of infants were receiving human milk supplemented with
formula for less than 20% of total feeding volume, and 40% received between 20 to 80% of human milk supplemented with formula for total feeding volume (Wang et al., 2019).

In a randomized control trial comparing donor human milk to a preterm infant formula in preterm infants, linear growth was significantly higher on average per week in the formula fed group versus the donor milk fortified group (Cristofalo et al., 2013). Very low birth weight (VLBW) infants (<1500 gm at birth) fed fortified human milk had significantly slower head circumference growth in comparison to those fed preterm formula (Lok et al., 2017). A study by Huang and Zhou (2016) evaluating body composition among preterm infants fed human milk or formula found that at 36 weeks corrected gestational age (CGA), the formula fed infants had significantly higher fat free mass, percentage of fat mass, and fat mass at term corrected gestation (42 weeks). However, at three, six, and twelve month CGA, there were no differences (2016). Research remains inconclusive whether donor human milk may be just as protective against NEC as mother’s human milk (Groh-Wargo & Sapsford, 2009). There was no difference in developing NEC in those infants fed mother’s milk or donor milk, but the risk for developing NEC was a 2.5-fold increase for those infants fed predominately preterm formula (Sisk et al., 2017). Preterm infants who continued a preterm formula after discharge had improved catch-up growth and better growth trajectories in comparison to preterm infants fed standard infant formula after discharge (Cooke, 2010).

Donor Human Milk

Those infants receiving donor human milk instead of formula received significantly less days of parenteral nutrition, had a significantly lower incidence of NEC and experienced less feeding intolerances (Sullivan et al., 2010; Cristofalo et al., 2013).
In VLBW infants, weight gain was improved with mother’s milk in comparison to donor milk (Groh-Wargo & Sapsford, 2009).

In a qualitative study conducted to evaluate mothers’ perspectives on the use of donor human milk, the most common reasons why mothers would choose donor human milk instead of formula is that it is viewed as more “natural” than formula and more consistent with their intention to breastfeed (Rabinowitz, Kair, Sipsma, Phillipi, & Larson, 2018). Furthermore, mothers who viewed the use of donor milk as a “short term” occurrence did not feel informed enough about donor human milk, and did not feel comfortable with it as an alternative option (Rabinowitz et al., 2018). Regardless of preference, most mothers did not know much about donor human milk selection, preparation, processing, or safety in terms of disease or substance transmission (Rabinowitz et al., 2018).

**Fortification**

Multiple studies have found that preterm infants receiving human milk fortified with a human milk fortifier or preterm formula had no significant differences in growth parameters including weight, length, or head circumference at discharge (Khorana & Jimsajjamongkhon, 2014; Sisk et al., 2017). However, several studies suggested that infants receiving fortified human milk at birth had better growth rates not only during the hospital stay, but also through the first year (Radmacher & Adamkin, 2017; Lok et al., 2017). Preterm infants receiving fortified human milk for feedings were approximately 1.2 kg heavier and had a larger head circumference on average at the end of their first year of life compared with preterm infants fed unfortified human milk (Ashley et al., 2009). There were no significant differences in length of stay, biochemical markers, or
feeding tolerance at discharge between infants receiving fortified human milk or a fortified preterm formula (Khorana & Jimsajamongkhon, 2014). A study conducted by O’Connor et al. (2012) found that at 4 to 6 months CGA, infants who received fortified human milk had greater visual acuity than those infants who received unfortified human milk.

A study by Kim et al., evaluated growth differences among preterm infants fed a powdered intact human milk fortifier (PI-HMF) providing 3 g of protein/100 kcal and a hydrolyzed liquid human milk fortifier (LE-HMF) providing 3.6 g of protein/100 kcal (2015). No statistically significant difference was observed in average daily weight gain between infants fed either fortifier (17.5 ± 0.6 g/kg/day vs 18.2 + 0.3 g/kg/day) (Kim et al., 2015). However, by day of life (DOL) 29, infants fed the LE-HMF had significantly higher weights and reached a weight of 1800 g seven days sooner than infants fed the PI-HMF (Kim et al., 2015). There was no significant difference in length or head circumference gain between groups (Kim et al., 2015). There were lower sepsis (PI-HMF 3.2%; LE-HMF 4.5%) and NEC rates (3.2% PI-HMF; 1.5% LE-HMF) for both powdered and hydrolyzed liquid fortifiers (Kim et al., 2015).

**Additional Benefits Associated with Breastfeeding**

Breastfeeding can have many benefits. Infants and mothers can be positively impacted by breastfeeding. Benefits are not only reflected in infancy or childhood, but in adulthood as well.

**Infancy/Childhood**

In developed countries, breastfeeding has been linked to a 36% reduction in sudden infant deaths (Sankar et al., 2015). For mothers receiving medication-assisted...
treatment such as Subutex, methadone, or buprenorphine for substance abuse, breastfeeding can delay the onset of neonatal abstinence syndrome (NAS) symptoms, reduce the severity of withdrawal, or decrease the duration of the NAS symptoms (American College of Obstetricians and Gynecologists, 2012). Breastfeeding can potentially prevent 72% of admissions for diarrhea, and 57% of admissions for respiratory illnesses in children under one year of age (Horta, Mola, & Victora et al., 2013; Sankar et al., 2015). Research also suggests that breastfeeding may protect against middle ear infections in children under two years of age (Bowatte et al., 2015).

Breastfeeding may protect against allergic rhinitis in children five years and under, but there was no relationship found between breastfeeding and food allergies (Lodge et al., 2015). The prevalence of childhood asthma decreased by 9% with breastfeeding (Lodge et al., 2015). Regarding oral health in children, breastfeeding reduced the risk of misaligned mature teeth by 68% (Peres, Cascaes, Nascimento, & Victora, 2015).

Childhood obesity risk was reduced by 20% in breastfed infants (Horta et al., 2015). On average, breastfed children and adolescents performed better on intelligence tests with a pooled score 3.4 intelligence quotient (IQ) higher than those who were not breastfed (Horta et al., 2015).

Adulthood

Breastfeeding can provide long-term benefits as well. Breastfeeding for any duration was associated with reduced the risk for overweight or obesity by 35% and type 2 diabetes by 26% in adults (Horta et al., 2015). Results in a prospective birth cohort study that examined data collected after 30 years showed a positive correlation between
breastfeeding duration and performance on intelligence tests, educational attainments, and income in adulthood (Victoria et al., 2015).

Maternal Health

Mothers who breastfed for any duration have experienced a 4.3% reduction in the occurrence of invasive breast cancer per every 12 months providing human milk (Chowdhury et al., 2015). Ovarian cancer risk was reduced by 30% with a breastfeeding duration greater than six months (Chowdhury et al., 2015). For every six months a mother breastfed, average body mass index (BMI) declined by 1% (Neville, McKinley, Holmes, Spence, & Woodside, 2014). Having ever breastfed was associated with a lower incidence of depression (Neville et al., 2014).

Recommendations for Infant Feeding Through the First Year of Life

Exclusive breastfeeding is recommended for the first six months of life (WHO, 2012; APP, 2012). Thereafter, infants should continue to receive human milk with the introduction of complementary solid foods and liquids progressing through the first one to two years (WHO, 2012; APP, 2012). A study by Rodriguez et al. (2018) evaluated infant feeding practices of toddlers born preterm and found that 41% of infants were introduced to complementary foods before four months of age. Introducing solids before four months has been associated with increased risk for obesity at three years of age. However, starting solids after six months has been associated with inadequate zinc and iron intakes (DiMaggio et al., 2017). Research suggests there is no evidence to support a specific order in which foods should be introduced. Research shows to offer a variety of foods, so the infant can become accustomed to different flavors (APP, 2012). For exclusively breastfed infants, iron fortified cereals or meats may be the foods to introduce
first because human milk is relatively low in iron, and term born infants have depleted iron stores by four to six months (APP, 2012). Homemade purees higher in nitrates such as spinach, beets, squash, and carrots should not be given before three months of age due to the risk for methemoglobinemia (APP, 2012). Whole milk and honey should not be given before one year of age (APP, 2012).

There is no evidence to suggest that food allergies can be prevented by delaying solid food introductions beyond four to six months; rather, this may increase the risk of developing food allergies. The introduction of allergenic foods during the first four to six months may instead decrease the risk for developing a food allergy (DiMaggio et al., 2017).

Breastfeeding Prevalence in the United States

According to the Centers for Disease Control and Prevention (2018), breastfeeding rates have increased in the United States from the year 2011 to 2015. Yet, these rates remained lower in the United States when compared to worldwide rates (WHO, 2018). According to WHO (2018), 45% of women still provided human milk complementary at two years. Rates vary largely by race, ethnicity, education level, WIC participation, and family income level (CDC, 2018).

Term Newborns

Breastfeeding rates in the U.S. among term infants have been reported to range from 79 to 83% at birth, 84% at one month of age, 57% at six months of age, and 27 to 36% at 12 months of age (CDC, 2018; Flaherman et al., 2017). In the U.S., exclusive breastfeeding rates range from 65% at birth, 43% one month of age, 46% at three months of age, and 24% to 28% at six months of age (Flaherman et al., 2017; Zanardo, Gabrieli,
Straface, Savio, & Soldera, 2017; CDC, 2018). Worldwide, 42% of term born infants are breastfed at birth while 41% less than 6 months of age are exclusively breastfed. Approximately 67% continue complementary breastfeeding at 12 months and 45% at 24 months (WHO, 2018).

**Preterm Newborns**

Breastfeeding rates among preterm infants range from 67 to 81% at birth, 48% to 53% at two weeks of age, 32% at one month of age, 12% to 21% at three months of age, and 22% to 50% at six months of age (Lee & Jang, 2016; Meio et al., 2018; Crippa et al., 2019; Wang et al., 2019). Exclusive breastfeeding rates among preterm infants range from 5% to 17% at birth, 7% to 48% at two weeks of age, 7% to 10% at one month of age, 19% to 31% at three months of age, and 1% to 23% at six months of age (Lee & Jang, 2016; Gomes at al., 2017; Zanardo et al., 2017; Meio et al., 2018; Crippa et al., 2019; Wang et al., 2019). Data from Meio et al (2018) suggests that peak breastfeeding duration among preterm newborns is four months. Preterm infants were significantly less likely to breastfeed at one month and exclusively breastfeed at one and three months in comparison to those born at term (Jung et al. 2019). In one study, only 20% of preterm infants were exclusively breastfed at discharge, decreasing to 12% at six months, which was significantly lower than term infants (Zanardo et al., 2017). Breastfeeding progression and the establishment of adequate milk supply, was inversely related to gestational age in preterm infants (Maastrup et al., 2014). Wang et al. (2019) found that infants born at less than 32 weeks gestation age were less likely to be breastfed at six months in comparison to those born at over 32 weeks gestational age.
Racial/Ethnic Disparities

Asian Americans have the highest overall breastfeeding rates. Caucasian women have the second highest overall breastfeeding rates, and the highest exclusive breastfeeding rates. Hispanic mothers have breastfeeding rates comparable to Caucasian mothers at birth, but at the six- and 12-month marks, Hispanic mothers have noticeably lower breastfeeding rates than Caucasian mothers (CDC, 2018). Hispanic mothers that migrate to the United States have lower breastfeeding rates in comparison to Hispanic mothers who do not reside in the U.S. (Howell, Bodnar-Deren, Balbierz, Parides, & Bickell, 2014). In 2013, approximately 68% of American Indian and Alaska Native mothers never attempted breastfeeding. African Americans have the lowest breastfeeding rates of all ethnic groups. Breastfeeding initiation rates were significantly less among African American infants than Caucasian infants across 23 U.S. states, mostly in the Midwest and South (CDC, 2018).

