FACTORS ASSOCIATED WITH BREAST MILK DONATION AND USE OF DONOR HUMAN MILK AMONG POSTPARTUM WOMEN AT THE PUMWANI MATERNITY HOSPITAL NAIROBI, KENYA

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DECLARATION

Candidate Declaration

This thesis is my original work and has not been presented for a degree in any other university or any other award.

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DEDICATION

This dissertation is dedicated to my doting parents; Mr. Samuel Kanyi and Mrs. Georgina Njeri. You have been my greatest source of inspiration, motivation, and support. You have imparted in me the traits of tenacity, and self-belief, assets that have proved invaluable in life. I am appreciative of your unwavering compassion, guidance, and encouragement throughout my pursuit of education. I love you always and forever.

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ABSTRACT

Background: The World Health Organization advocates donor human milk as a superior substitute for newborns unable to obtain mother's milk. Calls have been made for the scale-up of human milk banks to provide infants without access to mother's milk safe donor human milk.

Broad Objective: To assess factors associated with breast milk donation and use among postpartum women at a city hospital with human milk banking facilities.

Methods: This was a cross-sectional study. The study population were postpartum women receiving care at the Pumwani maternity hospital. Consecutive sampling technique was used to recruit 370 mothers. Data was collected using a pre-tested interview-based questionnaire. Data was analyzed using R-4.3.0 software and descriptive statistics were done for all variables. Further inferential statistics including Chi-Square test and multivariate logistics regression were computed with significance level set at $\alpha=0.05$.

Results: The mean age of the participants was 27 years (±6.3). A majority (78.6%) of the women were married and slightly above half (57%) had attained secondary school education. Only 27.3% were aware of human milk banking. The respondent's age had a significant association with willingness to donate breast milk OR =0.423[(95% CI 0.19, 0.942) p=0.0351]. Older mothers were less willing to donate compared to younger mothers. Awareness of human milk banking was significantly associated with willingness to use donated breast milk OR=0.894[(95% CI 1.066, 3.364) p=0.0294]. Respondents who were aware of human milk banking were less willing to use DHM compared to those who were unfamiliar with the practice.

Conclusion: Human milk banking awareness was low among the study population; however, mothers are willing to donate breast milk and use donated milk to feed their infants.

Recommendation: Maternal and child health programmes should educate mothers on human milk banking and the advantages of donor human milk to attract donor mothers and potential recipients.

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ABBREVIATIONS AND ACRONYMS

BM - Breast Milk

DHM - Donor Human Milk

HIV- Human Immunodeficiency Virus

HMB - Human Milk Bank

HTLV -1 - Human T-Lymphotropic Virus Type 1

LBW - Low Birth Weight

MOH - Ministry of Health

MOM - Mother's Own Milk

NBU- Newborn Unit

NEC - Necrotizing Enterocolitis

NICE - National Institute of Health and Clinical Excellence

NICU - Neonatal Intensive Care Unit

NMR - Neonatal Mortality Rate

PATH - Program for Appropriate Technology in Health

SDGs - Sustainable Development Goals

SNC - Special Care Nursery

SOP - Standard Operating Procedure

TB - Tuberculosis

UNICEF - United Nations Children's Fund

USAID- United States Agency for International Development

WHO- World Health Organization

OPERATIONAL DEFINITIONS OF TERMS

Donor Human Milk: Breast milk expressed by a nursing woman which undergoes standardized processing by an HMB for it to be consumed by a beneficiary who in this case is not the donor mother biological child (NICE, 2010).

Human Milk Bank: A strict program designed to recruit potential donors of breast milk, collect, process and distribute DHM that is free from any form of contamination for it to satisfy the unique nutritional and health demands of newborns (PATH, 2013).

Low Birth Weight: Infant birth weight of below 2500 g (WHO, 2014).

Mother's Own Milk: Human milk produced only for use by mother's own infant (Doege & Bauer, 2007).

Neonatal Mortality Rate: Deaths tolls in the initial twenty-eight days of life per every one thousand live births (UNCEF, 2015).

Preterm Birth: Babies born alive prior to completing 37 weeks of pregnancy (Vogel et al., 2018).

CHAPTER 1: INTRODUCTION

1.1 Background

Breast milk is the optimal nutrition source for every newborn. It contains bioactive compounds that are fundamental for their developing immune systems. This single characteristic of human milk makes it essential for the survival of infants, especially premature and underweight newborns who are known to have weak immune systems (Sánchez et al., 2021). Other health advantages associated with the provision of breast milk to infants include the promotion of gastrointestinal health, decreased mortality rates from severe respiratory infections and constipation, enhanced neurodevelopmental outcomes, and lowered risk of infectious illnesses in early childhood (Couto et al., 2020).

Breast milk provision has been considered a foundation for child survival and a viable means of reducing the more than 2.5 million infant mortalities that occur annually across the globe (Rosa-Mangeret et al., 2022). Considering the death risk for a non-breastfed child is significantly greater compared to that of a breastfed infant, especially in developing countries, it is evident human milk has the greatest effect on child health (North et al., 2022).

Not all newborns have access to mother's milk due to several challenges including maternal mortality, delayed onset of lactation due to preterm births, and maternal illnesses among other reasons. Without help, these vulnerable babies are unlikely to receive the lifesaving benefits that human milk provides. World Health Organization and other internationally recognized scientific bodies in the field of child health including the American Academy

of Pediatrics, the Academy of Breastfeeding Medicine, and the European Society for Paediatric Gastroenterology advise that Donor Human Milk (DHM) from Human Milk Banks (HMBs) should be the first choice before formula in cases of insufficient or unavailability of Mother's Own Milk (MOM) (Sriraman et al., 2018; Abrams et al., 2017; World Health Organization, 2011).

Donor human milk is breast milk that has been produced by lactating women, then processed by an HMB and distributed to recipients who are not the women's children (NICE, 2010). Evidence strongly suggests that DHM is preferable to infant formula (Henderson et al., 2001). Systematic analyses comparing DHM to infant formula show that donor human milk is substantially less likely to cause necrotizing enterocolitis in neonates, it is better tolerated by preterm newborns and significantly reduces the risk of neonatal sepsis (Altobelli et al., 2020).

In recognition of the advantages of DHM over infant formula where the use of MOM is not a viable option, the World Health Organization has recommended the expansion of HMBs globally (Darmstadt et al., 2023). Human milk banks are designed to collect breast milk from recruited donors after which, the donated milk is pasteurized, screened, and safely stored to ensure it's free from any form of contamination. Upon prescription, the DHM is distributed to cater to the unique nutritional and health requirements of infants in need (Demarchis et al., 2017).

The global trend in setting up HMBs to meet clinical demand for DHM has increased as the advantages of DHM are becoming more widely understood. Over 60 countries throughout the world have now established human milk banks, with a modest but growing

number of HMBs operating in resource-constraint regions (Shenker et al., 2020). The slow uptake of human milk banking in some countries can be attributed to a knowledge gap in the practice among the general public. According to research conducted in countries including Nigeria (Abhulimhen-Iyoha et al., 2015), South Africa (Goodfellow et al., 2016), and Turkey (Gürol et al., 2014), respondents who demonstrated awareness of human milk banking were knowledgeable about the procedures and hence more likely to donate or utilize DHM. Lack of knowledge led to inaccurate information on HMBs which affected the donor pool in that only a few mothers wanted to donate according to a survey conducted in Italy and the USA (Arianna et al., 2017; Pal et al., 2019).

