

**FACTORS ASSOCIATED WITH MOTHERS NOT
PRACTICING BREAST MILK EXPRESSION
INITIATION AND EXCLUSIVE USE OF
MOTHER'S BREAST MILK AFTER DELIVERY
OF PREMATURE INFANTS IN KELANTAN**

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by

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In the name of Allah SWT, the Most Gracious, the Most Merciful

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LIST OF SYMBOLS

%	Percentage
n	Sample size
N	Population size
P	proportion
p	<i>p</i> - value or probability of success
<	less than
>	more than
=	equal to
α	alpha
β	beta
Z	value of standard normal distribution
Δ	precision

LIST OF ABBREVIATIONS

HRPZ II	Hospital Raja Perempuan Zainab II
O&G	Obstetrics and Gynaecology
IPS	Institut Pengajian Siswazah
USM	Universiti Sains Malaysia
HUSM	Hospital Universiti Sains Malaysia
BFHI	Baby Friendly Hospital Initiative
EBF	Exclusive Breastfeeding
NEBF	Non-Exclusive Breastfeeding
EBM	Expressed breast milk
SLR	Simple Logistic Regression
MLR	Multiple Logistic Regression
NMRR	National Medical Research Register
RM	Ringgit Malaysia
ROC	Receiver Operating Characteristic
OR	Odd Ratio
SD	Standard Deviation
UNICEF	United Nation Children Education Fund
WHO	World Health Organization
SSC	Skin-to-Skin Contact
KMC	Kangaroo Mother Care
PIMS	Perceived Insufficient Milk Supply
BFHI	Baby Friendly Hospital Initiative
SDT	Self-determination theory
MOM	Mother's Own Milk
ROP	Retinopathy of Prematurity
HM	Human milk

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**FAKTOR BERKAITAN DENGAN IBU TIDAK MENGAMALKAN
PERMULAAN PEMERAHAN SUSU IBU DAN PEMBERIAN SUSU IBU
SECARA EKSKLUSIF SELEPAS KELAHIRAN BAYI PRAMATANG DI
KELANTAN**

ABSTRAK

Memulakan penyusuan pada bayi pramatang selalunya lebih mencabar berbanding bayi cukup bulan kerana ketidakmatangan bayi. Bayi pramatang juga kurang berjaga, kurang stamina, lekapan penyusuan sukar berlaku, sukar mengekalkan hisapan, dan masalah menelan berbanding bayi cukup bulan. Oleh itu, *lactogenesis II* (pengeluaran susu) harus dimulakan dengan pemerahan susu ibu, memandangkan ketidakupayaan bayi untuk menyusu secara langsung disebabkan oleh ketidakmatangan dan keadaan perubatan mereka. Kajian ini bertujuan untuk mengenal pasti faktor-faktor berkaitan dengan ibu yang tidak mengamalkan permulaan perahan susu ibu dalam masa enam jam selepas kelahiran dan tidak memberi susu ibu secara eksklusif dalam tempoh 24 jam sebelum keluar hospital dan enam bulan selepas kelahiran bayi pramatang di Kelantan. Seramai 234 wanita yang melahirkan bayi pramatang di dua hospital tertiar di Kelantan menyertai kajian kohort prospektif ini. Satu set borang soal selidik berstruktur telah digunakan untuk mendapatkan data yang diperlukan pada hari 3 hingga hari ke 7 kemasukan bayi ke Unit Rawatan Rapi Neonatal (NICU). Panggilan telefon susulan atau WhatsApp dibuat semasa keluar hospital dan enam bulan selepas kelahiran untuk menentukan amalan penyusuan bayi. Kebanyakan ibu (87.6%) tidak memulakan pemerahan susu ibu dalam tempoh enam jam selepas kelahiran. Ia dikaitkan dengan ibu yang tidak melaksanakan sentuhan kulit kepada kulit (SSC) atau *kangaroo mother care* (KMC) Nisbah Odds Terlaras (AOR)

2.58, 95% CI: 1.12, 5.95), salah menjawab susu perahan boleh dipanaskan di atas api (AOR 0.40, 95% CI: 0.16, 0.97), dan ibu tidak tahu bahawa pemerahan susu ibu boleh dilakukan setiap 3 jam jika bayi pramatang tidak bersama ibu (AOR 15.15, 95% CI: 1.97, 116.76). Peratusan ibu yang tidak mengamalkan penggunaan susu ibu secara eksklusif dalam tempoh 24 jam sebelum keluar hospital ialah 43.7%. Faktor yang didapati berkaitan dengan ibu yang tidak mengamalkan penggunaan susu ibu secara eksklusif dalam tempoh 24 jam sebelum keluar hospital adalah pengetahuan bahawa ibu yang tidak bersama bayi mereka harus memulakan pemerahan susu ibu dalam tempoh enam jam pertama selepas kelahiran (AOR 0.45, 95% CI: 0.22, 0.91), ibu menghadapi masalah untuk memerah susu ibu kerana tidak bersedia dengan kelahiran pramatang (AOR 3.31, 95% CI: 1.10, 9.98), dan ibu tidak mempunyai masa yang cukup untuk memerah susu (AOR). 0.13, 95% CI: 0.01, 1.33). Peratusan ibu yang tidak mengamalkan penggunaan eksklusif susu ibu pada enam bulan selepas kelahiran bayi pramatang ialah 59.1%. Ia secara signifikan dikaitkan dengan niat untuk menyusui bayi selama enam bulan pertama kelahiran (AOR 4.00, 95% CI: 0.77, 20.65), halangan keadaan badan yang keletihan mengganggu ibu untuk memerah susu (AOR 0.17, 95% CI: 0.05, 0.58) dan pengeluaran susu yang sedikit mengganggu ibu untuk memerah susu (AOR 5.64, 95% CI: 1.41, 22.50). Perkadaran ibu yang memulakan perahan susu ibu dalam tempoh enam jam selepas bersalin dan mengamalkan pemberian susu ibu secara eksklusif semasa keluar hospital dan enam bulan selepas melahirkan bayi pramatang masih tidak memuaskan. Oleh itu, pemberian pendidikan kesihatan secara berterusan oleh petugas kesihatan bermula dari fasa antenatal adalah penting untuk menambahbaik permulaan pemerahan susu ibu dan seterusnya mengekalkan amalan pemberian susu ibu secara eksklusif sehingga enam bulan selepas kelahiran bayi pramatang yang meliputi modul pembelajaran.