Education and Family Income Levels

In one study among WIC participants with low breastfeeding rates, only 6.2% of mothers had completed high school. Several studies identified that breastfeeding rates were associated with educational level in preterm infants (Wheeler, 2009; Lutz et al., 2018; Crippa et al., 2019; Wang et al., 2019). Only one study found maternal education as a significant risk factor for early breastfeeding cessation (Maastrup et al., 2014). Data from the Infant Feeding Practice Study II revealed that mothers with a college education have higher breastfeeding rates at months one through nine in comparison to mothers who only had a high school education (Li et al., 2008). Regarding preterm infants,
mothers with lower socioeconomic status were more likely to have shorter breastfeeding durations after discharge (Maastrup et al., 2014).

**WIC Participation**

Data collected from the Infant Feeding Practices Study II revealed no significant association between WIC participation and breastfeeding duration at the three month mark. (Gregory, Gros, Nguyen, Butz, & Johnson, 2016). In fact, from birth to one month of age, mothers who participate in WIC postpartum had similar breastfeeding rates to those who did not participate in WIC postpartum (Li et al., 2008). Several studies found prenatal breastfeeding education to have a positive effect on breastfeeding duration in preterm infants; however, this study did not determine the provider of this education (Lutz et al., 2018; Crippa et al., 2019; Wang et al., 2019).

**Breastfeeding Promotion**

Chapman & Perez-Escamilla (2012) found that prenatal education, peer counseling, appointments specific to breastfeeding, heightened hospital initiatives or practices, all had a positive effect on breastfeeding rates. Another study showed that mothers who established their breastfeeding goal prenatally were significantly more likely to breastfeed their infant beyond four months (Purdy et al., 2012). Other factors associated with positive breastfeeding outcomes included mothers who participated in breastfeeding support programs, had a higher self-efficacy, were of a younger age, and had a positive experience while breastfeeding. More factors associated with positive breastfeeding outcomes included prior breastfeeding experience, direct feeding at the breast, a singleton pregnancy, decreased separation time, and having an infant of greater
gestational age (Purdy et al., 2012; Ravn et al., 2012; Pinchevski-Kadir et al., 2017; Wang et al., 2019; Crippa et al., 2019).

Test weighing the infant, or measuring weight before and after breastfeeding to determine the amount of milk transferred, when transitioning to oral feedings and pacifier use were found to be significantly associated with exclusive breastfeeding at discharge (Maastrup et al., 2014). Two studies evaluated the effects of kangaroo care, or skin to skin contact, on breastfeeding outcomes in preterm infants. Those preterm infants, especially very preterm infants, who were breastfeeding after discharge up to six months received significantly more kangaroo care during the hospital stay. (Gathwala, Signh, & Signh et al., 2010 & Flacking, Ewald, & Wallin, 2011).

**Baby-Friendly Hospitals**

Baby Friendly is a designation for implementing and meeting standards for the ten steps for successful breastfeeding and abiding by the international code for marketing human milk substitutes (Baby Friendly USA, 2018). As of 2017, there were 137 (18.5%) hospitals with Baby Friendly status in the United States. Approximately one in four live births occur in Baby Friendly hospitals (Baby Friendly USA, 2018; CDC, 2018). The duration of breastfeeding was significantly longer for infants born in a Baby Friendly hospital (Jung et al., 2019). The odds of an infant being breastfed was significantly higher when mothers experienced at least two of the Baby Friendly practices (Jung et al., 2019). Exclusive breastfeeding during hospital stay was significantly associated with a Baby Friendly designation with rates increasing from 31% in 2008, to 59% in 2017 (Spaeth, Zemp, Marken, & Dravta, 2018; Jung et al., 2019). One study evaluating breastfeeding rates in a Baby Friendly hospital after discharge revealed that all mothers breastfeeding at
discharge were still breastfeeding at the two-week follow up visit (Gomes et al., 2017). Breastfeeding rates at one and six months and exclusive breastfeeding rates at one, three, and six months were significantly higher for infants born in a Baby Friendly hospital when compared to those who were not (Taren & Sinari, 2016; Jung et al., 2019). In one study comparing the rates of breastfeeding to formula feeding, breastfeeding was found to be the most common feeding method among infants from birth to three months in Baby Friendly Hospitals (Shealthy et al., 2008). The percentage of infants who received human milk during hospital stay was 6.8% lower in non-Baby Friendly hospitals (Jung et al., 2019).

Lactation Consultants and Hospital Staff

In 2016, for every 1000 live births, there were 3.8 board-certified lactation consultants (CDC, 2018). In one study, only 38% of mothers reported receiving breastfeeding information from a lactation consultant (Zielinska et al., 2017). The number of board-certified lactation consultants in a facility was significantly associated with the percentage of infants breastfed exclusively for six months, and complementary for 12 months (Taren & Sinari, 2016). Specifically, for preterm infants, the number of board-certified lactation consultants in a facility was significantly associated with the percentage of infants who received human milk for their first feeding (Gharib, Fletcher, Tucker, Vohr, & Lechner, 2018). Mothers became more confident with breastfeeding after receiving direction from staff or lactation consultants (Rocha et al., 2013). In a study by Rocha et al (2013) which evaluated maternal knowledge before and after breastfeeding instruction, and then again at discharge, revealed that mothers perceived guidance from staff as satisfactory. Initially, mothers were given guidance, but they did
not fully understand the information provided to them. However, upon evaluation at discharge, 33% of mothers were able to provide correct caring procedures for the breasts, 47% were able to provide correct positioning and handling, 13% were able to provide correct milk storage, 27% were able to give the recommended breastfeeding length, and 13% were able to appropriately assess the infant’s milk consumption.

**Workplace Lactation Support**

In 2010, a federal law passed requiring employers to provide break time and a private space other than a restroom for most hourly wage-earning and non-exempt salaried works to express human milk at work (United States Breastfeeding Committee, 2019). However, in 2018, the Society for Human Resource Management (2018) conducted a survey and approximately half of employers in the United States have lactation support programs available to new mothers. Worldwide, only 12% of companies provide the recommended 18 weeks’ time off for maternity leave (WHO, 2018). Companies who have workplace lactation programs had breastfeeding initiation rates of 87% to 98% among employees compared to national initiation rates of 67% to 83% (Kim, Shin, & Donovan, 2019). When workplaces provided breast pumps for one year, social support from coworkers, workplace lactation consultations via telephone, and access to lactation rooms, exclusive breastfeeding rates at six months were higher (Kim et al., 2019).

**WIC**

In one study, WIC services positively influenced breastfeeding rates (Chapman & Perez-Escamilla, 2012). However, in another study, WIC participation was associated with a shorter duration of breastfeeding (Li et al., 2008). Over two decades, breastfeeding
rates among WIC participants increased 21% (Zhang, Lamichane, Wright, McLaughlin, & Stacy, 2019). From 2006 to 2014, breastfeeding rates increased for WIC participants, and decreased for WIC-eligible non-participants (Zhang et al, 2019). WIC prenatal and postpartum peer counseling was significantly associated with breastfeeding initiation and duration (McCoy, Gappert, & Richardson et al., 2018).

**Reasons for Breastfeeding Cessation**

A number of factors can influence breastfeeding duration. These may be related to mother, child, or the environment.

**Infant-Related Factors**

Reasons for shorter breastfeeding duration have been reported to include infant health issues such as sleepiness, inadequate weight gain, and feeding intolerances (Wheeler, 2009; Odom et al., 2013; Lee & Jang, 2016; Zielinska et al., 2017; Crippa et al., 2019; Wang et al., 2019). Male gender, higher birth weight, and multiple gestation births were associated with early cessation of breastfeeding (Wheeler, 2009; Ostlund et al., 2010; Odom et al., 2013; Lawrence, 2013; Maastrup et al., 2014; Luz et al., 2018; & Crippa et al., 2019).

**Maternal Factors**

Research indicates several reasons why mothers never initiated breastfeeding including some medications, illnesses, or drug use (Wheeler, 2009; American College of Obstetricians and Gynecologists, 2012; Lawrence, 2013). Certain maternal illnesses can be severe enough to interfere with breastfeeding and milk production, including toxemia, venous thrombosis, thyroid disease, Cystic Fibrosis, and multiple sclerosis. A mammoplasty, mastitis, and polycystic ovarian syndrome may interfere with functional
breast tissues, nerves, or ductal structures, which can affect milk production (Lawrence, 2013). If mothers did not establish breastfeeding goals prenatally, or were never encouraged by a healthcare provider to do so, they were also less likely to initiate breastfeeding (Odom et al., 2013). The most common reason cited by mothers for early cessation of breastfeeding was perceived inadequate milk supply (Odom et al., 2013; Zielinska et al., 2017; Crippa et al., 2019; Wang et al., 2019). Initiating human milk expression beyond 48 hours after delivery was associated with reduced milk supply, thus a shorter breastfeeding duration (Maastrup et al., 2014). Other reasons included breast issues such as pain and difficulty with latching, use of nipple shields, and mothers returning to work in a workplace not conducive to breastfeeding (Odom et al., 2013; Lee & Jang, 2016; Zielinska et al., 2017; Crippa et al., 2019; Wang et al., 2019). Low maternal education level, advanced maternal age, lack of previous experience breastfeeding, smoking, single mothers, other previous children, lack of support from family or father, and post-partum depression were other maternal factors associated with a shorter duration of breastfeeding (Wheeler, 2009; Ostlund et al., 2010; Odom et al., 2013; Lawrence, 2013; Luz et al., 2018; Crippa et al., 2019). Fear, tension, stress, and pain were shown to negatively affect breastfeeding outcomes (Rocha et al, 2013).