The fear of spreading diseases is considerably higher in most developing countries considering they bear the heaviest burden of HIV/AIDS (WHO, 2023), a factor that drastically constricts the pool of potential donors. Other obstacles include systematic barriers, lack of policy support from the government, unfavorable community and maternal attitudes towards human milk banking, and detrimental traditions that frequently hinder the success of HMBs (McCloskey & Karandikar, 2018).

To meet clinical demand for DHM, it is essential to sustain successful recruitment practices, including regular donations of sufficient quantities as well as scaling up HMBs. Facilitators of human milk donation and DHM use ought to be established and appraised (Pimenteira Thomaz et al., 2008). Even though breast milk is the recommended feeding option for babies, with DHM as the best alternative to MOM, findings indicate DHM was inaccessible or frequently not used in caring for vulnerable neonates (Boundy et al., 2022). Limitations in the accessibility and use of DHM especially for preterm and LBW neonates might be attributed to different factors.

The availability of DHM at health facilities might be influenced by supply from HMBs. Human milk bank supply on the other hand can be affected by challenges an individual may encounter when considering donating breast milk including, paucity of awareness on human milk banking and notions about its acceptance (Doshmangir et al., 2019). When DHM is readily accessible, further hospital and individual-specific variables might impact its use. These include the lack of standardized guidelines and training of staff on DHM use, as well as HMB workers and mother's understanding and attitude about the health advantages and efficacy of DHM (Bai & Kuscin, 2021). Support from the government and logistics challenges to scaling up HMBs are essential to DHM supply. Addressing obstacles on the accessibility of HMBs, donation to HMBs, appropriate use of DHM in hospitals, and creating awareness about donated milk have a positive impact on its availability and use (Rosenbaum, 2012).

Results of a systematic review conducted to analyze factors affecting human milk banking indicated the primary facilitators were individual and social determinants while systemic and sociocultural factors, the most influential being religious belief, were major obstacles to the practice (Doshmangir et al., 2019). In Islamic countries, religious beliefs pose a significant challenge to human milk banking, as it is believed that human milk fosters kinship and therefore a limitation to marriage (Ergin & Uzun, 2018).

Intake of fluids, diet, and mental health status have been cited by literature as factors influencing the amount of milk produced. Human milk banks can positively impact milk donations by providing support to potential human milk donors (Alencar & Seidl, 2010). The improvement of lactation practices and, thus, the availability of MOM, depend on the support, promotion, and protection of breastfeeding (Demarchis et al., 2017). Increased

lactation assistance and better lactation counseling would help build a strong breastfeeding culture which would boost the pool of potential donors (Gelano et al., 2018). According to a study on Spanish milk donors, having surplus milk, altruism, and a strong breastfeeding culture were the primary drivers of milk donation. The choice to become a donor was primarily influenced by perceptions of the sociocultural environment as well as information from HMBs. The major obstacles to breast milk donation included a lack of awareness of human milk banking, distance from the HMB, work commitment, and reduced milk production due to breastfeeding (Mackenzie et al., 2013). Health professionals had a significant impact on caregivers' decisions to use DHM. They were regarded as experienced and reliable hence well positioned to educate mothers on human milk banking (Magowan et al., 2020).

With more than two hundred and thirty banks operating under a national program managed by the health ministry, Brazil boasts of the world's largest system of HMBs, supporting multitudes of newborns and nursing mothers. Underdeveloped countries including Uganda (Namuddu et al., 2024) and Nigeria (NHW, 2023) have also proven they are capable of successfully running HMBs. South Africa currently has seventy hospitals supported by HMB services, with thirty-seven HMBs in public health facilities (Demarchis et al., 2017).

The Sustainable Development Goal (SDG) number three aims to eliminate all preventable infant mortalities by 2030 and lower Neonatal Mortality Rates (NMR) to at least twelve deaths per one thousand live births (UN, 2015). In this regard, it is clear that additional resources and efforts are required during this crucial neonatal stage. Out of all the known strategies, human milk has the biggest possible effect on child survival (Clark & Wu,

2016). Therefore, every infant should be nourished with human milk to guarantee the best possible nutritional start to life.

Being one of the key strategies to prevent neonatal mortality rates, breastfeeding has been prioritized in Kenya. This is accomplished employing programs that encourage breastfeeding at the community units and in hospitals (Kenya Ministry of Health, 2013). The country's breastfeeding practices have greatly improved as a result of these interventions. For instance, the percentage of mothers who exclusively breastfed their babies increased from 32% in the year 2008 to currently 60% as indicated in the latest Kenya Demographic and Health Survey(KDHS, 2022).

Despite these advancements, infant formula is still the preferred feeding option for newborns that lack or have limited access to MOM considering the country is yet to adopt the WHO-recommended guidelines on the utilization of DHM. To ascertain that all infants benefit from human milk whether through breastfeeding or the safe supply of DHM if mothers' milk is unavailable, a comprehensive strategy to safeguard, encourage, and support breastfeeding is required (Israel-Ballard, 2018).

1.2 Problem Statement

To survive and flourish, newborn babies require the greatest care possible, including human milk, one of the most sophisticated forms of tailored medicines available (Witkowska-Zimny et al., 2019). Good digestion, strength, a strong immune system, a healthy metabolism, and many other favorable traits are fostered by human milk. Nothing else can provide the same level of support for immediate survival, short-term gains, or long-term benefits (Couto et al., 2020). Apart from promoting optimal growth and

development for every baby breastfed, the Lancet projects that optimal breastfeeding practices globally could avert over 820,000 child fatalities annually (Walters et al., 2016).

Following World Health Organization recommendations, all babies should nurse exclusively for the first six months after birth (WHO, 2003). The most popular method of giving human milk to infants is through breastfeeding or the use of expressed MOM. Nonetheless, not all women can be able to provide breast milk to their babies due to a variety of reasons, such as being too ill to nurse or using medications that are not advised during lactation. Furthermore, infants who are at risk—such as those who are orphaned, underweight, preterm, or suffering from serious health conditions—might lack access to MOM (Victora et al., 2016). These neonates are susceptible to poorer health outcomes as a result of complications that can be prevented with simple and economical interventions such as provision of human milk (Schanler et al., 1999).

In instances where mother's milk is unavailable, WHO advocates DHM as a life-saving substitute, particularly for vulnerable, preterm, and LBW neonates (World Health Organization, 2011). The advantages of DHM for at-risk neonates include lowering the incidence of necrotizing enterocolitis, an acute condition that results from inflammation of intestinal walls and frequently affects premature babies, particularly those who receive infant formula instead of human milk (Parker et al., 2021).

Currently, the primary causes of mortality during early childhood include prematurity and LBW. Approximately fifteen million babies are born prematurely every year worldwide, with about one million dying annually from complications related to preterm births. According to estimates, 196,000 babies are delivered prematurely in Kenya yearly, and

9,670 of those babies die from problems associated with prematurity (UNICEF, 2014). It has been established that the use of DHM over formula feeding in countries around the world, particularly developed countries where donor human milk is commonly utilized in caring for preterm and LBW neonates, considerably lowers neonatal mortality rates. For instance, since milk banks were incorporated into Brazil's newborn health strategy, there has been a dramatic 73% decrease in neonatal mortality between 1990 and 2013 (You et al., 2015).