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ABSTRACT

Initiation of breastfeeding in preterm infants is often more challenging compared with full-term infants due to their physiological immaturity. Preterm newborns have reduced levels of alertness, diminished stamina, and encounter heightened challenges in terms of latching, sustaining sucking, and swallowing as compared to their full-term counterparts. Thus, stage II lactogenesis (milk production) should begin with milk expression, considering the infants' inability to breastfeed directly due to their immaturity and medical state. This study aimed to determine the factors associated with mothers not practicing breast milk expression initiation within six hours post-delivery and not giving exclusive use of mother's breast milk within 24 hours prior to hospital discharge and six months after the birth of premature infants in Kelantan. A total of 234 women who delivered premature infants at two tertiary hospitals in Kelantan participated in this prospective cohort study. A set of structured questionnaires was used to obtain variables of interest within day 3 to day 7 of infants' admission to the Neonatal Intensive Care Unit (NICU). Follow-up phone calls or WhatsApp were made at discharge and six months after birth to determine the infant feeding practice. Most (87.6%) of the mothers did not initiate breast milk expression after six hours following birth. It was significantly associated with mothers who were not implementing skin to skin contact (SSC) or kangaroo mother care (KMC) Adjusted

Odds Ratio (AOR) 2.58, 95% CI: 1.12, 5.95), incorrectly answered EBM may be warmed on fire (AOR 0.40, 95% CI: 0.16, 0.97), and mother did not know that breast milk expression may be done every 3 hours if premature baby away from the mothers (AOR 15.15, 95% CI: 1.97, 116.76). The proportion of mothers not practicing exclusive use of mother's breast milk within 24 hours prior to hospital discharge was 43.7%. Factors found to be associated with mothers not practicing exclusive use of mother's breast milk within 24 hours prior to hospital discharge were knowledge that mothers who are not with their infants should start breast milk expression within the first six hours after birth (AOR 0.45, 95% CI: 0.22, 0.91), mothers have a problem to express breast milk because she was not prepared for premature delivery (AOR 3.31, 95% CI: 1.10, 9.98), and mother did not have enough time to perform breast milk expression (AOR 0.13, 95% CI: 0.01, 1.33). The proportion of mothers not practicing exclusive use of the mother's breast at six months after the birth of premature infants was 59.1%. It was significantly associated with intention duration to breastfeed the infant for the first six months (AOR 4.00, 95% CI: 0.77, 20.65), barrier of the tired body condition disturbed the mothers to express breast milk (AOR 0.17, 95% CI: 0.05, 0.58) and inadequate milk supply interrupted the mothers to express breast milk (AOR 5.64, 95% CI: 1.41, 22.50). The proportion of mothers who initiated breast milk expression within six hours after delivery and practicing exclusive use of mother's breast milk at discharge, and six months after delivery of premature infants was still unsatisfactory. Hence, it is imperative that health professionals engage in ongoing education beginning during the prenatal phase to enhance the initiation of breast milk expression and maintain the exclusive breastfeeding practice for six months after delivery of premature infants by using learning modules.

CHAPTER 1

INTRODUCTION

1.1 Background of the Study

Infants delivered before 37 completed weeks of gestation are considered premature and require close monitoring and intensive care (WHO, 2023c). Preterm birth is sub- categories based on gestational age during delivery. The first category pertains to infants born between 32 to 37 weeks, referred to as moderate to late preterm. The second category encompasses infants born between 28 to 32 weeks, known as very preterm. Lastly, the third category encompasses infants born before 28 weeks of gestation, categorized as extremely preterm (WHO, 2023c).

The global prevalence of preterm birth is 10.6%, with regional variations seen ranging from 8.7% to 13.4% of newborns (Chawanpaiboon et al., 2019). In the year 2020, it is anticipated that over 13.4 million infants were born prematurely, and tragically, nearly 1 million of these infants succumbed to complications associated with preterm birth. As per a recent report published by United Nations agencies and collaborating entities, the aforementioned statistic corresponds to around 10% of infants being born early, namely before reaching a gestational age of 37 weeks, on a global scale (WHO, 2023a). Malaysia has 12.3% of preterm births with a mortality rate of 1.35 per 1,00,000 live births per annum (Blencowe et al., 2012). In the year 2020, the prevalence of preterm births in Malaysia was recorded at 6.63%. Notably, the highest incidence of preterm births was observed among two specific demographic groups, namely Orang Asli and Indian women, as well as women aged 40 years and above (Ravichandran & Shamala, 2022). There exists a strong association between preterm deliveries and maternal health risks, including adolescent pregnancy and pre-

eclampsia (WHO, 2023). With an increasing survival rate of premature newborns, focusing on the nutritional management of this at-risk population is mandatory to enhance their standard of living (Ehrenkranz et al., 2006).