**Maternal Knowledge.** Multiple studies showed that limited knowledge regarding breastfeeding practices was correlated with a shorter breastfeeding duration (Rocha et al 2013; Odom et al., 2013; Wang et al., 2019). In one study of mothers with children one to two years old, 72% of surveyed mothers demonstrated good or very good knowledge regarding breastfeeding practices, with exclusively breastfeeding moms having the highest scores (Zielinska et al., 2017). Low breastfeeding knowledge was associated with
lower education levels, higher pre-pregnancy weights, and rural area populations (Zielinska et al., 2017). Most mothers reported receiving information regarding breastfeeding from the internet (70%), while 38% reported receiving information from a lactation consultant, and about 16% reported receiving from a physician (Zielinska et al., 2017).

Social/Environmental Factors

In one study, while 59% of mothers introduced formula on their own, 24% of women reported introducing formula as a result of a physician’s recommendation, and 20% as a result of a midwife’s recommendation (Zielinska et al., 2017). Mothers offered formula supplementation to breastfeeding during the NICU stay were more likely to choose formula later rather than exclusive breastfeeding (Lee & Jang, 2016). Those mothers who delivered infants vaginally were more likely to turn to exclusive breastfeeding or mixed feeding in comparison to those delivered via C-section (Lee & Jang, 2016).

Father Influences on Breastfeeding. Mothers were more likely to initiate breastfeeding when perceived that fathers desired exclusive breastfeeding, and were less likely to stop exclusive breastfeeding at any point within the first year of life (Wang, Guendelman, & Eskenazi, 2018). When both mother and father both desired to exclusively breastfeed, the risk for cessation was even more so reduced (Wang, Guendelman, & Eskenazi, 2018). In a study of fathers who were aware their child’s breastfeeding duration, the average duration was 7.4 months in comparison to 5.3 months for fathers who were unaware of breastfeeding duration (Laantera, Polkki, Ekstrom, & Pietila, 2010). Another study evaluated father’s attitudes and experiences with breastfeeding. Fathers are eager to
support their partner with breastfeeding, but feel they lack the knowledge or guidance on how to do so (Brown & Davies, 2014).

Summary

Breastfeeding rates appear to have a large decline between the age of three to four months (Lee & Jang, 2016; CDC, 2018; WHO, 2018; Meio, et al., 2018; Luz et al. 2018; Crippa et al., 2019; Odom et al., 2013). A variety of reasons and factors have been shown to contribute to cessation of breastfeeding prior to 12 months (Wheeler, 2009; Ostlund et al., 2010; Odom et al., 2013; Rocha et al 2013; Maastrup et al., 2014; Lee & Jang 2016; Zielinska et al., 2017; Luz et al., 2018; Crippa et al., 2019; Wang et al., 2019).

Breastfeeding can have numerous benefits for both infants and mothers (Lawrence, 2013; Victoria et al., 2015; Meio et al., 2018; Cortez, 2018; Thomas and Mathew, 2019).

Currently, minimal studies have compared preterm to term infants and stratified any differences between these populations (Wheeler, 2009; Ostlund et al., 2010; Zanardo et al., 2017). Further research is needed to identify differences related to breastfeeding duration and barriers that may exist among preterm and term infants in order to more effectively promote breastfeeding to mothers. The purpose of this study was to compare factors that influence breastfeeding duration or cessation in preterm and term infants. The study evaluated distinguishing factors that exist leading to early cessation of breastfeeding among groups.
CHAPTER 3
METHODS

The purpose of this study was to compare factors that may impact breastfeeding duration or cessation in preterm and term infants during the first year of life. This study was an online survey design. Survey Monkey™ software was utilized to develop the questionnaire. The questionnaire was distributed through a link provided on various social media outlets. It was retrospective in nature and included demographic items about both the mother and the infant, items about infantile feeding during the first year of life, and items about factors influencing breastfeeding cessation. There was 50 items on the questionnaire and it took approximately ten minutes to complete. For this study, receiving any amount of human milk either directly from the breast or expressed was defined as breastfeeding within 12 months of life. Exclusive breastfeeding was defined as receiving only human milk for feedings for at least six months per the recommendation from the American Academy of Pediatrics (2012). Mothers who stopped providing human milk before 12 months were asked to cite reasons on the survey for discontinuation. For survey purposes, actual gestation rather than corrected gestation was used for data collection in both term and preterm infants. All survey data was self-reported.

Sample

The participants in the study included mothers who resided in the United States at the time of the child’s birth, who were at least 18 years of age, and who had a child born
within the last 24 months. The exclusion criteria included mothers who did not provide human milk at any point within the first year of life, who had children greater than 24 months of age, who had a child that was not born in the United States, or were under the age of 18 as the time of their child’s birth. The study sample size was a target of 200 mothers with at least 50 responses from mothers of infants born pre-term. Survey responses remained anonymous.

Data Collection Instruments

The data collection instrument (Appendix A) used for this survey was an online questionnaire developed by the primary researcher using the Survey Monkey™ software. Questionnaire items were modeled after the Infant Feeding Practices Study II (Li et al., 2008; Odom et al., 2013). It was distributed via various social media outlets with a link to access the questionnaire. Questionnaire items collected both maternal and child demographics, and various items related to feeding during the first year. Maternal demographics included age, race/ethnicity, education level, region of residence, employment status, presence of chronic illness or disease and WIC participation. Infant demographic data included the child’s gestational age at birth, gender, birthweight, type of delivery, if multiparous, presence of other family members in the household, and WIC participation. Information regarding NICU stay was collected if applicable. If so, data pertaining to the NICU length of stay, the use of donor human milk, and lactation assistance was collected. Feeding information was also obtained, including breastfeeding initiation, breastfeeding duration, solid food instruction, and breastfeeding cessation. Mothers were asked to cite reasons for discontinuation of breastfeeding prior to 12 months. Choices provided included milk supply, latching/sucking problems, infant
growth concerns, infant health issues, breast health issues, maternal health issues, maternal medication regimen, maternal support at home, workplace barriers, time constraints, social concerns, and healthcare provider recommendations. An “other” option was also be included where mothers were asked to identify issues not listed. Additional information regarding presence of workplace lactation support, total number of children, previous breastfeeding experience, offered or received lactation assistance, prenatal breastfeeding education, postpartum breastfeeding education, family breastfeeding support, previous exposure to breastfeeding, and the source of breastfeeding education was obtained.

Data Collection Process

Institutional Review Board approval was attained from the Human Use Committee at Louisiana Tech (Appendix B). Prior to collection of any data, the survey was accessible for three weeks, included 50 questions, and took approximately ten minutes to complete. The survey was publicized and a link was provided through various social media outlets. It was also posted in various social media groups related to preterm infants and guardians. As an incentive, all participants had the option to provide their email address to be entered into a drawing for a $25.00 Amazon gift card. The email address was not linked to the questionnaire to maintain anonymity of the participant.

Data Analysis

The Scientific Package for Social Sciences (SPSS) BASE for Students was used for statistical analysis (SPSS Statistics for Windows, Version 25.0., 2017). Demographic and descriptive data were summarized using frequencies and percentages. All hypotheses
were tested using a Chi-square test. A p-value of 0.05 (x ± SD; p < .05) was used to define statistical significance. Incomplete surveys were removed from the study data.
CHAPTER 4
RESULTS

Of the 687 responses to the survey, 531 responses were complete and used for analysis. Fifty mothers had a child born preterm, and 481 at term.

Maternal Demographics

The majority of respondents were non-Hispanic white (78.7%), had completed a college degree (61.6%), and were from the Southern United States (63.3%). Mothers with GDM ($x^2(1, N = 531) = 9.07, p = .008$), T1DM or T2DM ($x^2(1, N = 531) = 8.23, p = .020$), GHTN or Preeclampsia ($x^2(1, N = 531) = 7.79, p = .046$) were significantly more likely to have a preterm birth. Mothers of term infants were more likely to be free of medical conditions ($x^2(1, N = 531) = 24.48, p = .000$). Mothers of preterm infants were more likely to have another medical condition not identified on the survey ($x^2(1, N = 531) = 13.170, p = .006$) (Table 1).
Table 1: Maternal Demographics