World Health Organization issued a call for the expansion of HMBs to supply infants deprived of mother's milk safe donated human milk. Due to this development, calls have been made for vulnerable infants, such as underweight babies suffering from necrotizing enterocolitis, to have equal access to human milk (Darmstadt et al., 2023). Recognizing and addressing limitations to the provision of DHM for preterm and LBW infants would guarantee that these vulnerable infants access donor human milk whenever necessary to reduce associated deaths and morbidity (Parker et al., 2021).

Kenya launched a hospital-based model HMB, the first one in Eastern Africa in 2019 at Pumwani Maternity Hospital in Nairobi County (PATH, 2019a). The project is a pilot to see if similar banks can be set up elsewhere in the country. The HMB will enhance the safe delivery of DHM to newborns unable to obtain milk from their mothers as well as improve breastfeeding support for lactating mothers (PATH, 2019b).

1.3 Research Questions

i. What is the level of awareness of human milk banking and its influence on acceptance to donate breast milk and DHM use among postpartum women at the Pumwani maternity hospital?

ii. What is the perception of human milk banking among postpartum women at the Pumwani maternity hospital?

iii. How does previous maternal history (breastfeeding, perinatal characteristics) influence acceptance to donate breast milk and DHM use among postpartum women at the Pumwani maternity hospital?

iv. How do socio-demographic characteristics influence acceptance to donate breast milk and DHM use among postpartum women at the Pumwani maternity hospital?

v. How do socio-cultural aspects influence acceptance to donate breast milk and DHM use among postpartum women at the Pumwani maternity hospital?

1.4 Research Objectives

1.4.1 Broad Objective

To assess factors associated with breast milk donation and use of DHM among postpartum women at the Pumwani maternity hospital in Nairobi, Kenya.

1.4.2 Specific Objectives

i. To examine the awareness of human milk banking and its influence on acceptance to donate breast milk and DHM use among postpartum women at the Pumwani maternity hospital.

ii. To describe the perception of human milk banking among postpartum women at the Pumwani maternity hospital.

iii. To determine how previous maternal history (breastfeeding, perinatal characteristics) influences acceptance to donate breast milk and use of DHM among postpartum women at the Pumwani maternity hospital.

iv. To illustrate the influence of socio-demographic characteristics on acceptance to donate breast milk and use of donated milk among postpartum omen at the Pumwani maternity hospital.

v. To demonstrate how socio-cultural aspects influence acceptance to donate breast milk and the use of DHM among postpartum women at the Pumwani maternity hospital.

1.5 Justification of the Study

A great percentage of infants worldwide have no access to MOM, despite extensive evidence showing the advantages of breast milk with regard to infant development and well-being (Lyons et al., 2020). Around the world, up to 40% of babies in Neonatal Intensive Care Unit (NICU) are unable to access sufficient human milk in their first few weeks or days after birth (Israel-Ballard, 2018). These at-risk infants, mostly preterm neonates with LBW, are more prone to disability and death due to acute digestive problems,

frequent infections, and retarded growth or development. For these newborns, the WHO advocates the safe utilization of DHM as a crucial risk-reduction measure (World Health Organization, 2011).

The establishment of HMBs is becoming more widely acknowledged as a crucial intervention for fostering the health and nutrition of infants in the event the supply of MOM is insufficient or unavailable (Bhasin & Nangia, 2020). However, access to adequate and safe breast milk is a major problem in many countries globally, particularly for vulnerable newborns born prematurely or with health complications. The lack of HMBs in some regions especially resource constraint setups poses a major obstacle to providing vital, life-saving human milk to at-risk infants (Nakibuuka et al., 2024). In the absence of safe and reliable DHM, healthcare providers frequently have to consider alternative feeding options such as baby formula. Unfortunately, dependence on breast milk substitutes can have adverse effects on early initiation of breastfeeding and promotion of breastfeeding practices (WHO, 2022). The absence of readily available and affordable DHM from human milk banks aggravates this issue considering it limits the accessibility of an essential resource that could be instrumental in helping with breastfeeding constraints (Pimenteira Thomaz et al., 2008).

The absence of international protocol to guide the safe, efficient, and sustainable operationalization of HMBs as well as recommendations for the responsible use of DHM has been a significant gap. To address this limitation, PATH organized an advisory team in 2017 to create a blueprint for creating essential tools and guidelines that would improve integrated human milk banking initiatives. A toolkit for the establishment and integration of HMBs into the health care system programs was developed by PATH. This was a

collaborative undertaking that took into consideration inputs from key stakeholders and policy experts from different parts of the world (PATH, 2019b). The need for DHM has since increased both regionally and internationally (Abhulimhen-Iyoha et al., 2015). To ensure sustainability, human milk banks must boost donor mother recruitment and the quantity and frequency of each donation while promoting, protecting, and supporting breastfeeding (Goodfellow et al., 2016).

A feasibility study on human milk banking which was conducted before the launch of the only HMB in Kenya looked at the viability of the subject overall (Kimani-Murage et al., 2019); however, no studies have assessed the factors that support or oppose the practice of human milk banking. Findings from this study will help identify factors that promote breast milk donation and utilization of DHM in infant feeding, allowing for the implementation of strategies that will raise the prevalence of such donations and use as well as address concerns that may act as barriers to successful actualization and sustainability of additional HMBs in Kenya.

Considering Kenya is yet to implement the global best practice on human milk banking, evidence generated from this research is crucial for strengthening and aligning relevant policies in the country to emphasize prioritization and execution of strategies for the safe supply of DHM when MOM is unavailable.

1.6 Significance of the Study

The World Health Organization gave recommendations on the use of DHM to care for preterm and LBW infants who cannot be fed MOM. This recommendation was feasible in settings where safe and affordable human milk banking facilities have been implemented

or can be established. This was due to the worry that in severely resource-constrained e regions, the expenses associated with guaranteeing that donated human milk is free of HIV and other infections might be prohibitive (WHO, 2022). To meet the demand for DHM, there is a growing interest in setting up and maintaining HMBs throughout the world. Human milk banks are currently operating in more than 60 countries worldwide, with a modest but growing number of HMBs operating in low- and middle-income nations (Shenker et al., 2020).

Limited literature is currently available citing awareness, acceptance, and perception of human milk banking in Kenya. This study seeks to address this significant literature gap by determining the awareness and acceptance level of the practice, record postpartum women's perception of the topic as well as establish facilitators and barriers to the practice of donating breast milk and utilization of DHM in infant feeding. Considering the country has an operational human milk bank, it is also important to find out the mother's experience with the already established HMB. Furthermore, Human milk banking is a fairly new health concept and one that involves sensitive biological fluid, it is critical to also assess the influence of sociocultural concerns, especially in the African setup where diverse cultures and religions may interfere with its applicability.

Evidence generated from this research is crucial for guiding the establishment of additional HMBs in the country, including the formulation of standard operating procedures for human milk banking, integration of HMBs into the healthcare system, and the creation of effective and focused advocacy and communication campaigns regarding human milk banking (Amundson et al., 2017).

1.7 Scope of the Study

Human milk banks offer vital services of ensuring at-risk infants have access to human milk to help them develop, heal, and thrive when mother's own milk is unavailable or insufficient to feed her baby. The focus of this study is to examine awareness, acceptance, and perception of human milk banking and analyze factors associated with the donation of breast milk and the utilization of DHM for infant feeding among postpartum women at the Pumwani Maternity Hospital in Nairobi, Kenya.