1.2 Introduction

Premature newborns exhibit significant heterogeneity in terms of their nutritional requirements and immune protection demands. Human breast milk derived from mothers who give birth preterm exhibits elevated protein content and increased concentrations of numerous beneficial compounds than women delivering at term (Underwood, 2013). Therefore, the American Academy of Paediatrics encourages all premature neonates to be fed with breast milk. If the mother's milk supply is insufficient, pasteurised donor milk should be supplemented instead of premature infant formula (Statement, 2012). Numerous studies have provided evidence that breast milk provides numerous benefits to these extremely fragile preterm infants. Among them are protecting preterm infants against infection (Lapidaire et al., 2022), improving neurodevelopment at 24 months corrected age (Gibertoni et al., 2015) and reducing the risk for necrotizing enterocolitis (Altobelli et al., 2020). Giving birth to a preterm is challenging due to premature delivery and Neonatal Intensive Care Unit (NICU) hospitalization. This phenomenon is widely regarded as an early adverse experience, which could affect mothers' emotions and perceptions during the early postpartum period which are regarded as a crucial factor in the establishment of maternal bonding with the infant (Trumello et al., 2018). Women with premature babies can encounter higher levels of stress due to presence of premature infants and their infants being admitted to the NICU for a few weeks or months (Ong et al., 2019). Consequently, the process of milk starts and maintenance poses greater complexity for

moms of premature infants. The expression must initiate milk production (lactogenesis II), because direct breastfeeding is impossible due to, they are born too early and medical state of neonates (Nyqvist et al., 2013). Most women faced with the occurrence of preterm delivery also doubting their capacity to breastfeed and produce breast milk. Premature infants commonly exhibit an underdeveloped sucking pattern after delivery, which is typically characterized as "disorganized" (Yi et al., 2019). This may lead mothers and staff to mistakenly perceive these infants as incapable of effectively engaging in nutritive sucking. However, it is important to note that this early suckling pattern does not serve as a reliable predictor of subsequent feeding development.

The UNICEF and WHO guidelines on Baby-Friendly Hospital 2009 in step 5 for infant who is unable to breastfeed directly from the breast recommend that, "if the baby is not able to suckle, the initiation of breast milk expression should commence promptly following childbirth, by six hours preferably" for successful breastfeeding. If expression is used to increase breast milk production, the goal is to express for approximately 20 minutes six or more times within 24 hours, including at least once during the night (WHO, 2009). Therefore, mothers should start expressing breast milk within six hours of giving birth and expression needs to be done regularly (Nyqvist et al., 2013). Study have found that, beginning milk expression within an hour after delivery boosts milk supply and reduces time to lactogenesis stage II in mothers of infants with very low birth weight (Parker et al., 2012).

An earlier study found that week one milk output strongly predicts an adequate/inadequate milk output at six weeks postpartum among premature infants. Regular lactation stimulation is linked to increases in milk production afterward (Hill et al., 2005a).

Providing human milk to a neonate born prematurely presents a number of challenges. Despite the well-established evidence supporting the positive impact of breast milk on reducing death and morbidity rates in preterm infants, the process of expressing breast milk poses significant challenges for the mothers (Ikonen et al., 2018). According to Swanson et al. (2012), fatigue frequently hinders the ability of mother to express breast milk effectively. Moreover, the frequent movements between home and NICU hinder the ability of mother to adhere to established routines for expressing milk. Mothers who were unprepared for preterm delivery and experienced disruptions in their plans, as well as concerns regarding the health of their infant, job security, and financial stability, were shown to be less attentive to frequent pumping. Lack of privacy while pumping due to interruptions by hospital staff, family and friends was identified as an obstacle to the establishment of a pumping schedule. Not having suitable breast pump at home resulted in great difficulty in developing a consistent pumping schedule and ensuring sufficient milk production despite devices' discomfort and exhaustion to empty the breast. Long distances from home to the hospital to bring breast milk that has been expressed is one of the barriers to expression. Apart from that, did not have enough time to do breast expression, difficulty in time management for breast expression and lack of assistance from their husband and family is another barrier for breast expression (Sisk et al., 2010). For some women, using a breast pump to express breast milk is embarrassing (Rossman et al., 2013). Women also may experience bruises, skin abrasions, or pain while expressing the milk in the first few days, especially women who do not have experience in expression skills (Lee et al., 2009).

An empirical investigation by Ikonen et al. (2018) proved that about 36.0% of mothers who delivered premature babies initiated the process of expressing breast milk

within six hours after delivery with median time of expression initiation was 9.0 hours. About 33.3% of mothers express their breast more than six times per day with the daily median expression frequency was six times. About fifty percent of mothers in this investigation offered their breast milk exclusively. A study by Gianni et al. (2018) found that approximately 66% of infants received any form of breastfeeding, while 27% of infants were exclusively breastfed at the time of their discharge from the hospital.

Various factors contribute to the non-exclusive use of mother's milk in premature infants. A study indicated that high gestational ages in premature infant, a lack of prior experience with expressing, and financial difficulties all predicted non-exclusive use of mother's milk. Significant predictors of delayed beginning of breastfeeding include experiences in the NICU, compromised psychological health, newborn boy's gender, delivery through caesarean section, and a higher gestational age at birth (Ikonen et al., 2018). Additionally, a higher chance of the baby exclusively receiving formula was linked to difficulty in expressing breast milk and difficulties in giving the infants with enough milk. A higher likelihood of being entirely formula-fed at discharge was also linked to initiating milk expression after the first 6 to 8 hours after delivery (Gianni et al., 2018).

1.3 Problem Statement

For preterm newborns, breast milk is generally regarded as the best source of nutrition (Kair et al., 2016). Due to their immaturity and premature birth, initiation of breastfeeding in preterm infants is frequently more challenging than in infants born full-term. Compared to full-term infants, premature infants are less alert, less physically fit, and have more difficulties latching, sucking, and swallowing (Boies et

al., 2016). Studies indicates that the initiation of breast milk expression should commence within six hours following delivery for mothers whose premature infants are admitted to the NICU, as this has been associated with increased milk output in the future (Parker et al., 2012; Hill et al., 2005b). In mothers with VLBW children, the first expression of breast milk 1 to 3 hours after birth prolongs the duration lactation and shortens the time to stage II of lactogenesis (Parker et al., 2018).