<table>
<thead>
<tr>
<th>Variable</th>
<th>Preterm (≤36 weeks)</th>
<th>Term (≥37 weeks)</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n = 50 (%)</td>
<td>n = 481 (%)</td>
<td>N = 531 (%)</td>
</tr>
<tr>
<td>Race</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>White (Not Hispanic/Latino)</td>
<td>39 (78.0%)</td>
<td>379 (78.8%)</td>
<td>418 (78.7%)</td>
</tr>
<tr>
<td>Hispanic/Latino</td>
<td>8 (16.0%)</td>
<td>63 (13.1%)</td>
<td>71 (13.4%)</td>
</tr>
<tr>
<td>Black/African American</td>
<td>2 (4.0%)</td>
<td>16 (3.3%)</td>
<td>18 (3.4%)</td>
</tr>
<tr>
<td>Asian/Asian American</td>
<td>0 (0.0%)</td>
<td>5 (1.0%)</td>
<td>5 (0.9%)</td>
</tr>
<tr>
<td>American Indian/Alaska Native</td>
<td>1 (2.0%)</td>
<td>6 (1.2%)</td>
<td>7 (1.3%)</td>
</tr>
<tr>
<td>Other/Prefer not to answer</td>
<td>0 (0.0%)</td>
<td>12 (2.5%)</td>
<td>12 (2.3%)</td>
</tr>
<tr>
<td>Education</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No schooling</td>
<td>1 (2.0%)</td>
<td>2 (0.4%)</td>
<td>3 (0.6%)</td>
</tr>
<tr>
<td>Grades 1 – 12 (No diploma)</td>
<td>2 (4.0%)</td>
<td>6 (1.2%)</td>
<td>8 (1.6%)</td>
</tr>
<tr>
<td>Regular High School Diploma, GED, or Alternative Credential</td>
<td>7 (14.0%)</td>
<td>52 (10.8%)</td>
<td>59 (11.1%)</td>
</tr>
<tr>
<td>Some college credit, no degree</td>
<td>14 (28.0%)</td>
<td>113 (23.5%)</td>
<td>27 (23.9%)</td>
</tr>
<tr>
<td>Associates degree</td>
<td>6 (12.0%)</td>
<td>58 (12.1%)</td>
<td>64 (12.1%)</td>
</tr>
<tr>
<td>Bachelor’s degree</td>
<td>15 (30.0%)</td>
<td>156 (32.4%)</td>
<td>171 (32.2%)</td>
</tr>
<tr>
<td>Master’s degree</td>
<td>4 (8.0%)</td>
<td>75 (15.6%)</td>
<td>79 (14.9%)</td>
</tr>
<tr>
<td>Professional degree (MD, DDS, DVM, LLB, JD)</td>
<td>0 (0.0%)</td>
<td>13 (2.7%)</td>
<td>13 (2.4%)</td>
</tr>
<tr>
<td>Doctoral degree</td>
<td>1 (2.0%)</td>
<td>6 (1.2%)</td>
<td>7 (1.3%)</td>
</tr>
<tr>
<td>Region of Residence</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>New England</td>
<td>2 (4.0%)</td>
<td>17 (3.5%)</td>
<td>19 (3.6%)</td>
</tr>
<tr>
<td>Mid-Atlantic</td>
<td>6 (12.0%)</td>
<td>56 (11.6%)</td>
<td>62 (11.7%)</td>
</tr>
<tr>
<td>Midwest</td>
<td>5 (10.0%)</td>
<td>37 (7.7%)</td>
<td>42 (7.9%)</td>
</tr>
<tr>
<td>South</td>
<td>29 (58.0%)</td>
<td>307 (63.8%)</td>
<td>336 (63.3%)</td>
</tr>
<tr>
<td>Southwest</td>
<td>6 (12.0%)</td>
<td>43 (8.9%)</td>
<td>49 (9.2%)</td>
</tr>
<tr>
<td>West</td>
<td>2 (4.0%)</td>
<td>21 (4.4%)</td>
<td>23 (4.3%)</td>
</tr>
<tr>
<td>Employment (During Child’s First Year of Life)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>At Birth</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Not Employed</td>
<td>20 (40.0%)</td>
<td>169 (35.1%)</td>
<td>189 (35.6%)</td>
</tr>
<tr>
<td>Part-Time</td>
<td>3 (6.0%)</td>
<td>25 (5.2%)</td>
<td>28 (5.3%)</td>
</tr>
<tr>
<td>Full-Time</td>
<td>3 (6.0%)</td>
<td>54 (11.2%)</td>
<td>57 (10.7%)</td>
</tr>
<tr>
<td>On Maternity Leave</td>
<td>24 (48.0%)</td>
<td>233 (48.4%)</td>
<td>257 (48.4%)</td>
</tr>
<tr>
<td>At 3 Months</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Not Employed</td>
<td>21 (42.0%)</td>
<td>170 (35.3%)</td>
<td>191 (36%)</td>
</tr>
<tr>
<td>Part-Time</td>
<td>6 (12.0%)</td>
<td>51 (10.6%)</td>
<td>57 (10.7%)</td>
</tr>
<tr>
<td>Full-Time</td>
<td>14 (28.0%)</td>
<td>153 (31.8%)</td>
<td>167 (31.5%)</td>
</tr>
<tr>
<td>On Maternity Leave</td>
<td>9 (18.0%)</td>
<td>107 (22.2%)</td>
<td>116 (21.8%)</td>
</tr>
<tr>
<td>At 6 Months</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Not Employed</td>
<td>18 (36.0%)</td>
<td>163 (33.9%)</td>
<td>181 (34.1%)</td>
</tr>
<tr>
<td>Part-Time</td>
<td>7 (14.0%)</td>
<td>73 (15.2%)</td>
<td>80 (15.1%)</td>
</tr>
<tr>
<td>Full-Time</td>
<td>24 (48.0%)</td>
<td>236 (49.1%)</td>
<td>260 (49.0%)</td>
</tr>
<tr>
<td>On Maternity Leave</td>
<td>1 (2.0%)</td>
<td>9 (1.9%)</td>
<td>10 (1.9%)</td>
</tr>
<tr>
<td>At 12 Months</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Not Employed</td>
<td>18 (36.0%)</td>
<td>161 (33.5%)</td>
<td>179 (33.7%)</td>
</tr>
<tr>
<td>Part-Time</td>
<td>6 (12.0%)</td>
<td>74 (15.4%)</td>
<td>80 (15.1%)</td>
</tr>
<tr>
<td>Full-Time</td>
<td>26 (52.0%)</td>
<td>246 (51.1%)</td>
<td>272 (51.2%)</td>
</tr>
</tbody>
</table>
Table 1 (cont.): Maternal Demographics

<table>
<thead>
<tr>
<th>Variable</th>
<th>Preterm (≤36 weeks)</th>
<th>Term (≥37 weeks)</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n = 50 (%)</td>
<td>n = 481 (%)</td>
<td>N = 531 (%)</td>
</tr>
<tr>
<td>Heart</td>
<td>0 (0.0%)</td>
<td>2 (0.4%)</td>
<td>2 (0.4%)</td>
</tr>
<tr>
<td>Cancer</td>
<td>1 (2.0%)</td>
<td>3 (0.6%)</td>
<td>4 (0.8%)</td>
</tr>
<tr>
<td>Kidney</td>
<td>1 (2.0%)</td>
<td>1 (0.2%)</td>
<td>2 (0.4%)</td>
</tr>
<tr>
<td>Respiratory</td>
<td>1 (2.0%)</td>
<td>9 (1.9%)</td>
<td>10 (1.9%)</td>
</tr>
<tr>
<td>Gestational Diabetes</td>
<td>8 (16.0%)*</td>
<td>25 (5.2%)*</td>
<td>33 (6.2%)</td>
</tr>
<tr>
<td>Type 1 or Type 2 Diabetes</td>
<td>4 (8.0%)*</td>
<td>8 (1.7%)*</td>
<td>12 (2.3%)</td>
</tr>
<tr>
<td>Autoimmune</td>
<td>0 (0.0%)</td>
<td>7 (0.4%)</td>
<td>7 (1.3%)</td>
</tr>
<tr>
<td>Thyroid</td>
<td>3 (6.0%)</td>
<td>12 (2.5%)</td>
<td>15 (2.8%)</td>
</tr>
<tr>
<td>Gestational</td>
<td>2 (4.0%)*</td>
<td>2 (0.4%)*</td>
<td>4 (0.8%)</td>
</tr>
<tr>
<td>Hypertension/Preeclampsia</td>
<td>2 (4.0%)</td>
<td>3 (0.6%)</td>
<td>5 (0.9%)</td>
</tr>
<tr>
<td>Gastrointestinal</td>
<td>0 (0.0%)</td>
<td>5 (1.0%)</td>
<td>5 (0.9%)</td>
</tr>
<tr>
<td>Reproductive</td>
<td>0 (0.0%)</td>
<td>4 (0.8%)</td>
<td>4 (0.8%)</td>
</tr>
<tr>
<td>Psychological</td>
<td>28 (56.0%)*</td>
<td>406 (84.4%)*</td>
<td>434 (81.7%)</td>
</tr>
<tr>
<td>None</td>
<td>4 (8.0%)*</td>
<td>5 (1.0%)*</td>
<td>9 (1.7%)</td>
</tr>
<tr>
<td>Other</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note. *p < .05. No respondents found for the Native Hawaiian/Other Pacific Islander group. No respondents on maternity leave at 12 months. Respondents may have multiple responses for medical diseases/conditions.

Child Demographics

Preterm infants were significantly more likely to be of male gender ($x^2 (1, N = 531) = 4.58, p = .037$) and delivered via a cesarean section ($x^2 (1, N = 531) = 9.45, p = .003$) compared to term infants (Table 2). For preterm infants, the father ($x^2 (1, N = 531) = 15.95, p = .001$) and other family members ($x^2 (1, N = 531) = 8.23, p = .016$) were more likely to live partially in the household during the first year of life. Many of the fathers were only in the household partially during the first year because of military deployment as cited in the “other” category by respondents. The most common other family member to occupy the household partially during the first year of life was another sibling of the child. Despite the differences in NICU admittance and length of stay, breastfeeding rates were similar.
<table>
<thead>
<tr>
<th>Variable</th>
<th>Preterm (≤36 weeks)</th>
<th>Term (≥37 weeks)</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n = 50 (%)</td>
<td>n = 481 (%)</td>
<td>N = 531 (%)</td>
</tr>
<tr>
<td>Gender</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>33 (66.0%)*</td>
<td>241 (50.1%)*</td>
<td>274 (51.6%)</td>
</tr>
<tr>
<td>Female</td>
<td>17 (34.0%)*</td>
<td>240 (49.9%)*</td>
<td>257 (48.4%)</td>
</tr>
<tr>
<td>Delivery Type</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Vaginal</td>
<td>25 (50.0%)*</td>
<td>342 (71.1%)*</td>
<td>367 (69.1%)</td>
</tr>
<tr>
<td>C-section</td>
<td>25 (50.0%)*</td>
<td>139 (28.9%)*</td>
<td>164 (30.9%)</td>
</tr>
<tr>
<td>Birth Type</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Single</td>
<td>44 (88.0%)</td>
<td>477 (99.2%)</td>
<td>521 (98.1%)</td>
</tr>
<tr>
<td>Twin</td>
<td>5 (10.0%)</td>
<td>2 (0.4%)</td>
<td>7 (1.3%)</td>
</tr>
<tr>
<td>Other</td>
<td>1 (2.0%)</td>
<td>2 (0.4%)</td>
<td>3 (0.6%)</td>
</tr>
<tr>
<td>Birth Weight</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>450-999 g</td>
<td>0 (0.0%)</td>
<td>1 (0.2%)</td>
<td>1 (0.2%)</td>
</tr>
<tr>
<td>1000-1499 g</td>
<td>1 (2.0%)</td>
<td>0 (0.0%)</td>
<td>1 (0.2%)</td>
</tr>
<tr>
<td>1500-2499 g</td>
<td>15 (30.0%)</td>
<td>11 (2.3%)</td>
<td>26 (4.9%)</td>
</tr>
<tr>
<td>2500-3999 g</td>
<td>31 (62.0%)</td>
<td>400 (83.2%)</td>
<td>431 (81.2%)</td>
</tr>
<tr>
<td>≥4000 g</td>
<td>3 (6.0%)</td>
<td>69 (14.3%)</td>
<td>72 (13.6%)</td>
</tr>
<tr>
<td>WIC Services During First Year</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>16 (32.0%)</td>
<td>127 (26.4%)</td>
<td>143 (26.9%)</td>
</tr>
<tr>
<td>No</td>
<td>34 (68.0%)</td>
<td>348 (72.3%)</td>
<td>382 (71.9%)</td>
</tr>
<tr>
<td>Prefer not to answer</td>
<td>0 (0.0%)</td>
<td>6 (1.2%)</td>
<td>6 (1.1%)</td>
</tr>
<tr>
<td>Household Occupants in First Year</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Both Parents (Entire)</td>
<td>44 (88.0%)</td>
<td>450 (93.6%)</td>
<td>494 (93%)</td>
</tr>
<tr>
<td>Only Mother (Entire)</td>
<td>3 (6.0%)</td>
<td>19 (4.0%)</td>
<td>22 (4.1%)</td>
</tr>
<tr>
<td>Only Father (Entire)</td>
<td>0 (0.0%)</td>
<td>4 (0.8%)</td>
<td>4 (0.8%)</td>
</tr>
<tr>
<td>Father (Partial)</td>
<td>7 (14.0%)*</td>
<td>13 (2.7%)*</td>
<td>20 (3.8%)</td>
</tr>
<tr>
<td>Father (None)</td>
<td>0 (0.0%)</td>
<td>4 (0.8%)</td>
<td>4 (0.8%)</td>
</tr>
<tr>
<td>Grandparents (Entire)</td>
<td>5 (10.0%)</td>
<td>45 (9.4%)</td>
<td>26 (4.9%)</td>
</tr>
<tr>
<td>Grandparents (Partial)</td>
<td>2 (4.0%)</td>
<td>19 (4.0%)</td>
<td>21 (4.0%)</td>
</tr>
<tr>
<td>Other Family Members (Entire)</td>
<td>5 (10.0%)</td>
<td>98 (20.4%)</td>
<td>103 (19.4%)</td>
</tr>
<tr>
<td>Other Family Members (Partial)</td>
<td>5 (10.0%)*</td>
<td>12 (2.5%)*</td>
<td>17 (3.2%)</td>
</tr>
<tr>
<td>Received Human Milk at Birth</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>46 (92.0%)</td>
<td>471 (97.9%)</td>
<td>517 (97.4%)</td>
</tr>
<tr>
<td>No</td>
<td>3 (6.0%)</td>
<td>9 (1.9%)</td>
<td>12 (2.3%)</td>
</tr>
<tr>
<td>I don’t know</td>
<td>1 (2.0%)</td>
<td>1 (0.2%)</td>
<td>2 (0.4%)</td>
</tr>
<tr>
<td>First Human Milk Feeding</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0-2 hours</td>
<td>23 (46.0%)</td>
<td>407 (84.6%)</td>
<td>430 (81%)</td>
</tr>
<tr>
<td>3-12 hours</td>
<td>16 (32.0%)</td>
<td>36 (7.5%)</td>
<td>52 (9.8%)</td>
</tr>
<tr>
<td>13-24 hours</td>
<td>2 (4.0%)</td>
<td>11 (2.3%)</td>
<td>13 (2.4%)</td>
</tr>
<tr>
<td>&gt;24 hours</td>
<td>1 (2.0%)</td>
<td>13 (2.7%)</td>
<td>14 (2.6%)</td>
</tr>
<tr>
<td>I don’t know</td>
<td>8 (16.0%)</td>
<td>14 (2.9%)</td>
<td>22 (4.1%)</td>
</tr>
</tbody>
</table>
Table 2 (cont.): Child Demographics