CHAPTER 2: LITERATURE REVIEW

2.1 Introduction

The chapter presents an overview of the history of human milk banking and the processes involved, considerations for breast milk donors and DHM recipients, awareness, acceptability, and perceptions of human milk banking as well as determinates of human milk donation and DHM use.

2.2 History of Human Milk Banking

Records indicate the first ever HMB was started in Vienna, Austria in the year 1909 (Haiden & Ziegler, 2017). Wet nursing during that time was a prevalent method in Europe used as a substitute for breastfeeding for babies who couldn't access MOM. Wet nurses were replaced by HMBs due to their shortage and the increased danger of infection transmission. Around the world, many nations later passed federal food laws that recommended against informal breast milk sharing. Due to improvements in newborn feeding that heralded the production of high-quality baby formula in the 1960s, less labor was put into breast milk banking (Arslanoglu et al., 2013).

Many human milk banks were shut down when HIV infection was first reported in the 1980s because of its potential for transmission through breast milk. Unscreened breast milk was recognized as a threat; therefore, it became necessary to test human milk donors for the virus. More HMBs were also shut down due to the increased expense of screening potential donors. That pattern was reversed by the mandatory screening of the donor mother and adhering to standard operating procedures (Haiden & Ziegler, 2017).

Worldwide, human milk banking practices vary significantly due to religion, culture, and the prevailing economic status. Recommendations by WHO and pediatric societies on the use of DHM to feed premature/LBW newborns have spurred interest in human milk banking globally (Arslanoglu et al., 2013). In more than 60 countries, over 600 HMBs have been opened, with a majority located in developed countries. Brazil alone has a nationalized system of over 230 HMBs (Demarchis et al., 2017). There are roughly 70 HMBs in Africa, of which South Africa accounts for the majority (Eidelman, 2012) The first HMB was opened in Kenya at the Pumwani Maternity Hospital in 2019.

2.3 Human Milk Banking Process

The function of HMBs is to collect donor human milk, screen the DHM for any form of contamination, store, and after processing, distribute the prescribed human milk to infants in need. Breast milk from human donors needs to be handled like any other bodily fluid. Similar to blood donation, all human milk donors must go through a comprehensive screening process which involves an interview with potential donor mother, a serological examination to detect viral infections, and doctor approval.

After breast milk has been donated, a standardized procedure is followed throughout the entire process, from handling to screening to eventually prescription (Baumer, 2004). Significant differences exist in terms of the macronutrient composition of expressed breast milk among donor mothers (Cooper et al., 2013). To maintain a standardized nutritional content, breast milk from different donors is batched at the HMB. The Holder pasteurization method is used to process the milk at 62.5°C for half an hour using an industrial pasteurizer machine. The pasteurized milk is then cultured and donated milk

which has a positive culture after the pasteurization process is discarded. When DHM has been prescribed to an infant, the milk is supplied while frozen and thawed at the site of the beneficiary and administered accordingly. Meticulous records are maintained to facilitate the tracing of donor mothers and recipients and if needed, the recall of any unconsumed milk (NICE, 2010).

It is recommended to use globally accepted hazard management techniques as a guide to developing standardized operating protocols for donor mother screening and DHM processing. This will help to ensure the efficacy of the donated human milk. The fundamental specifications and quality guidelines that should apply to every HMB are outlined in PATH's implementation layout for enhancing HMB establishment (PATH, 2013). Furthermore, PATH conducts workshops on strengthening human milk banking and offers tools that were created using technical input from HMB networks that already exist as well as from earlier work done in other countries. The tools have since been tested and adopted by different jurisdictions such as India (PATH, 2016).

It has been proven that pasteurizing breast milk reduces the number of cells, growth hormones, and nutritional elements as well as its ability to protect against infections. Despite this, DHM is still strongly preferable to infant formula (Peila et al., 2016). The most significant group of newborns where DHM is required due to the lack of or insufficiency of MOM is premature LBW infants (Henderson et al., 2001).

2.4 Potential Human Milk Donors

They include healthy breastfeeding women who have excess breast milk than what their babies need, allowing them to donate and still have enough to feed their babies. Surplus

breast milk is determined by the ability of potential donors to express an extra feed or several feeds per day as might be the possibility with a woman with perinatal loss. Women are only permitted to donate if they test negative for human T-cell leukemia virus (HTLV), hepatitis B and C, syphilis, and human immunodeficiency virus (HIV). Women, who use illicit drugs, drink alcohol, smoke cigarettes, use cannabis or under prescription medication are not accepted as donors. Donor mothers are educated for eligibility purposes in a non-technical language, and written consent is sought. Afterward, the staff at the HMB gets a brief history of the donor and then draws blood for screening. After fulfilling all conditions, the donor mother is handed sterile milk containers for storage of expressed breast milk and taken through counseling on the best procedures for expressing and handling breast milk.

2.5 Recipients of Donor Human Milk

When a mother is not able to produce enough breast milk even after discussing and exhausting every possible alternative with staff that are knowledgeable about lactation and breastfeeding, DHM should be considered. WHO advocates donor human milk, particularly for LBW infants who are mostly preterm. To ensure distribution equality that benefits all vulnerable babies, prioritization criteria are essential.

The proposed DHM allocation criteria are as follows: Premature or LBW babies experiencing ill health; premature or LBW babies who are not sick; full-term babies having health issues who would benefit from donated human milk; Term babies who are healthy but lack access to MOM (PATH, 2013). Only after receiving a parent or guardian's written informed consent should DHM be administered. An approved prescription from the healthcare professional is needed beyond first-time infant feeding. If DHM is available and

supplementation is medically recommended, a continuing provision may be indicated for any infant.

2.6 The Need for Donor Human Milk

At-risk newborns, who either require gastrointestinal surgery as newborns or those born prematurely, have the greatest need for DHM. There are several obstacles preventing preterm babies from accessing MOM. Physical obstacles could exist when babies are taken to hospitals located distant from their mothers. In other instances, the mother might be sick or under a lot of stress due to her newborn being admitted to NICU and she might not be in a position to produce enough milk to feed her baby. Furthermore, infants who are at risk—such as those who are orphaned, abandoned, or suffering from serious health conditions—might lack access to MOM (Henderson et al., 2008). These neonates are susceptible to negative health outcomes as a result of complications that can be prevented with simple and economical strategies such as provision of human milk (Schanler et al., 1999).

2.7 Benefits of Donor Human Milk

Research comparing DHM with baby formula was published in the year 2007 (Henderson et al., 2007). Only eight studies fulfilled the requirements to be included in the Cochrane review, with only one of those studies comparing breast milk with fortified infant feeds (Schanler et al., 2005). Neonates who were recipients of donor human milk had lower NEC levels. Exclusive consumption of breast milk which includes MOM and/or DHM has been proven to lower necrotizing enterocolitis by 63% as well as surgical necrotizing

enterocolitis by 92% in extremely premature infants who weigh less than 1250 grams (Sullivan et al., 2010).