The National Obstetrics Registration (NOR) statistics for 2018-2020, compiled by Ravichandran & Sharmala (2021), reveal the distribution of preterm births at Hospital Raja Perempuan Zainab II (HRPZ II) in Kelantan State Hospital. The data indicates that 5.17% of births were premature in 2018, 5.98% in 2019, and 6.51% in 2020. This data is likewise exhibiting an upward trend. Evidence was found that, mothers who had premature babies and had delayed lactogenesis II thought their breast milk couldn't adequately meet the needs of newborns and they additionally planned to breastfeed for less than six months (Liu et al., 2013). The mothers' perception and intention for lactation at an early stage after birth predicted the duration of breastfeeding and were more inclined to follow through with their intention (Liu et al., 2013).

Previous research has identified several risk factors for mothers not initiate breast milk expression after delivery including, they are not ready for premature delivery, maternal health problem, infant health problem, perception of feeling inadequate milk supply, and caesarean delivery (Lui et al., 2013; Morag et al., 2016). According to parents' opinion, the elements that contribute to a successful supply of breast milk depend on mothers' motivation, knowledge of breastfeeding, and the compatibility of the NICU's routines with their demands (Alves et al., 2013). The practice of exclusive breastfeeding would be impacted by the delayed start of breast

milk expression. The later the initiation of breast milk expression, the greater the risk for failure to exclusively breastfeed at discharge, although only initiation after 48 hours was significant (Maastrup, et al., 2014a). Other than that, perceived inadequate milk supply and nursing difficulties will be led to early breastfeeding discontinuation (Kair et al., 2016). In recent years, there has been a significant accumulation of scholarly literature that has elucidated an escalated susceptibility to adverse health outcomes and death among children born in the late preterm period. This is commonly linked to feeding issues, especially when there is insufficient breastfeeding support available (Boies et al., 2016).

Therefore, the women's barriers to start breast milk expression and adhering to exclusive usage of mother's breast milk following the delivery of premature infants must be further investigated in greater detail. Thus, this research was conducted to explore the time of breast milk expression initiation and exclusive use of a mother's breast milk within 24 hours prior to hospital discharge and six months after birth of premature infants in Kelantan, Malaysia. Furthermore, the barrier factors for the women to start expression of breast milk within 6 hours and continue breastfeeding until the infants was discharged from NICU also need to be explored as it will be an associated factor for the women not to practice exclusive breastfeeding until 6 months.

1.4 Research Questions

The research questions formulated based on the problem statement and justification of the study. This study seeks to gain insight into the following research questions.

Research question 1: What is the proportion of mothers not practicing breast milk expression initiation within six hours of premature delivery in Kelantan, Malaysia?

- Research question 2: What are the associated factors for not practicing breast milk expression initiation within six hours of premature delivery in Kelantan, Malaysia?
- Research question 3: What is the proportion of mothers not practicing exclusive use of mother's breast milk within 24 hours prior to hospital discharge and six months after the birth of premature infants in Kelantan Malaysia?
- Research question 4: What factors are associated with not practicing exclusive use of mother's breast milk within 24 hours prior to hospital discharge and six months after the birth of premature infants in Kelantan Malaysia?

1.5 Objectives of the Study

1.5.1 General Objective

To study the factors associated with mothers not practicing breast milk expression initiation within six hours post-delivery and not giving exclusive use of mother's breast milk within 24 hours prior to hospital discharge and six months after the birth of premature infants in Kelantan.

1.5.2 Specific Objectives

1. To determine the proportion of mothers not practicing breast milk expression initiation within six hours of premature delivery in Kelantan, Malaysia.
2. To determine the factors associated with not practicing breast milk expression initiation within six hours of premature delivery in Kelantan, Malaysia.
3. To determine the proportion of mothers not practicing exclusive use of mother's breast milk within 24 hours prior to hospital discharge and six months after birth of premature infants in Kelantan, Malaysia.

4. To determine factors associated with not practicing exclusive use of mother's breast milk within 24 hours prior to hospital discharge and six months after birth of premature infants in Kelantan, Malaysia.

1.6 Research Hypothesis

1. Mothers' socio-demographic data, previous and current obstetric history, previous and current breastfeeding history, infant's history, experience with skin-to-skin contact, knowledge on feeding breast milk and barrier on breast milk expression are the associated factors with not practicing breast milk expression within six hours of premature delivery in Kelantan, Malaysia.
2. Mothers' socio-demographic data, previous and current obstetric history, previous and current breastfeeding history, infant's history, experience with skin-to-skin contact, knowledge on feeding breast milk and barrier on breast milk expression are the associated factors for not practicing exclusive use of mother's breast milk within 24 hours prior to hospital discharge and six months after birth of premature infants in Kelantan, Malaysia.

1.7 Conceptual and Operational Definitions

1.7.1 Conceptual framework

Figure 1.1 shows the conceptual framework of the study. Many factors are associated with not practicing breast milk expression initiation within six hours of

premature delivery and not practicing exclusive use of the mother’s breast milk at hospital discharge and six months after the birth of premature infants. The literature review revealed that maternal factors, infants’ factors, staff factors and breastfeeding history are the factors that may contribute to whether the mother will initiate breast milk expression within six hours of premature delivery. The success of exclusive use of a mother’s breast milk within 24 hours prior to hospital discharge and six months postpartum is closely related to the initiation of breast milk expression within six hours of premature delivery. All those factors mentioned may influence whether the mother will practice exclusive breastfeeding within 24 hours before hospital discharge and six months after delivery of premature infants.