<table>
<thead>
<tr>
<th>Variable</th>
<th>Preterm (≤36 weeks)</th>
<th>Term (≥37 weeks)</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n = 50 (%)</td>
<td>n = 481 (%)</td>
<td>N = 531 (%)</td>
</tr>
<tr>
<td>NICU Admittance</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>22 (44.0%)</td>
<td>36 (7.5%)</td>
<td>58 (10.9%)</td>
</tr>
<tr>
<td>No</td>
<td>28 (56.0%)</td>
<td>443 (92.5%)</td>
<td>471 (88.7%)</td>
</tr>
<tr>
<td>I don’t know</td>
<td>0 (0.0%)</td>
<td>2 (0.4%)</td>
<td>2 (0.4%)</td>
</tr>
<tr>
<td>NICU Length of Stay</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>None</td>
<td>28 (56.0%)</td>
<td>445 (92.5%)</td>
<td>473 (89.1%)</td>
</tr>
<tr>
<td>&lt;24 hours</td>
<td>1 (2.0%)</td>
<td>6 (1.2%)</td>
<td>7 (1.4%)</td>
</tr>
<tr>
<td>1 – 7 Days</td>
<td>12 (24.0%)</td>
<td>20 (4.2%)</td>
<td>32 (6.2%)</td>
</tr>
<tr>
<td>8 – 14 Days</td>
<td>4 (8.0%)</td>
<td>8 (1.7%)</td>
<td>12 (2.3%)</td>
</tr>
<tr>
<td>≥15 days</td>
<td>5 (10.0%)</td>
<td>2 (0.4%)</td>
<td>7 (1.4%)</td>
</tr>
</tbody>
</table>

Note. *p < .05. No respondents for triplet birth type. Respondents may have multiple responses for occupants in household. NICU = Neonatal Intensive Care Unit.

Breastfeeding Rates

Data for breastfeeding rates and factors affecting cessation between preterm and term infants was analyzed using a Chi-square test. No difference was found in exclusive breastfeeding rates between preterm and term infants at 0 to 3, 4 or 5 months. However, a significant difference was found at six months, with increased exclusive breastfeeding rates for preterm infants (40.0% vs 22.7%) ($x^2 (1, N = 531) = 7.4, p = .009$) (Table 3).

There were no significant differences found at any time mark within the first year of life for non-exclusive breastfeeding rates (Table 4).

Table 3: Results of Chi-square Test for Exclusive Breastfeeding Rates During the First Six Months of Life

<table>
<thead>
<tr>
<th>Month(s)</th>
<th>Preterm (≤36 weeks)</th>
<th>Term (≥37 weeks)</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n = 50 (%)</td>
<td>n = 481 (%)</td>
<td>N = 531 (%)</td>
</tr>
<tr>
<td>0-3 Months</td>
<td>38 (76.0%)</td>
<td>401 (83.4%)</td>
<td>438 (82.7%)</td>
</tr>
<tr>
<td>4 Months</td>
<td>37 (74.0%)</td>
<td>356 (74.0%)</td>
<td>393 (74.0%)</td>
</tr>
<tr>
<td>5 Months</td>
<td>35 (70.0%)</td>
<td>299 (62.2%)</td>
<td>334 (62.9%)</td>
</tr>
<tr>
<td>6 Months</td>
<td>20 (40.0%)*</td>
<td>109 (22.7%)*</td>
<td>129 (24.3%)</td>
</tr>
</tbody>
</table>

Note. *p < .05
Table 4: Results of Chi-square Test for Breastfeeding Rates at Each Month During the First Year of Life

<table>
<thead>
<tr>
<th>Month(s)</th>
<th>Preterm (≤36 weeks) n = 50 (%)</th>
<th>Term (≥37 weeks) n = 481 (%)</th>
<th>Total N = 531 (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-3 Months</td>
<td>50 (100%)</td>
<td>481 (100%)</td>
<td>531 (100%)</td>
</tr>
<tr>
<td>4 Months</td>
<td>47 (94.0%)</td>
<td>447 (92.9%)</td>
<td>494 (93.0%)</td>
</tr>
<tr>
<td>5 Months</td>
<td>43 (86.0%)</td>
<td>434 (90.2%)</td>
<td>477 (89.8%)</td>
</tr>
<tr>
<td>6 Months</td>
<td>42 (84.0%)</td>
<td>424 (88.1%)</td>
<td>466 (87.8%)</td>
</tr>
<tr>
<td>7 Months</td>
<td>42 (84.0%)</td>
<td>410 (85.2%)</td>
<td>452 (85.1%)</td>
</tr>
<tr>
<td>8 Months</td>
<td>42 (84.0%)</td>
<td>400 (83.2%)</td>
<td>442 (83.2%)</td>
</tr>
<tr>
<td>9 Months</td>
<td>40 (80.0%)</td>
<td>393 (81.7%)</td>
<td>433 (81.5%)</td>
</tr>
<tr>
<td>10 Months</td>
<td>38 (76.0%)</td>
<td>382 (79.4%)</td>
<td>420 (79.1%)</td>
</tr>
<tr>
<td>11 Months</td>
<td>37 (74.0%)</td>
<td>375 (78.0%)</td>
<td>412 (77.6%)</td>
</tr>
<tr>
<td>12 Months</td>
<td>37 (74.0%)</td>
<td>365 (75.9%)</td>
<td>402 (75.7%)</td>
</tr>
</tbody>
</table>

Note. Includes nursing directly from breast, human milk via bottle, or human milk via feeding tube. No statistical significance found.

Factors Influencing Breastfeeding Duration

Regarding early cessation, a significant difference was noted between preterm and term infants for multiparous births with preterm infants having earlier cessation ($x^2 (1, N = 531) = 11.5, p = .025$). Approximately 70% of mothers reported providing human milk during the entire first year of life for both preterm and term infants. The most common reason for early cessation in both preterm and term infants was not producing enough milk (16.4%). Other frequently cited reasons were difficulty latching, sucking, or use of a nipple shield (7.7%), and returning to work or unable to express milk at work (6.2%). Mothers of preterm infants were significantly more have a shorter breastfeeding duration due taking a medication ($x^2 (1, N = 531) = 6.1, p = .044$) (Table 5).
Table 5: Results of Chi-square Tests for Breastfeeding Cessation Reasons