2.8 Awareness of Human Milk Banking

The slow uptake of the practice of donating human milk and utilization of DHM in underdeveloped nations can be attributed to limited awareness of human milk banking among the general public. A feasibility study on the perception of human milk banking which was conducted before the establishment of the only HMB in Kenya reported only 23% of participants who took part in the quantitative survey were familiar with the practice (Kimani-Murage et al., 2019). Studies conducted in other countries have also established low human milk banking awareness. A study among postnatal mothers in KwaZulu Natal, South Africa reported that only 18.9% of mothers interviewed had prior knowledge of human milk banking (Bhoola & Biggs, 2021). According to a similar survey which recruited one hundred and ninety-eight women in a health facility in Nigeria, only 25.8% were familiar with the practice of human milk banking (Abhulimhen-Iyoha et al., 2015). An investigation in south-east Nigeria that enrolled 1,500 pregnant and breastfeeding women from six different tertiary health facilities and another in Uganda among pregnant women indicated that only 39% and 24.6% were aware of the practice respectively (Iloh et al., 2018; Namuddu et al., 2023). Additionally, a similar study in Southeast China revealed that only 17% of postpartum women knew about human milk banking (Tu et al., 2022).

2.9 Acceptability of Human Milk Banking

To implement human milk banking programs, mothers and the larger community must show some level of acceptance of the practice for it to be successful. The acceptance of

DHM as an alternative, when MOM is not available, has been reported in some studies. An investigation carried out in Nigeria established that 70% of women were reluctant to receive DHM, however, out of a sample population of 680 people, 60% showed willingness to donate to an HMB (Ighogboja et al., 1995). In a similar research done in Ethiopia on the acceptability of human milk banking, only 11% of the 1,085 study subjects were ready to donate human milk while 15% were open to using DHM to feed their babies (Gelano et al., 2018).

A feasibility study in Kenya on the acceptability of DHM established that the majority of the participants (80%) were positive towards donating breast milk. Those who were willing to feed DHM to their children were 87%. At an individual level, more respondents (78%) were willing to donate breast milk compared to those who were willing to feed their infants DHM (59%). Personal dislikes concerns about transmission of diseases, and hygiene issues were the primary concerns with regard to donation of human milk and its utilization (Kimani-Murage et al., 2019). Similar observations were reported in a survey conducted among women in southeast China, which found that 44.6% of the participants were open to using DHM to feed their babies and 73.4% of the participants would donate breast milk to an HMB (Tu et al., 2022). A similar research where 448 mothers in Izmir, Turkey were interviewed revealed that 71.3% would accept DHM and 68.8% would donate human milk to an HMB (Ekşioğlu et al., 2015). In addition, a survey took place in Bhopal, India, revealed that 84.9% of the mothers interviewed were open to donating excess breast milk to an HMB while 85.4% would utilize DHM for feeding their infants (Melwani et al., 2018).

The observation that respondents who are knowledgeable about breast milk banking were inclined to donate human milk and use DHM in infants feeding is evident from the results of studies that took place in the USA and Brazil (Pal et al., 2019; Pimenteira et al, 2008). In Africa, results from similar studies conducted in South Africa and Nigeria (Bhoola & Biggs, 2021; Iloh et al., 2018) were also consistent with these findings. Thus, to increase public acceptance of human milk donation and utilization of donated milk, the advantages of HMBs ought to be widely promoted (Mackenzie et al., 2013). As it is in Brazil, incorporating HMB education into the current national breastfeeding framework would be a successful strategy for raising awareness (Israel-Ballard, 2018).

An investigation on the acceptability of DHM among health professionals conducted in urban Zimbabwean settings found that the idea was well-liked by different cadres of healthcare workers. While 56% of the study subjects said they would tell their clients to consider donating breast milk, just 31% were ready to use DHM to feed their babies (Chagwena et al., 2020).

2.10 Socio-Demographic Factors Influencing Human Milk Banking

Clinical demand for DHM is undoubtedly increasing, especially for premature babies and other neonates with various health conditions (Balachandran et al., 2018). The growing need has resulted in the operationalization of HMB in both public and private sectors in many countries (Nangi et al., 2018). However, the initial step in this process is to get donations and HMBs rely on donations from breastfeeding women with surplus breast milk or those unable to nurse own babies due to a variety of reasons (Osbaldiston & Mingle, 2007). In most HMBs, recruitment of donor mothers and boosting the amount and

consistency of donation have taken precedence. Considering donations are ultimately what make human milk banking successful, proper donor characterization is crucial (Pimenteira et al., 2008). The profiles of the donor mothers and factors motivating donation have been analyzed to identify new and better approaches for human milk donor recruitment and strategies to sustain donations (Stevens & Keim, 2015).

According to a study in India, among mothers who made regular donations to HMBs, older breastfeeding mothers were fewer. The majority of the women resided in urban settings and a great percentage were Christians and Muslims which are minority religions in the country. Most of the donors were unemployed, well-educated, and belonged to the middle class (Balachandran et al., 2018). A systematic analysis of facilitators and barriers of breast milk donation and its use revealed most human milk donors were highly educated and a majority had one to three children (Doshmangir & Khabiri, 2019).

According to research conducted in France, the conventional donor mother was of childbearing age and had a solid support system at home. Nearly half of the participants were stay-at-home mothers (Azema & Callahan, 2003). Socio-demographic attributes of donor mothers in a NICU setup were the subject of a study done in India. It was determined that the majority of the mothers in the section consistently donated breast milk, and a third had donated breast milk in the past. Religion did not influence breast milk donation. Continuous donations were observed in educated, well-off women with multiple children. Lastly, the duration of hospitalization and the mother and child's current health status affected whether donation continued after discharge from the hospital (Balachandran et al., 2018).

2.11. Socio-Cultural Concerns Associated with Human Milk Banking

Diverse religions and cultures have varying points of view on human milk banking. It is not considered improper in Buddhism, Hinduism, or Christianity to share breast milk. Rather, it is highly recommended (Ramli et al., 2010).

Breast milk sharing is regarded as a virtue in the Islamic religion. Numerous verses in the Koran encourage and support breastfeeding. It is challenging to establish HMBs in the Islamic community, nevertheless, because of a belief that holds that infants under two years who receive breast milk from the same mother are regarded as her biological children despite their lack of kinship. This belief states that since these children are siblings, they are not allowed to get married (Ramli et al., 2010). The Islamic Fiqh Academy Council has declared that the consumption of DHM from human milk banks could lead to future sibling marriages and has outlawed the introduction of HMBs in predominantly Muslim regions (Mackenzie et al., 2013).

Al-Naqeeb et al. (2000) suggest a culturally acceptable strategy for human milk banking and maintain that HMBs in Islamic countries ought to make certain that the donor and the recipient are aware of one another (Al-Naqeeb et al., 2000). In Turkey, the majority of the people have religious beliefs (Karadag et al., 2015). In an investigation by Gürol et al., nearly all the breastfeeding mothers who were interviewed were not familiar with human milk banking, and post sensitization on the practice more than half were unwilling to donate breast milk. Of those who took part, 36.3% reported religious concerns, while 28.9% indicated it would result in moral and social shortcomings (Gürol et al., 2014). The single-donor policy, in which an infant receives human milk from a known donor, is supported

by the Turkish people (Karadag et al., 2015). Single donor policy is in effect in Sweden as well; it is not recommended to pool donated milk for tracking purposes (Bonn et al., 2011).