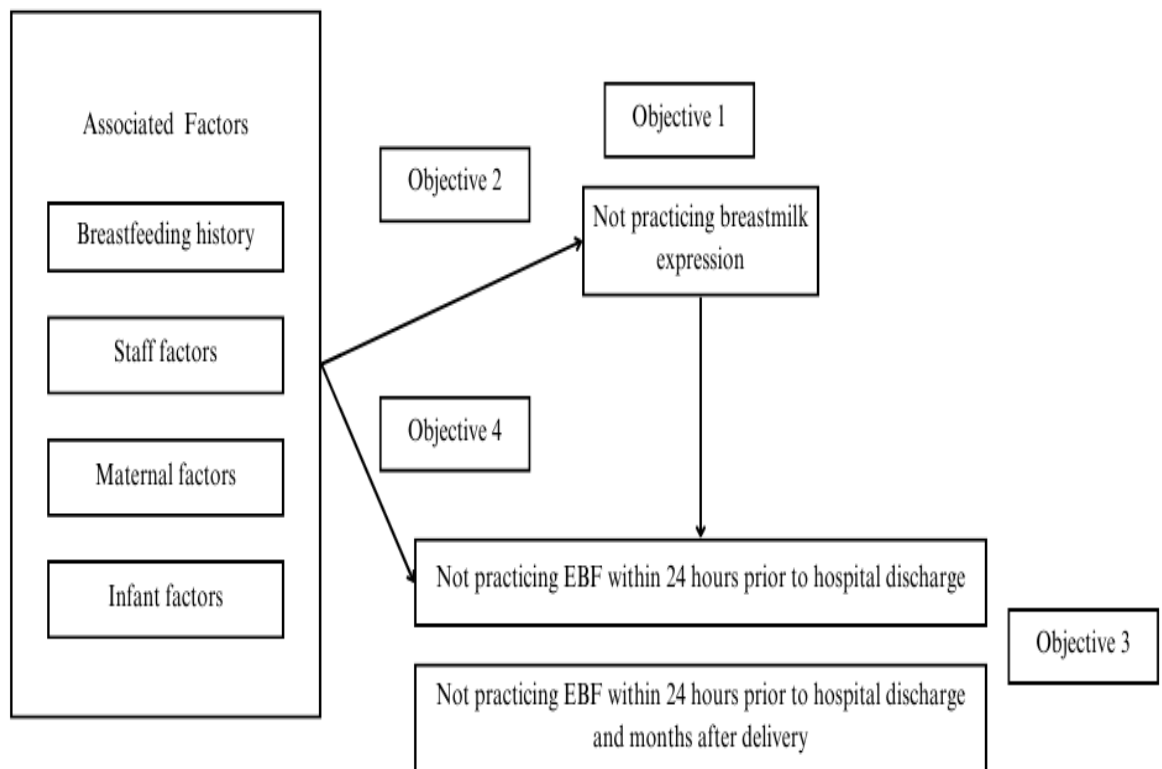


Figure 1.1 Conceptual framework of the study

1.7.2 Operational Definition

1. **Premature infants:** Infants born prior to 37 weeks of gestation are classified as premature (WHO, 2023c).
2. **Exclusive breastfeeding (EBF):** Providing newborns with just breast milk from their mother, or from a wet nurse, or expressed breast milk, with no other liquids or solids except from syrups containing vitamins, minerals, or medications, is known as exclusive breastfeeding (WHO, 1991).
3. **Exclusive breastfeeding at discharge:** It was defined as the infant feeding directly from the breast and from a bottle or other device (Maastrup et al., 2014a).
4. **Non- Exclusive breastfeeding (NEBF):** Defined as feeding neonates other than breast milk, excluding medications and vitamins, before the age of six months (WHO, 1991).
5. **Not practicing breastmilk expression (for objective 1):** In this study, not practicing breastmilk expression for objective 1 is defined as the mothers do not initiate expression of breast milk within six hours post premature delivery (Nyqvist et al., 2013; Ikonen et al., 2018).
6. Overarching category of factors:
 - i. **Skin-to-skin contact (SSC):** It is defined as placing the newborn on the mother's bare abdomen or chest as soon as possible following delivery. WHO recommends SSC for at least one hour after birth (WHO, 2009).

- ii. **Kangaroo mother care:** It is a care method for premature infants that involves continuous skin-to-skin contact between the mother and her infant. This contact is maintained for as close to 24 hours a day as possible, with the infant being placed in an upright position on the mother's chest, commonly referred to as the kangaroo position (Heidarzadeh et al., 2013).
- iii. **Length of hospital stay:** Duration of hospital stay after premature delivery.
- iv. **Lactogenesis II:** The onset of copious milk secretion after birth is known as lactogenesis II (Neville and Morton, 2001).

1.8 Significance of the Study

This section highlights the significance of the study by explaining two primary justifications. Firstly, breastfeeding offers numerous benefits for both mothers and their newborns, and premature delivery may heighten the likelihood of not engaging in exclusive breastfeeding. According to the literature study, preterm infants had a lower breastfeeding frequency than full-term neonates (Neila-Veila et al., 2015). This is because premature infants are susceptible to nutritional issues. Medical complications may lengthen a patient's hospital stay and delay their oral feeding progression (Lee et al., 2009). Furthermore, in many contexts, mothers and infants are physically separated, requiring special interventions to eventually breastfeed their infants (Nyqvist et al., 2013).

Besides that, it can take many weeks before infants born prematurely are capable of initiating breastfeeding. Maintaining lactation can present challenges, especially for mothers of extremely premature infants. This is due to the possibility

that they may need to express enough milk for a number of weeks before their child is ready to breastfeed, and it can be upsetting when they are unable to do so because their milk has reduced (Wilson, 2012). Moreover, a significant proportion of premature newborns have low birth weight and are too medically compromised to engage in breastfeeding. This often requires the utilization of breast milk expression to develop and maintain the mother's milk production. As a result, preterm infants' mothers face physiological and emotional obstacles that can negatively impact lactation (Jones and Spencer, 2007).