<table>
<thead>
<tr>
<th>Reason</th>
<th>Preterm (≤36 weeks) n = 50 (%)</th>
<th>Term (≥37 weeks) n = 481 (%)</th>
<th>Total N = 531 (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Infantile:</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Difficulty latching/sucking and/or had to use nipple shield</td>
<td>3 (6.0%)</td>
<td>38 (7.9%)</td>
<td>41 (7.7%)</td>
</tr>
<tr>
<td>Child biting</td>
<td>1 (2.0%)</td>
<td>17 (3.5%)</td>
<td>18 (3.4%)</td>
</tr>
<tr>
<td>Child not gaining weight</td>
<td>2 (4.0%)</td>
<td>19 (4.0%)</td>
<td>21 (4.0%)</td>
</tr>
<tr>
<td>Child sleepiness</td>
<td>0 (0.0%)</td>
<td>3 (0.6%)</td>
<td>3 (0.6%)</td>
</tr>
<tr>
<td>Multiple birth (twins, triplets, etc.)</td>
<td>2 (4.0%)*</td>
<td>1 (0.2%)*</td>
<td>3 (0.6%)</td>
</tr>
<tr>
<td>Child illness</td>
<td>0 (0.0%)</td>
<td>5 (1.0%)</td>
<td>5 (0.9%)</td>
</tr>
<tr>
<td>Child feeding intolerance</td>
<td>1 (2.0%)</td>
<td>12 (2.5%)</td>
<td>13 (2.4%)</td>
</tr>
<tr>
<td><strong>Maternal:</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Breast engorged or overfull</td>
<td>0 (0.0%)</td>
<td>2 (0.4%)</td>
<td>2 (0.4%)</td>
</tr>
<tr>
<td>Leaking breasts</td>
<td>0 (0.0%)</td>
<td>3 (0.6%)</td>
<td>3 (0.6%)</td>
</tr>
<tr>
<td>Pain with breastfeeding (i.e. sore, cracked, bleeding nipples; infected/abscessed breasts)</td>
<td>0 (0.0%)</td>
<td>13 (2.7%)</td>
<td>13 (2.4%)</td>
</tr>
<tr>
<td>Previous breast surgery</td>
<td>0 (0.0%)</td>
<td>4 (0.8%)</td>
<td>4 (0.8%)</td>
</tr>
<tr>
<td>Not producing enough milk</td>
<td>5 (10.0%)</td>
<td>82 (17.0%)</td>
<td>87 (16.4%)</td>
</tr>
<tr>
<td>Maternal medication</td>
<td>3 (6.0%)*</td>
<td>6 (1.2%)*</td>
<td>9 (1.7%)</td>
</tr>
<tr>
<td>Maternal illness or depression</td>
<td>3 (6.0%)</td>
<td>12 (2.5%)</td>
<td>15 (2.8%)</td>
</tr>
<tr>
<td>Maternal stress, fear, or tension of breastfeeding</td>
<td>1 (2.0%)</td>
<td>8 (1.5%)</td>
<td>9 (1.7%)</td>
</tr>
<tr>
<td>Maternal fatigue/tiredness</td>
<td>2 (4.0%)</td>
<td>19 (4.0%)</td>
<td>21 (4.0%)</td>
</tr>
<tr>
<td>Wanted to lose weight</td>
<td>0 (0.0%)</td>
<td>2 (0.4%)</td>
<td>2 (0.4%)</td>
</tr>
<tr>
<td>Became pregnant</td>
<td>1 (2.0%)</td>
<td>19 (4.0%)</td>
<td>20 (3.8%)</td>
</tr>
<tr>
<td><strong>Environmental:</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Inconvenience</td>
<td>0 (0.0%)</td>
<td>6 (1.2%)</td>
<td>6 (1.1%)</td>
</tr>
<tr>
<td>Not enough time</td>
<td>3 (6.0%)</td>
<td>14 (2.9%)</td>
<td>17 (3.2%)</td>
</tr>
<tr>
<td>Healthcare provider discouraged</td>
<td>1 (2.0%)</td>
<td>2 (0.4%)</td>
<td>3 (0.6%)</td>
</tr>
<tr>
<td>Returning to work/unable to express milk at work</td>
<td>2 (4.0%)</td>
<td>31 (6.4%)</td>
<td>33 (6.2%)</td>
</tr>
<tr>
<td>Did not want to breastfeed/pump in public</td>
<td>0 (0.0%)</td>
<td>5 (1.0%)</td>
<td>5 (0.9%)</td>
</tr>
<tr>
<td>Your partner did not support you to breastfeed</td>
<td>0 (0.0%)</td>
<td>5 (1.0%)</td>
<td>5 (0.9%)</td>
</tr>
<tr>
<td>The child’s grandparents did not support you to breastfeed</td>
<td>1 (2.0%)</td>
<td>2 (0.4%)</td>
<td>3 (0.6%)</td>
</tr>
<tr>
<td>Other family members did not support you to breastfeed</td>
<td>1 (2.0%)</td>
<td>4 (0.8%)</td>
<td>5 (0.9%)</td>
</tr>
<tr>
<td>Baby preferred the bottle</td>
<td>1 (2.0%)</td>
<td>9 (1.9%)</td>
<td>10 (1.9%)</td>
</tr>
<tr>
<td>None, I provided breast milk the entire first year of life</td>
<td>36 (72.0%)</td>
<td>337 (70.1%)</td>
<td>373 (70.2%)</td>
</tr>
<tr>
<td>Other</td>
<td>5 (10.0%)</td>
<td>37 (7.7%)</td>
<td>42 (7.9%)</td>
</tr>
</tbody>
</table>

Note. *p < .05

**Access to Lactation Room or Suite**

Of mothers who were employed during the first year of their infant’s life, approximately 63% reported having a lactation space available for use in the workplace, and 89% reported having a private space to pump milk without interruption. Roughly, three-fourths of mothers having a lactation space reported using this space several times
daily. The majority of mothers (83.4%) reported the lactation space was convenient for use.
This study examined factors that may impact breastfeeding duration or cessation in preterm and term infants during the first year of life. The hypothesis stating that there would be no significant difference in exclusive breastfeeding rates at six months between preterm and term infants was rejected. Preterm births account for about 10% of all births nationwide, which is consistent with the results in this study (9.4%) (CDC, 2018). Exclusive and non-exclusive breastfeeding rates, for both preterm and term infants, were much higher in this study compared to rates reported in other studies at every time mark (Crippa et al., 2019; CDC, 2018; Lee & Jang, 2016; Meio et al., 2018; Wang et al., 2019; WHO, 2018; Zanardo et al., 2017). This is likely a result of self-selection bias. In this study, exclusive breastfeeding rates at six months were much higher for preterm infants (40%) in comparison to term infants (22.7%), and much different from results indicated in prior studies. In other research, exclusive breastfeeding rates at six months ranged from 1 to 31% preterm infants and 20 to 28% for term infants (Meio et al., 2018; Wang et al., 2019; Masstrup et al., 2014; CDC, 2018; Zanardo et al., 2017). There may be a few explanations for these differences. The maternal demographics may reflect the population who primarily uses social media. The majority of mothers who completed the survey were non-Hispanic white and completed a college degree. According to the CDC, non-Hispanic whites, and college graduates, have the highest exclusive and non-exclusive
breastfeeding rates compared to other races/ethnicities and education levels (2018). This study showed similar data within the non-Hispanic white, educated group. Secondly, the survey was distributed only via social media outlets; therefore, access to a computer, smart phone, tablet or other portable device was necessary to access the survey. Data from the CDC (2018) suggests income ratio levels have a linear relationship with breastfeeding rates. In addition, in this study only 26.9% of mothers reported that their child received WIC services during the first year. National data indicates that of infants who were ever breastfed, 45.4% received WIC services (CDC, 2018). This could suggest that mothers who completed the survey were generally of higher socioeconomic class. Lastly, while there was an incentive for participation in the survey, respondents were likely more interested or knowledgeable regarding breastfeeding practices and benefits than the general public; therefore more willing to participate in the survey. The difference in exclusive breastfeeding rates among preterm infants may be related to the age used in the study. This study used chronological age of the infant, while the majority of studies used corrected age or adjusted age of the infant. In a study by Maastrup et al., exclusive breastfeeding rates for preterm infants was 13% at six months postnatal age, then when adjusted for age, the rate declined to 2% (2014).

The largest decline in overall breastfeeding rates was between months 3 and 4 of age which is consistent with prior research (Lee & Jang, 2016; CDC, 2018; WHO, 2018; Meio, et al., 2018; Luz et al. 2018; Crippa et al., 2019; Odom et al., 2013). However, for preterm infants, the largest decline was between months 4 and 5 of age in this study. The majority of preterm infants in this study were between 35 and 36 weeks gestational age (76%), which would reflect similar results as prior research when correcting for age.
Notably, the largest decline in exclusive breastfeeding rates was between 5 and 6 months for both groups of infants. A few factors may contribute to this change. One may be the timing of solid foods. Despite recommendations from WHO, CDC, and AAP to exclusively breastfeed for six months, data from the NHANES survey shows that 54.6% of infants were introduced to complementary foods before six months (Barrera, Hamner, Perrine, and Scanlon, 2018).

Another factor may be related to the mother’s return to work. Data from the Infant Feeding Practices Study II indicates that about 50% of mothers were employed full-time at six months which is comparable to the data from this study (49%) (Fein, Mandal, & Roe, 2008). Results from this study showed that of working mothers, approximately 75.1% of mothers were on maternity leave at birth, 33.9% at three months, 2.9% at six months, and none at 12 months. The average length of maternity leave in the U.S is between 8 to 12 weeks (Barrera et al., 2018; Ogbuanu, Glover, Probst, Liu, & Hussey, 2011). Data from the Early Child Longitudinal Study revealed the lowest percentage of mothers providing human milk were those who returned to work between 7 and 12 weeks in comparison to those who returned earlier, later, or not at all (Ogbuanu et al., 2011). Mothers consistently provided milk for an average of two weeks once returning to work (Barrera et al., 2018). As a result of less expression during the day, milk production declines, and the stored milk supply is utilized, so alternate means of nutrition are needed at approximately 5 to 6 months of age. Secondly, many workplaces may lack breastfeeding policies or support as well as a convenient space to express milk. In addition, lack of support from managers and coworkers, and demanding job requirements negatively impact breastfeeding duration (Sattari, Serwint, Neal, Chen, Levine et al.,
In this study, 63% of employed mothers outside of the home said they had a lactation room, suite, or space available to them during the first year of life. Previous research suggests that approximately one third of employers have a space specifically dedicated for milk expression (Bai et al, 2015; Hojnacki et al., 2012). In 2010, section seven of the Fair Labor Standards Act was amended requiring employers to provide lactation accommodation; however, the Act is not specific in its requirements. A private space does not have to be only dedicated to expressing milk, reasonable break times are not defined, and no specific necessities for the private space are outlined such as a refrigerator for human milk storage (Payton et al., 2019). The difference in the results from this study could be related to the socioeconomic status and education level of respondents. The type of employment or place of employment may play a role in time, space, or resources available for lactation. The variance could also be indicative of these amended laws transitioning to the workplace.

While NICU admittance and length of stay vary largely between preterm and term infants, breastfeeding rates were similar, suggesting that education in the hospital may be adequate in both areas. In this study, 64.2% received breastfeeding education prior to birth – most frequently from a lactation consultant (35.8%), followed by social media outlets (28.8%), and the internet (27.5%). In the hospital after birth, 78% of mothers received breastfeeding education. This education primarily came from a lactation consultant (71.6%) or registered nurse (42.7%). Sixty-three percent of mothers reported receiving breastfeeding education within 24 hours of birth and 51.6% reported receiving education after discharge. The timing and source of breastfeeding education for this study were consistent with results from other research. Individual and peer prenatal
breastfeeding education was associated with improved non-exclusive breastfeeding duration at 3 to 6 months and exclusive breastfeeding duration at six months (Patnode, Henninger, Senger, Perdue, & Whitlock, 2016). A systematic review found that breastfeeding duration was improved with prenatal education solely or in combination with intrapartum and postpartum education. Support from partners or family members further improved breastfeeding rates (Wouk, Tully, Labbok, 2017). Specifically, lactation consultants had a positive influence on breastfeeding duration during both prenatal and postpartum periods (Patel & Patel, 2016). One study particularly examined topics asked by mothers related to breastfeeding support on a social media page by the Australian Breastfeeding Association. The most common questions pertained to breastfeeding management (42%) such as feeding timing and frequency, positioning and latching, sore or damaged nipples, breastfeeding with large breasts, mastitis, blocked ducts, cysts, and thrush (Bridges, Howell, Schmied, 2018). Advances in technology provide another avenue for delivering health information, and may impact breastfeeding duration by providing social and peer support, as well as education (Asiodu, Waters, Dailey, Lee, & Lyndon, 2015).