2.12 Perception of Human Milk Banking

Before introducing a health intervention, determining the perception of the said intervention within the target population is an important first step. This is especially true with interventions involving delicate body fluids and in regions with increased HIV cases, where certain infant feeding options are frequently viewed negatively or feared due to their connections to HIV (Thairu et al., 2005). The efficacy of DHM has been extensively studied, but there is little information about its perception among the general public including HCWs who are hugely involved in the prescription and administration of DHM.

Results of a study in South Australia on mother's understanding and perception of human milk banking indicated respondents unanimously supported human milk donation to an HMB, as long as it was simple and couldn't consume a lot of time and mothers would utilize DHM provided they are guaranteed it is safe and suitable for their babies (Mackenzie et al., 2013). Human milk banking is not widely accepted in Ethiopia because of a lack of understanding of the practice and misconception about the efficacy of DHM (Gelano et al., 2018). According to research conducted in countries including South Africa (Goodfellow et al., 2016), Nigeria (Abhulimhen-Iyoha et al., 2015), and Turkey (Gürol et al., 2014), participants who demonstrated awareness of human milk banking had more knowledge about procedures involved and hence willing to donate human milk and feed their babies DHM. Lack of education led to inaccurate information on HMBs which affected the donor

pool in that only a few mothers wanted to donate according to studies in Italy and the USA (Arianna Virano et al., 2017; Pal et al., 2019).

Successful HMB implementation is heavily dependent on health care professionals. They play a crucial role when it comes to encouraging and influencing mothers to donate breast milk and feed their babies DHM. They must be adequately trained in order to serve as successful HMB ambassadors (PATH, 2019b). In the Brazilian case, mothers were informed of human milk banking while they received medical care, where a health worker informed them about the possibilities of donating breast milk and the use of DHM in infant feeding (Pimenteira et al., 2008).

Alencar et al. (2009) established training of mothers by HCWs on human milk banking helped Brazilian mothers to identify themselves as possible donors and users of DHM (Alencar et al., 2009). Like South Africa, accepting the practice of human milk banking was difficult because healthcare workers were not sensitizing mothers on the practice of human milk banking, which discouraged them from participating in breast milk donation and feeding their babies DHM (Goodfellow et al., 2016).

2.13 Strengthening Human Milk Banking

Numerous lives could be saved if all babies had fair access to human milk, especially vulnerable newborns like those who are prematurely born or with LBW. However, many are deprived of MOM during their first few hours or days after birth. Giving DHM to such infants is advised as it is preferable to formula. To guarantee the safety of donated human milk, a strict screening, pasteurization, storage, and distribution procedure is needed in an HMB. Human milk banks can also protect, promote, and support breastfeeding when

incorporated into comprehensive and integrated programs for nutrition and newborn care (PATH, 2019b).

2.14 Identification of Knowledge Gap

Limited literature is currently available citing awareness, acceptance, and perception of human milk banking as well as determinants of human milk donation and its use in the country. This investigation seeks to tackle this significant literature gap by determining the awareness and acceptance level of the practice, record postpartum women's perceptions of the topic as well as establishing facilitators and barriers to the practice of donating breast milk and utilization of DHM in infant feeding. Considering the country has an operational human milk bank, it is also important to find out the mother's experience with the already established HMB.

2.15 Conceptual Framework

Data on the dependent variables (willingness to donate breast milk, willingness to use DHM) was collected and respondents were classified as willing or not willing to either donate breast milk or use DHM to feed their babies. Information on participants' socio-demographic attributes, maternal history (perinatal, breastfeeding characteristics), awareness on human milk banking, perception of the practice, and socio-cultural factors were collected and analyzed to determine the significance of association with the dependent variables.

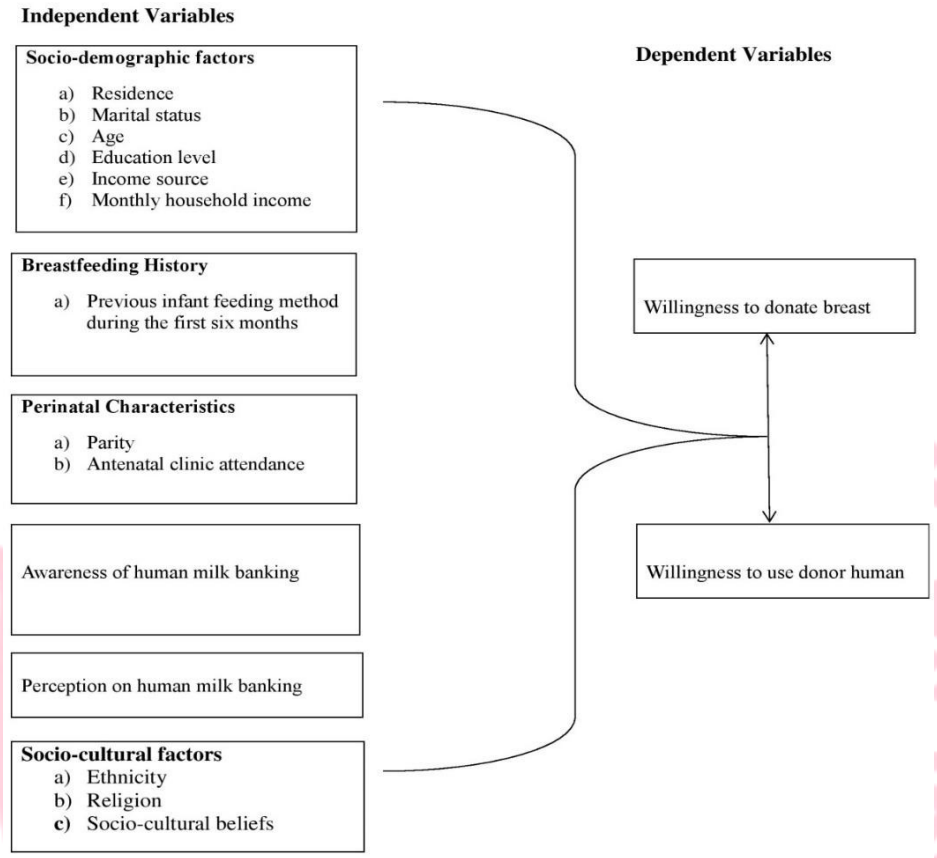

Figure 2.1: Conceptual Framework

CHAPTER 3: METHODOLOGY

3.1 Introduction

The materials and techniques used in this investigation are covered in this section. It outlines the research methods including the study design, target population, site of study, variables examined, and data collection instruments. Additionally, it describes the sampling techniques and the processes, analytical approaches for data collected, and ethical aspects guiding the study.

3.2 Study Design

A cross-sectional study design was used where information was obtained from study subjects at a single point in time. This was an effective method of carrying out the research as it provided a snap chat of the current situation and there was no loss to follow-up. Both descriptive and analytical methods were employed to describe and investigate the relationship between the predictor and the outcome variables. Descriptive methods were useful in the assessment of the frequency and distribution of the variables, while analytical methods were used to examine the association between variables.

3.3 Study Setting

This research was carried out at the Pumwani Maternity Hospital, a Ministry of Health primary care facility located in Kamukunji constituency, Nairobi County. With an average of 120 deliveries per day, it is Kenya's largest specialized referral hospital dedicated to maternity and newborn care. The facility mostly serves women from Nairobi and the surrounding counties who are low and middle-income earners.