As preterm delivery is an unplanned event, most mothers of preterm neonates may not be antenatally primed on the lactational process, which could contribute to insufficient breast milk production, particularly in the first 2 weeks after delivery (Seah and Cheah, 2017). A Study performed by Hill et al. (2005) found that, mothers with preterm neonates are three times more likely to experience inadequate milk production in the first week following delivery than the mothers of full-term infants (Hill et al., 2005a). The research also discovered that numerous mothers of premature infants encounter difficulties in achieving optimal milk production due to various factors of unknown mechanisms (Geddes et al., 2013).

Therefore, this study was conducted to determine the proportion of mothers not practicing breast milk expression initiation within six hours of premature delivery, 24 hours prior to hospital discharge and six months post-delivery premature infants. In addition, in this study researcher want to identify whether the mother can initiate breast milk expression within the recommended period by UNICEF and WHO that stated in order to successfully breastfeed the child if they are unable to suckle from the mother's breast, the mother should begin expressing as soon as possible after giving birth or ideally by six hours (WHO, 2009). Understanding on barrier factors to start expression

of breast milk within six hours post-delivery and to continue breastfeeding or use of maternal breast milk upon hospital discharge and six months after delivery is very important for medical staff and policy makers to plan a strategy, interventions and additional support during pregnancy and after premature delivery. A special module as a guide to help a mother and medical practitioner in dealing with a problem that may be faced by a mother related to providing a mother's milk to their premature infant can be developed.

Secondly, since the study on the impacts of premature delivery on breastfeeding outcomes among the Malaysian population was limited, therefore the result of this study can be used by policymakers to develop comprehensive prenatal programs that highlights the significance of exclusive breastfeeding and the initiation of breast milk feeding. It is crucial for women to acquire knowledge and skills related to breast milk expression, appropriate storage and transit methods, and the maintenance of milk quality. This can assist to empower the women to continuously provide express breast milk and direct breastfeeding of their preterm neonates. In addition, hospital staff need to constantly provide support, encouragement, and feedback while observing for cues from both the mother and infant. Interaction between mothers in the NICU while nursing their respective babies may positively enhance individual confidence to continue expressing their milk and prolong the duration of breastfeeding (Seah and Cheah, 2017). Therefore, the aim of this study is to enhance the rate of breastfeeding among mothers who have given birth prematurely. This can be achieved by addressing the obstacles that prevent these mothers from initiating and maintaining breastfeeding. Health care providers can play a crucial role in this process by offering increased support, assistance, information, and education to these mothers.

CHAPTER 2

LITERATURE REVIEW

An efficient literature search technique is crucial for obtaining a comprehensive literature review from prior studies relevant to this study. The operational and conceptual terms, literature review, and findings from earlier related studies were obtained through a search of literature search engines. This was done in order to effectively integrate new knowledge into the literature review chapter. The search engines employed in this study included Google Scholar and PubMed, which were selected as freely available platforms to conduct the literature review. Additional search engines that were included were Science Direct and Research Gate. The key terms utilized were breast milk expression, initiation of breast milk expression, and premature infants. The screening method involved filtering the journal articles published between 2018 and 2023, covering a span of 5 years.

Breastfeeding is one of the most effective ways to ensure child health and survival (WHO, 2023b). However, contrary to WHO recommendations, fewer than half of infants under 6 months old are exclusively breastfed. Breastmilk is the optimal nourishment for newborns, particularly those born prematurely. It is secure, hygienic, and contains antibodies that provide protection against numerous childhood illness. Breastmilk supplies the infant with sufficient energy and nutrients throughout the initial months of life, and it remains a significant source of at least half of a child's nutritional requirements during the latter half of the first year, and up to one third during the second year of life (WHO, 2023b).

“Exclusive breastfeeding (EBF) means that an infant receives only breast milk from his or her mother or a wet nurse, or expressed breast milk, and no other liquids or solids, not even water, with the exception of oral rehydration solution, drops or

syrups consisting of vitamins, minerals supplements or medicines” (WHO, 1991). WHO and UNICEF recommend that, the infant should be initiate breastfeeding within the first hour of birth and be exclusively breastfed for the first 6 months of life which is meaning no other foods or liquids are provided, including water (WHO, 2023b). Infants should be breastfed according to their own needs, without any specific schedule, both during the day and at night. It is advised not to utilize any bottles, teats, or pacifiers. Starting at 6 months old, children should introduce safe and sufficient supplementary foods into their diet while also continuing to breastfeed until they are 2 years old or older (WHO, 2023b).

2.1 Breastfeeding among premature infants

Despite all of the aforementioned benefits, premature infants exhibit comparatively reduced rates of breastfeeding when comparing with newborns who delivered at term (Alves et al., 2013). A study found that only 63.8% of late preterm babies were breastfeeding at one month compared to 72.6% of term and 76.5% of post-term babies (Hackman et al., 2016). The study also discovered that infants with normal birth weights had a higher likelihood of being breastfed than those with small birth weights (Prasetyo et al., 2023). Study have found, the percentage of newborns getting breast milk exhibited variation according to their week of delivery (Chiang et al., 2019). The Malaysia data observed that around 7% of childbirths culminate in a preterm delivery (Jones et al., 2023). Studies have found that between 14.1% and 20.2% of preterm births in Malaysia were very or extremely preterm (Ravichandran & Sharmala, 2020; Inaz, 2017). There are quite a few research studies exclusively on mother’s breast milk among premature infants in Malaysia, and they are rare to find in

the literature. However, a survey by Hamid et al. (2021) shows that Malaysian neonates received breast milk at a higher rate than British infants.

Premature birth stands as the leading cause of mortality among children under the age of five globally. The preterm birth rate worldwide in 2014 was expected to be 10.6%, resulting in approximately 14.84 million live preterm births. Despite advancements in preterm survival rates shown in high-income nations, the mortality of preterm newborns remains a significant concern in numerous middle-income and low-income countries due to insufficient newborn care (Chawanpaiboon et al., 2019).