According to data from the CDC (2018), the cesarean delivery rate was approximately 32% of all births. Cesarean rates are higher among preterm births than term births (54% vs 46%) which supports the findings in this study (50% vs 28.9%) (CDC, 2018). Mothers who deliver by cesarean section were more likely to delay breastfeeding initiation, especially within the first hour of life (Hobbs, Mannion, McDonald, Brockway, & Tough, 2016). Cesarean deliveries can also increase separation time between mother and infant, and decrease skin-to-skin contact, which are both factors
that contribute to insufficient milk supply (Hobbs, Mannion, McDonald, Brockway, & Tough, 2016).

GHTN, T1DM or T2DM, and GDM are among the top ten causes for an indicated preterm birth (Butler & Behrman, 2007). Therefore, it is not surprising that in this study, GDM ($\chi^2 (1, N = 531) = 9.07, p = .008$), T1DM or T2DM ($\chi^2 (1, N = 531) = 8.23, p = .020$), GHTN or Preeclampsia ($\chi^2 (1, N = 531) = 7.79, p = .046$) were significantly associated with preterm birth. As mothers of preterm infants were more likely to have a medical condition, this is likely the reason that medication use was a significant factor contributing to early cessation of breastfeeding. However, according to the APP (2013), the majority of medications are safe for mothers to use while lactating. This could reflect a gap in communication between healthcare providers of different specialties. Multiple gestation pregnancy was another factor found to be associated with early breastfeeding cessation similar to other studies (Wheeler, 2009; Odom et al., 2013; Maastrup et al., 2014; & Luz et al., 2018). The most common complication of a multiple gestation pregnancy is preterm birth. A multiple pregnancy can also increase the risk of preeclampsia and gestational diabetes (American College of Obstetricians and Gynecologists, 2019). This may explain why these medical conditions and multiple gestation pregnancy were both significantly associated with mothers of preterm infants.

In addition to the increased human milk supply needed for multiple infants, the mother must spend additional time to feed each infant during the day, likely affecting duration.

The most common reason for early cessation was inadequate human milk supply. This is consistent with findings from other studies (Odom et al., 2013; Zielinska et al., 2017; Crippa et al., 2019; Wang et al., 2019). All of the 531 respondents reported
breastfeeding from 0 to 3 months. Latching, sucking issues, or the use of a nipple shield were common reasons cited by respondents for early cessation. However, these issues would likely have developed within the first few weeks after delivery – likely leading to cessation prior to three months. Eighty-one percent of mothers reported their child received human milk within 0-2 hours of birth (46% preterm, 84.6% term). Preterm infants were more likely to receive their first feeding later – possibly due to admittance to the NICU, resulting in increased separation time. Longer stays in the NICU also contribute to extended separation time. Research suggests that mothers who expressed milk within six hours of delivery had a longer breastfeeding duration than those mothers who expressed milk beyond six hours (Parker, Sullivan, Krueger, & Mueller, 2015).

There were a few limitations to the current study. All survey responses were self-reported. It is possible that some respondents may have contributed some inaccurate data. Secondly, the survey was delivered using an online platform and a design flaw had occurred. In this case, some respondents were unable to answer particular questions based on previous responses. Questions regarding maternal age, maternal WIC participation, obtaining a breast pump, and use of a private lactation space were removed from analysis due to improper survey construction. In addition, mothers in the study were primarily white, of a higher education level, and likely higher socioeconomic status, not reflecting the general population of new mothers. Furthermore, the sample size for preterm infants inhibited statistical analysis of some questions. Also, the preterm population may have been skewed toward late preterm infants (≥34 weeks to ≤36 weeks). Of the total respondents, 9.4% had preterm infants with 1.1% reported as early preterm infants (<34 weeks gestational age). According to national data from the CDC, in 2015, 9.57% of the
all infants born are preterm with 2.75% of infants early preterm and 6.82% of infants late preterm. The variation in gestational age among the preterm group could be related to the overall sample size and self-selection bias. Given the demographics, these mothers may have had early access to prenatal care, influencing preterm birth rates. Approximately 15% of mothers in the United States receive inadequate prenatal care (CDC, 2018).

Lastly, breastfeeding rates from birth to three months were assessed as one group, rather than by each month.

There were several strengths of this study. The study provided a large variety of options for respondents to indicate the reasoning behind their cessation of either exclusive or non-exclusive breastfeeding. This study also obtained information specific to support and experiences from family and friends, in relation to cessation of breastfeeding. These questions were absent from most prior studies. The study directly compared preterm to term infants for multiple factors influencing breastfeeding cessation for one year where prior research was limited.
CHAPTER 6
CONCLUSIONS AND FUTURE WORK

This study found evidence to support a difference in exclusive breastfeeding rates between premature infants and term newborns at six months. Evidence also supports that maternal medications and multiparous births may be differentiating reasons for early breastfeeding cessation for preterm infants when compared to term infants. Additional research is needed to determine whether these breastfeeding rates and factors contributing to cessation differ using various methods for participant recruitment. This may provide a more equal distribution of race/ethnicity, education level, and socioeconomic status among the study population. As mothers in this study were primarily white, and of a higher socioeconomic class, it would be interesting to see if adequacy of prenatal care affected preterm birth rates and breastfeeding duration. More research is necessary to see if factors related to breastfeeding are associated with a specific gestational age in preterm infants. As these breastfeeding rates were higher than those indicated in previous studies, it would be interesting to identify what percentage of these births occurred at Baby Friendly Hospitals.

Future studies should contain a larger cohort especially including earlier preterm gestational ages (≤34 weeks) to determine if factors affecting earlier cessation differ by gestational age for preterm infants in comparison to term infants. A large proportion of respondents in this study received breastfeeding education from online sources including
social media and the internet. It may be necessary to identify the specific sources mothers are utilizing to ensure that accurate information is provided. In addition, it may be useful to collect more information about changes made to lactation support in the workplace as laws are amended at national and state levels.
APPENDIX A

DATA COLLECTION INSTRUMENT
Survey Instrument

HUMAN SUBJECTS CONSENT FORM

The following is a brief summary of the project in which you are asked to participate. Please read this information before proceeding with the survey (clicking “ok” below). You must be of legal age to participate in this study.

TITLE OF PROJECT: Exploring the Reasons for Breastfeeding Cessation in Preterm and Term Infants During the First Year of Life

PURPOSE OF STUDY/PROJECT: The purpose of this study is to compare the duration of breastfeeding among preterm and term children until 12 months of gestational age (GA), and identify differentiating barriers to early cessation of breastfeeding between populations.

SUBJECTS: Mothers of children aged 12 to 24 months who have provided human milk or at any point within the first year of life.

PROCEDURE: You have received a link to this study via social media outlets. You agree that you meet eligibility criteria (18 years or older, have a child between 12-24 months born in the U.S., and the child received human milk at some point during the first year of life). This survey will take approximately 20 minutes to complete.

BENEFITS/COMPENSATION: There are no direct benefits from participating in this study. However, participants can provide an email address to be entered into a drawing for a $25.00 Amazon gift card.

RISKS, DISCOMFORTS, ALTERNATIVE TREATMENTS: There are no risks to subjects in the study. As with all online survey tools, the server may collect information and your IP address indirectly and automatically via “cookies”.

I attest by clicking “ok” below that I have read and understood the following description of the study, “Exploring the Reasons for Breastfeeding Cessation in Preterm and Term Infants During the First Year of Life,” and its purposes and methods. I understand that my participation in this research is strictly voluntary. Further, I understand that I may withdraw at any time or refuse to answer any questions without penalty. Upon completion of the study, I understand that the results will be freely available to me upon request. I understand that the results of the material will be confidential, accessible only to the principal investigators, myself, or a legally appointed representative. I have not been requested to waive nor do I waive any of my rights related to participating in this study. I am over 18 years of age. I understand that I may voluntarily provide my email address at the conclusion of this survey for a chance to win a $25 (twenty-five dollar) Amazon gift card.

CONTACT INFORMATION: The principal experimenters listed below may be reached to Answer questions about the research, subjects' rights, or related matters.
1. Are you 18 years of age or older?
   - Yes
   - No
2. Was your child born in the United States?
   - Yes
   - No
3. Do you have a child currently between the ages 12 to 24 months?
   - Yes
   - No
4. Was your child fed breast milk at any point during the first year of life?
   - Yes
   - No

If answered no to questions 1-4: “Thank you for your participation in this study. Based on your responses to the previous questions, you do not fit the eligibility criteria for this study.”