The inaugural HMB in Eastern Africa was set up at this hospital in 2019 as a pilot project to support and promote breastfeeding among nursing mothers while at the same time facilitating the provision of safe DHM to at-risk neonates with no access to MOM (PATH, 2019a).

3.4 Study Population

The study subjects were postpartum women at the Pumwani Maternity Hospital postnatal wards. Postpartum women were the target for this study considering they are potential human milk donors and users of DHM.

3.4.1 Inclusion Criteria

Postpartum women above eighteen years receiving care at the Pumwani Maternity Hospital postnatal wards including those referred from different hospitals within the duration of data collection were considered to be part of this survey. The minimum period after birth for postpartum women who had normal deliveries to be considered for the study was at least eight hours after giving birth and at least two days post-operation for those who had undergone caesarian delivery.

3.4.2 Exclusion Criteria

Mothers with babies in critical condition, mothers who did not meet the minimum post-delivery time consideration, mothers who declined to be part of the study as well as mothers who were ill and could not answer survey questions were not part of this survey.

3.5 Sample Size Determination and Sampling Procedure

The parameters from a feasibility study in Kenya that found 78% of the sampled population showed willingness to donate human milk were used to determine the sample size for this study. This study was carried out in three health facilities of which two were public hospitals namely Mama Lucy Kibaki Hospital and Kenyatta National and a private health facility dedicated to pediatric care. In the community, the investigation took place in Umoja and Kayole localities in the eastern parts of Nairobi county (Kimani-Murage et al., 2019).

Single population proportion formula was used to estimate the sample size with a 95% confidence level and 5 % margin of error as indicated below:

$$n = Z_{\alpha/2}^2 * p*(1-p) / d^2,$$

$$n=1.96^2 *0.78 (1-0.78)/ 0.05^2$$

Where;

z = SD which at 95% confidence interval is set at 1.96

p = the proportion of the population of interest estimated to possess the desired characteristic.

d = Desired degree of accuracy, which at 95% confidence interval is set at 0.05

n = 264

The admission process in the postnatal wards at the Pumwani maternity hospital is sequential. The mother-infant pairs are then admitted to designated rooms for further care therefore, recruitment of participants was initiated upon admission in the postnatal wards.

By use of consecutive sampling method, all accessible study subjects who meet the eligibility criteria were considered to be part of the research. Three hundred and seventy mothers were recruited which was more than the required minimum sample.

3.6 Data Collection Instruments

A pretested interview-based questionnaire developed by the authors based on relevant literature and issues brought up by other researchers was used in obtaining information on participant's socio-demographic attributes, previous maternal experiences (breastfeeding history, perinatal characteristics), awareness on human milk banking, perception towards the practice other general factors that might influence acceptance to donate human milk and its use when MOM is unavailable. Data was collected from 8th May 2023 to 16th May 2023.

3.7 Reliability and Validity of Data Collection Tools

Before the questionnaire was used to collect actual data, it was pretested at Gatundu Hospital, where twenty-five postpartum women admitted to the hospital's postnatal wards were interviewed. The results were analyzed, and internal consistency tests were performed to determine the reliability. The questionnaire was reviewed, and corrections were made to better align it with the objectives of the study. Face and content validity were also adopted to establish the appropriateness of the research tool. To establish face validity, the researcher examined the instruments to determine whether they measured the variables appropriately. The researchers engaged professionals in the field of human milk banking to establish content validity. Two experts evaluated the instruments and verified their ability to measure the variables under study.

3.8 Data Collection Procedure

This study employed a researcher-administered electronic-based questionnaire using ODK Collect, an open-source Android application. After the survey tool has been uploaded in ODK collect, users can access the form from the application and respond to a survey. Finalized submissions are sent to a server and new forms are downloaded. The dataset can be downloaded from the application or sent to other software to create real-time dashboards. For this study, the lead researcher was the one who uploaded the data collection tool in ODK and reserved all the rights to access the server.

The lead researcher together with four research assistants carried out the data collection. The research assistants received training before data collection to ensure consistency in recording responses and asking questions. The training featured the identification of eligible participants, data collection procedure, obtaining informed consent, and conducting the interviews. The inclusion- exclusion criteria were used to identify potential study subjects. The research team briefed the study participants in detail on the aim of the survey and what was required of them. Mothers were then asked for their informed consent. After receiving consent, a physical interview was carried out with the research subjects using a pretested structured questionnaire which captured their bio-data and other relevant information of interest to the study.

On either day 2 or day 3 following birth, mothers receiving care in the postnatal wards after undergoing cesarean delivery were interviewed. Interviews with mothers who had normal deliveries were conducted in their wards of residence 8 hours after giving birth, while those whose babies were admitted to the special care nursery were interviewed any time during

their stay in the hospital. Interviews with participants lasted about 20 minutes. Every day, all of the questionnaires were reviewed to make sure they had been filled correctly. Before the interviews started the following day, missing data was verified. Informed consent forms were put in files and safely kept in a locked cabinet at the site.

3.9 Quality Control

To ascertain the relevance of set questions in identifying the significant differences of variables under investigation, the study tool was pre-tested at Gatundu Hospital, where twenty-five postpartum women receiving care at the hospital's postnatal wards were interviewed. The interviews were conducted in Swahili language considering it was easily understood by respondents. The research assistants were trained on the usage of the questionnaire and how best to carry out the interviews. They also received copies of the research protocol to ensure consistency in collecting data.

The inclusion and exclusion criteria were to be strictly followed. Data collected on each day was checked for accuracy, and any potential errors were forwarded to the research aids who conducted the structured interviews for verification and correction. Data collected each day was assessed by the principal researcher who also took the lead in data management.

3.10 Data Analysis and Presentation

Findings for this investigation were reported using descriptive statistics including means, frequencies, and percentages while inferential data was presented as association between predictor variables and outcome variables.

After collection, data was coded, entered, and cleaned then analyzed using R-4.3.0 software. Chi-square test was used to assess the initial relationship between independent and dependent variables, with any statistically significant differences being noted. Using multivariate logistic regression models, the odds ratio (OR) at 95% confidence intervals (CIs) for each potential factor influencing acceptance to donate breast milk and acceptance to use DHM were computed. $P < 0.05$ was regarded as statistically significant.

3.11 Ethical Considerations

i. Ethical clearance was sought from Amref Ethical and Scientific Review Committee (Appendix III). The research permit authorizing the study was obtained from the National Council of Science and Technology (Appendix IV). Authorization letter to conduct the study the study at the site was provided by the medical superintendent of Pumwani Maternity Hospital (Appendix V).

ii. Written informed consent was given by study subjects prior to enrollment. The participants received an explanation of the study in their preferred language, with the assistance of a translator when necessary.

iii. Participants were made aware of the non-mandatory nature of participation. They were informed there would be no consequences if they chose to decline or withdraw from the research at any given time during data collection.

iv. Participant confidentiality was safeguarded by the use of unique identification codes on the questionnaire and personal information was not recorded. Additionally, access to data collected was limited to the researchers who signed the data confidentiality agreement forms.

v. Participants received assurances that there would be no risks and that taking part in the study would not result in any additional expenses while at the hospital.

3.12 Study Limitations

This investigation was carried out in a government hospital that mostly serves women who are low and middle-income earners. As such, the findings might not be generalizable to other Kenyan contexts. Given that the research was carried out at a health facility, the views of women in other setups may differ.