Preterm birth, as the leading contributor to prenatal morbidity and mortality, has garnered significant attention from the World Health Organisation (WHO) since 2010, as it aligns with the objectives outlined in the Millenium Development Goal (MDG) and Sustainable Development Goal (SDG) indicator. Breastfeeding is widely recognised as the predominant approach for nourishing and sustaining full-term newborns until they reach six months of age, at which point complementary feeding is introduced. Ideally, breastfeeding should continue beyond the first year of life, if feasible. Recent research findings have provided compelling evidence on the considerable advantages associated with the utilization of human milk (HM) for children who are ill or born prematurely and require care in neonatal intensive care units (NICUs) (Bertino et al., 2012).

A different breastfeeding policy for neonatal intensive care is required due to the distinctions between preterm and sick infants and their mothers and those of healthy infants and their mothers. Additionally, it mandated that medical workers have experience in lactation and breastfeeding assistance, as well as antenatal knowledge of newborn care (Nyqvist et al., 2013). There is a need for the enhancement of

breastfeeding support for premature infants and address concerns related to perceived mother milk supply and challenges with nursing (Kair et al., 2016).

2.2 Benefits of breast milk among premature infants

A substantial body of literature has been published, elucidating the advantages associated with the consumption of breast milk among premature newborns. Breast milk is more readily digested by infants, especially among preterm babies. It aids the baby's immune system and has unique qualities for premature infants (The Royal Women's Hospital, 2015). Compared to human milk from women who give birth at term, human milk from preterm delivered women contains higher quantities of protein and beneficial compounds (Underwood, 2013). Therefore, breastfeeding for premature babies should be started as soon as possible if there are no contraindications. The decision to start and sustain breastfeeding should be predicated exclusively on the infant's aptitude and stability, while a semi-demand feeding regimen should be employed during the process of transitioning to exclusive breastfeeding (Nyquist et al., 2013).

The optimal feeding option for preterm newborns continues to be expressed breast milk provided by the mother. In order to address the common feeding challenges experienced by preterm infants, such as difficulties coordinating sucking, swallowing, and breathing, it is recommended that mothers engage in the practice of expressing breast milk. (Grassi et al., 2019). Since breast milk is the most nutritious diet advised for preterm infants, admission of a neonate born preterm to the NICU shortly after birth resulting in the physical separation of the infant from the mother, thus practicing expressed breast milk (EBM) is necessary (Namusoke et al., 2021).

Due to its favourable effects on cardiovascular, neurological, bone, and growth outcomes, EBM is regarded as the optimal method of feeding for premature infants (Kumar et al., 2017). Providing nourishment to premature newborns with human milk decreases the infection rates, necrotizing enterocolitis (NEC), and rates of death. Breast milk also can enhance cardiovascular and neurocognitive outcomes (Bertino et al., 2012). In addition, it has been shown that the provision of human milk to premature infants has demonstrated enhanced neurodevelopmental outcomes in the long run (Eidelman, 2012).

NEC is characterized by ulcerative inflammation of the intestinal wall. In premature neonates, it is the most common acquired gastrointestinal (GIT) disorder. (Muller et al., 2016). Evidence demonstrate that the risk reduction is statistically significant only for studies in which breastmilk was administered to premature infants including their own and donated breastmilk. Measure such as breastfeeding and exclusive use of breast milk is one step in preventing NEC (Altobelli et al.,2020). It was supported by Eidelman (2012) that mentioned the advantages of feeding breast milk to premature infants, including decrease in the occurrence and severity of necrotizing enterocolitis. Additionally, the research demonstrates a decrease in the necessity of surgical intervention for managing necrotizing enterocolitis, with a corresponding decrease in mortality rates. This effect is particularly prominent when preterm infants are fed with breast milk that has been supplemented with a fortifier derived from breast milk. The disease-preventive properties of breast milk are likely associated with its ability to promote appropriate colonisation of the intestines, hence reducing the risk of inflammation and illness caused by harmful bacteria (Gregory & Walker, 2013).

The provision of human milk to preterm newborns not only serves as a safeguard against the onset of diseases and ensures an ideal supply of nutrients in the immediate period, but also fosters the establishment of a robust immune response in the extended duration (Gregory & Walker, 2013). In addition to this, the incidence of infection, sepsis, and meningitis is significantly diminished in very low birth weight (VLBW) infants who are nourished with breast milk as opposed to those who are exclusively fed formula (Petal et al., 2013).

There is a potential presence of beneficial components in human breast milk that may have the capacity to alleviate the severity of retinopathy of prematurity (ROP) (Okamoto, 2007; Manzoni et al., 2013). The identification of these components present in human milk has the potential to help to the development of a strategic approach aimed at preventing blindness in premature newborns (Okamoto, 2007). In a study done by Muneer et al. (2018) revealed that a relatively lower proportion of preterm infants who received breastfeeding exhibited the occurrence of retinopathy of prematurity. The research conducted on a sample of 428 preterm infants revealed a notable tendency towards a reduced occurrence of ROP in the cohort of newborns who were breastfed (36.8%) in comparison to those who received top-up feeding (63.2%). Besides taking breast milk as a nutrient orally, using newly expressed breast milk as ocular drops has demonstrated a reduction in the severity of ROP or the need for laser intervention in patients diagnosed with ROP during their initial assessment (Silahli et al., 2022).