5. How old were you when your child was born?
   - ≤ 18 years
   - 19 – 24 years
   - 25 – 29 years
   - 30 – 34 years
   - 35 – 39 years
   - ≥ 40 years
6. What is your race/ethnicity?
   - White (Not Hispanic/Latino)
   - White (Hispanic/Latino)
   - Black or African American
   - Asian or Asian American
   - Native Hawaiian/Other Pacific Islander
   - American Indian/Alaska Native
   - Other
   - Prefer not to answer
7. Who lived in your child’s household during child’s first year of life (mark all that apply):
   - Both parents lived in household during entire first year
   - Only mother lived in the household during the first year of life
   - Father lived in the household during the entire first year of life
   - Father lived in the householder partially during the first year of life
   - Father did not live in the household during the first year of life
   - Child’s grandparent(s) lived in the household during the entire first year of life
   - Child’s grandparent(s) lined in the household partially during the first year of life
   - Other family member(s) lived in the household partially during the first year of life
   - Other (please specify): __________

8. What is your highest level of education?
   - No schooling completed
   - Nursery school
   - Grades 1 through 11
   - 12th grade—no diploma
   - Regular high school diploma
   - GED or alternative credential
   - Some college credit, but less than 1 year of college
   - 1 or more years of college credit, no degree
   - Associates degree (for example: AA, AS)
   - Bachelor’s degree (for example: BA, BS)
   - Master’s degree (for example: MA, MS, MEng, MEd, MSW, MBA)
   - Professional degree beyond bachelor’s degree (for example: MD, DDS, DVM, LLB, JD)
   - Doctoral degree (for example, PhD, EdD)

9. Which region of the U.S. do you currently live? (select from drop down):
   - New England – (Connecticut, Maine, Massachusetts, New Hampshire, Rhode Island, Vermont)
   - Mid-Atlantic – (Delaware Maryland, New Jersey, New York, Pennsylvania, Washington)
   - Midwest – (Illinois, Indiana, Iowa, Kansas, Michigan, Minnesota, Missouri, Nebraska, North Dakota, Ohio, South Dakota, Wisconsin)
   - South - (Alabama, Arkansas, Florida, Georgia, Kentucky, Louisiana, Mississippi, North Carolina, South Carolina, Oklahoma, Tennessee, Virginia, West Virginia)
   - Southwest – (Arizona, New Mexico, Oklahoma, Texas)

10. Employment status (check box for each time mark):

<table>
<thead>
<tr>
<th></th>
<th>Not Employed</th>
<th>Part-time</th>
<th>Full-time</th>
<th>On Maternity Leave</th>
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</thead>
<tbody>
<tr>
<td>Birth</td>
<td></td>
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</tbody>
</table>
11. What is your child’s gender?
   - Male
   - Female

12. What type of delivery was your child’s birth?
   - Vaginal
   - C-Section

13. What type of birth was your child?:
   - Single
   - Twin
   - Triplet
   - Other (please specify): __________

14. At what week of pregnancy did you delivery your baby? (ex: 37 weeks)
   - _____________ (free text answer)

15. What was your child’s birth weight?
   - 15.8 oz – 2 lb 3.2 oz (450 – 999 gm)
   - 2 lb 3.3 oz – 3 lb 4.8 oz (1000-1499 gm)
   - 3 lb 4.8 oz – 5 lb 8.1 oz (1500-2499 gm)
   - 5 lb 8.2 oz – 8 lb 13 oz (2500 – 3999 gm)
   - ≥ 8 lb 13.1 oz (≥ 4000 gm)

16. Did the child receive WIC services during the first year of life?
   - Yes
   - No
   - Prefer not to answer

17. Did you receive WIC services during your pregnancy?
   - Yes
   - No
   - Prefer not to answer

18. If you or your child received WIC services, did you receive a breast pump from WIC?
   - Yes
   - No
   - Prefer not to answer
   - Does not apply

19. If you expressed (pumped) breast milk for your child during the first year of life, when did you receive your breast pump?
   - Prior to pregnancy
   - During pregnancy
   - A few days after birth
• A few weeks after birth
• One month after birth
• Several months after birth
• I never received, did not have, or did not use a breast pump

20. Do you have any of the following medical conditions? (select all that apply)
• Heart disease
• Cancer
• Kidney disease
• Respiratory disease
• Gestational Diabetes
• Type 1 or Type 2 Diabetes
• Other (please specify): ________________

21. Was the child fed human milk at birth?
• Yes
• No
• I don’t know

22. If yes, how long after birth did the child receive their first feed (either via the breast, bottle, or feeding tube)?
• 0-2 hours
• 3-12 hours
• 13-24 hours
• >24 hours
• I don’t know

23. After birth, was the child admitted to the Neonatal Intensive Care Unit (NICU) for any period of time?
• Yes
• No
• I don’t know

If answered “No” or “I don’t know” redirected to question 28

24. What was the reason for admittance to the NICU (select all that apply)?
• Respiratory problems
• Heart problems
• Poor feeding ability
• Infection /Fever
• Unable to control body temperature well
• Low blood sugar
• Low birth weight
• Monitoring/observation
• Other (please specify): ____________
25. If yes, how long did the child stay in the NICU?
   • ________ (free text answer)

26. How long did the child receive mother’s milk in the NICU?
   • Not at all during stay
   • Partially during stay
   • During entire stay

27. Did the child receive donor breast milk at any point in the NICU?
   • Yes
   • No
   • I don’t know

28. Check the corresponding box(es) for food(s) provided at each age:

<table>
<thead>
<tr>
<th>Age</th>
<th>Breastmilk Via Nursing (Directly from the breast)</th>
<th>Breastmilk (Via Bottle or Feeding Tube)</th>
<th>Formula</th>
<th>Rice Cereal/Oatmeal</th>
<th>Pureed Baby Foods</th>
<th>Table / Soft Foods</th>
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<tbody>
<tr>
<td>0-3 months</td>
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</table>

29. What are the reason(s) the child stopped receiving breastmilk within the first year of life? (select all that apply)
   • Difficulty latching/sucking and/or had to use nipple shield
   • Child biting
   • Child not gaining weight
   • Child sleepiness
   • Multiple birth (twins, triplets, etc.)
   • Child illness
   • Child feeding intolerance
   • Breast engorged or overfull
   • Leaking breasts
   • Pain with breastfeeding (i.e. sore, cracked, bleeding nipples; infected/abscessed breasts)
   • Previous breast surgery
   • Not producing enough milk
• Maternal medication
• Maternal illness or depression
• Maternal stress, fear, or tension of breastfeeding
• Maternal fatigue/tiredness
• Wanted to lose weight
• Became pregnant
• Inconvenience
• Not enough time
• Healthcare provider discouraged
• Returning to work/unable to express milk at work
• Did not want to breastfeed/pump in public
• Your partner did not support you to breastfeed
• The child’s grandparents did not support you to breastfeed
• Other family members did not support you to breastfeed
• None, I provided breast milk the entire first year of life
• Other (please specify): ____________________________

30. If employed, during the child’s first year of life, was a lactation room, suite, or designated space available to you for use?
   • Yes
   • No
   • I don’t know
   • Not employed outside the home within the last year
   
   *If answered “No,” “I don’t know,” or “Not employed outside the home within the last year” redirected to question 34*

31. How often did you use the lactation room or suite?
   • Several times daily
   • Once daily
   • Weekly
   • Rarely
   • Never

32. Was the lactation space convenient to you for use?
   • Yes
   • No

33. Did you have a private space (office, etc) where you were able to express (pump) milk without interruption?
   • Yes
   • No

34. Were you breastfed as an infant?
   • Yes
   • No
   • I don’t know
35. Have you ever seen anyone breastfed in person?
   - Yes
   - No
   - I don’t know
36. Had any of your close friends or family breastfed?
   - Yes
   - No
   - I don’t know
37. Have you ever discussed the topic of breastfeeding with anyone?
   - Yes
   - No
   - I don’t know
38. How many children do you have?
   - _____________________ (free text)
39. What are the ages of your children?
   - _____________________ (free text)
40. Had you had any experience breastfeeding older children prior to this birth?
   - Yes
   - No
41. Have you had any experiences with other family members or friends breastfeeding their children prior to giving birth?
   - Yes
   - No
42. Did you receive any breastfeeding education prior to giving birth?
   - Yes
   - No
   - I don’t know
   *If answered “No” or “I don’t know” redirected to question 44
43. Who provided the breastfeeding education? (check all that apply)
   - Doctor
   - Lactation consultant
   - Nurse
   - Midwife
   - Dietitian
   - Other healthcare professional
   - WIC services
   - Attended a class
   - Family member
   - Friend
   - Book
   - Internet (Google search, etc)
• Social media outlets (Facebook groups, Instagram, Blogs, YouTube videos, etc.)
• Other (please specify): _____________

44. Did you receive any breastfeeding education in the hospital?
• Yes
• No
• I don’t know

If answered “No” or “I don’t know” redirected to question 47

45. Who provided the breastfeeding education in the hospital? (check all that apply)
• Doctor
• Nurse
• Lactation Consultant
• Dietitian
• Other healthcare personnel

46. At what point did you receive the breastfeeding education in the hospital?
• 0 – 24 hours after birth
• 25 – 48 hours after birth
• 49- 72 hours after birth
• > 72 hours after birth

47. Did you receive any additional breastfeeding education after being discharged from the hospital (after giving birth) during your child’s first year of life?
• Yes
• No
• I don’t know

48. Did you receive lactation assistance after giving birth?
• Yes
• No
• I don’t know

49. Did you have the opportunity to receive lactation assistance after giving birth?
• Yes
• No
• I don’t know

50. If you are not currently breastfeeding or expressing (pumping), please provide the reason why you stopped. (Type “N/A: if still breastfeeding or providing breast milk)
• ____________________________________________ (free text)

Thank you for completing this survey! If you would like to be entered into a drawing for a chance to win a $25.00 Amazon gift card, please copy and paste the link below into your browser to provide your email address: https://www.surveymonkey.com/r/2RR7CK8
APPENDIX B

LOUISIANA TECH HUMAN USE COMMITTEE APPROVAL
OFFICE OF SPONSORED PROJECTS

TO: Ms. Rebecca Roberts and Dr. Vicky Green
FROM: Dr. Richard Kordal, Director of Intellectual Property & Commercialization (OIPC)
rkordal@latech.edu
SUBJECT: HUMAN USE COMMITTEE REVIEW
DATE: November 21, 2019

In order to facilitate your project, an EXPEDITED REVIEW has been done for your proposed study entitled:

"Exploring the Reasons for Breastfeeding Cessation in Preterm and Term Infants during the First Year of Life"

HUC 20-047

The proposed study's revised procedures were found to provide reasonable and adequate safeguards against possible risks involving human subjects. The information to be collected may be personal in nature or implication. Therefore, diligent care needs to be taken to protect the privacy of the participants and to assure that the data are kept confidential. Informed consent is a critical part of the research process. The subjects must be informed that their participation is voluntary. It is important that consent materials be presented in a language understandable to every participant. If you have participants in your study whose first language is not English, be sure that informed consent materials are adequately explained or translated. Since your reviewed project appears to do no damage to the participants, the Human Use Committee grants approval of the involvement of human subjects as outlined.

Projects should be renewed annually. **This approval was finalized on November 21, 2019 and this project will need to receive a continuation review by the IRB if the project continues beyond November 21, 2020. ANY CHANGES to your protocol procedures, including minor changes, should be reported immediately to the IRB for approval before implementation. Projects involving NIH funds require annual education training to be documented. For more information regarding this, contact the Office of Sponsored Projects.**

You are requested to maintain written records of your procedures, data collected, and subjects involved. These records will need to be available upon request during the conduct of the study and retained by the university for three years after the conclusion of the study. If changes occur in recruiting of subjects, informed consent process or in your research protocol, or if unanticipated problems should arise it is the Researchers responsibility to notify the Office of Sponsored Projects or IRB in writing. The project should be discontinued until modifications can be reviewed and approved.

Please be aware that you are responsible for reporting any adverse events or unanticipated problems.
REFERENCES