2.3 Breast Milk Expression Initiation

It is quite advisable to provide support to the mother in the process of milk expression initiation within six hours of birth, and breast milk expression can be done

approximately six or more times throughout a 24-hour period (WHO & UNICEF, 2009). However, the onset of lactation can be negatively impacted by premature delivery, as the growth of the mammary glands may be inadequate due to the significantly shorter duration of pregnancy and the mammary epithelium are not receive sufficient priming from pregnancy hormones, resulting in an inadequate response for efficient milk (Gupta & Parikh, 2020). Moreover, the process of lactation can potentially be impeded due to factors such as stress, exhaustion, and worry (Jalal et al., 2017)

Early breast milk expression within six hours after delivery and frequent breast stimulation are correlated with higher milk production later (Hill et al., 2005). Study have found that, the commencement of milk expression within six hours after childbirth may not be linked to a higher milk volume, unless milk expression is commenced during the first hour after delivery (Parker et al., 2015). Therefore, mothers need to begin breastmilk expression as early as possible if separated from their babies

It is generally advised for mothers to commence breast milk expressing promptly following birth; nevertheless, there exists a lack of unanimity on how soon this should be performed (Maastrup, et al., 2014). Similarly, The Royal Women's Hospital (2016) also recommended mothers to begin breast milk expression as early after birth as possible, i.e., within a few hours. However, it may be a stressful event following the birth of premature infants. Therefore, it is recommended for mothers of preterm newborns receive guidance to commence early breast milk expressing during the first 12 hours following childbirth, which has the potential to lead to improved breastfeeding results (Maastrup et al., 2014). The act of expressing breast milk can be performed at intervals of three hours if a premature baby is away from their mother

(Che'Muda et al., 2016). The study also discovered that failure to exclusively breastfeed at discharge increased with delayed commencement of breast milk expression, albeit this relationship was only significant for initiation beyond 48 hours postpartum (Maastrup et al., 2014).

According to Boies et al. (2016), if the mother and child are separated, the mother should start hand-expressing colostrum within the first hour of birth. Late preterm infants who have no problems after delivery are encouraged to start breastfeeding within an hour after birth. However, according to Becker et al. (2016), the optimal method for expressing breast milk may vary depending on the length of time since birth, the reason for expressing the milk, and the individual characteristics of a mother's and infants. Favorable outcomes can be achieved by low-cost therapies such as early commencement of milk expression in non-suckling infants, relaxation techniques, breast massage, breast warming, manual expression by hand, and using less expensive pumps may be just as effective as huge electric pumps (Becker et al., 2016).

2.4 Practicing Breast Milk Expression Initiation

The occurrence of preterm birth followed by postnatal hospitalization presents obstacles to optimal use of mothers' breast milk. Usually, mother and child are separated so that the infant can receive necessary medical treatment. Because of prematurity and poor sucking of the infants, several weeks of breast milk expression are required before a baby can be breastfed directly (Heller et al., 2021). The stress of having premature newborns may be experienced by mothers of premature infants due to not being ready for early delivery, and their babies are admitted to the NICU for a day, a few weeks, or even months. Stress will be intensified for the mothers if they

lack sufficient knowledge and poor NICU-related maternal ability (Ong et al., 2019). The mothers of NICU-admitted neonates require well-planned interventions to deal with psychological issues that arise after their child's hospitalization. It's critical to promote early, ongoing, and sustained skin-to-skin contact (kangaroo mother care), early breastfeeding initiation, and mothers' access to breastfeeding support throughout the duration of the infants' hospital stay (Nyqvist, et al., 2013).

The establishment of a collaborative relationship between postnatal and neonatal wards is crucial in order to implement service enhancements that promote the beginning of early breast milk expression. The obstacle for health professionals is to ensure that all mothers receive individualized support to begin expressing breast milk as soon as possible and the support cater the unique requirements of each mother. Support from healthcare professionals among the factors influencing breastfeeding success in premature infants (Yang et al., 2018). Consistent and persistent support is crucial for the entirety of mother's journey, encompassing the processes of expressing breast milk, nursing, and transitioning to their home setting. Furthermore, it is imperative that assistance is provided to the household by a specialized community neonatal team in collaboration with the health visitor, or by fostering a more robust connection between health visitors and the neonatal unit (Wilson et al., 2012).

2.5 The important of Practicing Breast Milk Expression Initiation for successful exclusive breastfeeding at discharge and six months old

WHO and UNICEF advocate that breastfeeding should begin within an hour of birth and continue solely for the first six months of a baby's life without the addition of any other foods or beverages, including water (WHO, 2023b). Therefore, mothers with premature delivery who are separated from their infants need to motivate and

supported to start expression of breast milk as early as possible after birth (Parker et al., 2015). Therefore, it is crucial to support women in generating pleasant nursing experiences because they are predictive of future breastfeeding initiation and duration. (Jacobzon et al., 2022). In mothers with VLBW infants, starting breast milk expression within an hour after delivery boosts milk supply and accelerates the transition to stage II of lactogenesis (Parker et al., 2012).

Early and consistent breast milk expression likely through processes involving frequent and full removal of intramammary inhibitors of breast milk production, significantly contributes to the rapid initiation of lactogenesis stage II (Fok et al., 2019). Following childbirth, stage II lactogenesis, sometimes referred to as secretory activation, is characterised by the start of substantial milk production. This stage is triggered by the placenta delivery and the subsequent rapid fall in progesterone as well as the presence of high levels of prolactin, cortisol, and insulin (Pillay & Davis, 2023).

For a mother to be able to give breast milk for her preterm newborn at discharge, early breast milk expression must be begun (Degaga et al., 2020). Independently, early initiation enhances breastfeeding rates at six months (Fok et al., 2019).

2.6 Factors of sociodemographic of mothers will influence the practice of breast feeding to premature infants.

Factors associated with exclusive breastfeeding involving sociodemographic of mothers, including younger maternal age, older infant gestational age, and a higher level of breastfeeding self-efficacy, significantly predicted exclusive breastfeeding practice (Wang et al., 2019). A recent study conducted by Magnano San Lio et al. (2021) found that there is a positive correlation between educational level and the