CHAPTER 4: RESULTS

4.1 Introduction

Our study examined awareness, acceptance, and perception of human milk banking and analyzed factors associated with the donation of breast milk and the utilization of DHM for infant feeding among postpartum women at the Pumwani maternity hospital. The response rate for the survey was 98%. This section presents the study findings in accordance with the aims of the research. The results are here below presented in tables.

4.2 Socio-demographic Characteristics of the Study Population

The mean age of the mothers was 27 years (±6.3). The majority (78.6%) were married, 19.5% were single, and 1.9% had separated from their partners. Slightly above half (57%) of the respondents had attained secondary school education, 22.2% had attained primary school education, 18.4% had attained tertiary education and 2.4% had no formal education.

Over two-fifths (44.1%) of the participants were housewives, 35.1% were self-employed and the rest (20.8 %) were regular salaried workers. The mean monthly household income of the participants was KES 14975.2 (±17618.7). Slightly above half (55.7%) of the study participants were from informal urban areas, 42.2% from formal urban areas, and 2.2% from rural areas (Table 4.1).

Table 4.1: Socio-demographic characteristics of study participants

Variables	Category	n=370
		n (%)
Residence	Informal urban	206 (55.7)
	Formal urban	156 (42.2)
	Rural	8 (2.2)
Marital status	Single	72 (19.5)
	Married	291 (78.6)
	Separated	7 (1.9)
Respondents age group	< 25 years	145 (39.2)
	25 – 29 years	100 (27)
	30 – 34 years	73 (19.7)
	35 – 39 years	34 (9.2)
	> 40 years	18 (4.9)
Education level	No formal education	9 (2.4)
	Primary school	82 (22.2)
	Secondary school	211 (57)
	Tertiary	68 (18.4)
Income source	Formal employment	77 (20.8)
	Housewife	163 (44.1)
	Self-employed	130 (35.1)
Monthly household income	< 20000 ksh	247(66.7)
	20000 – 40000 ksh	95(25.7%)
	> 40000 ksh	28(7.6)

4.3 Previous Maternal History

4.3.1 Perinatal characteristics of participants

More than half (58.1%) of the participants were multipara. Nearly all (98.9%) mothers attended antenatal clinics when they were expecting their current child. The average

number of ANC visits among participants who reported having attended antenatal clinics was 4.1 (±1.3) as shown in Table 4.2.

Table 4.2: Perinatal characteristics of participants

Variable	Category	n=370 n (%)
Parity	Primiparous	155 (41.9)
	Multiparous	215 (58.1)
Antenatal clinic attendance	Yes	366 (98.9)
	No	4 (1.1)

4.3.2 Breastfeeding characteristics of participants

The majority (85.6%) of multiparous participants reported having exclusively breastfed their previous child/children for the first six months.

Before giving birth, most (77.8%) participants indicated they received encouragement to breastfeed their current babies from healthcare professionals, 22.7% were encouraged by family/ friends and 20.8% did not receive any encouragement to breastfeed their current babies.

After giving birth, the majority (86.5%) of the women reported to have received encouragement to breastfeed their current babies from healthcare professionals, 22.4% indicated they received encouragement to breastfeed from family/friends and 13% did not receive any encouragement to breastfeed their babies.

Among the participants who attended antenatal clinics during their recent pregnancy, 79.5% reported having received health education and information on breastfeeding during their visits (Table 4.3).

Table 4.3: Breastfeeding characteristics of participants

Variables	Frequency	Percentage (%)
Previous infant feeding methods during the first six months (n=215)		
Breastfeeding only	184	85.6
Encouragement to breastfeed current baby (n=370)		
Before giving birth		
Health care workers	288	77.8
Family, friends	84	22.7
No one	77	20.8
After giving birth		
Health care workers	320	86.5
Family, friends	83	22.4
No one	48	13.0
Breastfeeding information provided at ANC (n=366)	291	79.5

4.4 Awareness of Human Milk Banking

Only 27.3% of the respondents knew about human milk banking. Sources of information on human milk banking were mainly healthcare workers (69.3%) and the media (19.8%).

Among the respondents who were aware of the practice, only 10.9% had previously donated human milk at an HMB. Only 11.9% reported to have feed their infants DHM. Table 4.4 provides details on awareness of human milk banking.

Table 1.4: Awareness of human milk banking

Variables	Frequency	Percentage (%)
Awareness of human milk Banking (n=370)	101	27.3
Source of information on human milk banking (n=101)		
Health care workers	70	69.3
Media (print, electronic)	20	19.8
Talk within the community	18	17.8
Previously donated breast milk at an HMB	11	10.9
Previously used DHM	12	11.9
Information on advantages of breast milk provided by HCW	70	69.3
Information on opportunities to donate breast milk or use of DHM provided	71	70.3

4.5 Acceptance to Donate Breast Milk and Use Donor Human Milk

The majority (78.1%) of the study subjects stated they would be willing to donate breast milk at an HMB. Most (70.8%) of the participants indicated they would feed their babies' donor human milk.

A majority (75.4%) of the respondents indicated they would require spousal consent to either feed their infant/s donor human milk or donate breast milk at an HMB.

Nearly all (96.2%) of the respondents indicated they would recommend breast milk donation or the use of DHM to other mothers. Regarding feeding preference where breastfeeding is not an option, a majority (75.1%) indicated they would prefer their babies to be fed donor human milk while only 24.9% indicated they would prefer infant formula (Table 4.5).

Table 4.5: Acceptance to donate breast milk and use donor human milk

Variables	Frequency (n=370)	Percentage (%)
Willingness to donate breast milk at an HMB	289	78.1
Willingness to use donor human milk from an HMB	262	70.8
Need for spousal consent to either donate or use DHM (n=305)	230	75.4
Recommend donation or use of DHM to other mothers	356	96.2
Preference for DHM where breastfeeding is contraindicated	278	75.1
Preference for infant formula where breastfeeding is contraindicated	92	24.9

4.5.1 Reasons Encouraging Breast Milk Donation

Acceptance to donate human milk was primarily attributed to the positive feeling the mothers would get by helping other babies (81.9%). Other main reasons were information received from healthcare professionals on human milk banking (80.8%) and support from family/friends to donate breast milk. Table 4.6 provides more details on reasons encouraging breast milk donation at an HMB.

Table 4.6: Reasons encouraging breast milk donation

Variables	Frequency (n=370)	Percentage (%)
Information received from health care staff on human milk banking	299	80.8
The need to help other infants	303	81.9
Knowing HMBs need human milk	271	73.2
Support from family/friends to donate breast milk	278	75.1
Other reasons	36	9.7

4.5.2 Reasons Against the Use of Donor Human Milk

Slightly over half (55.9%) of the respondents who were reluctant to give their babies DHM cited fear of disease transmission as the main reason for their decision. Other major concerns against the use of DHM for feeding infants are presented in Table 4.7.

Table 4.7: Reasons Against Use of Donor Human Milk

Variables	Frequency (n=370)	Percentage (%)
Fear of disease transmission	207	55.9
Fear of genetic mixing	158	42.7
Preference of infant formula	104	28.1
Unhygienic milk collection	178	48.1
Lack of support from family/friends/partner	186	50.3
Other reasons	75	20.3

4.6 Perception of Human Milk Banking

The vast majority (88.9%) of the respondents thought DHM would be safe for use. Most mothers (94.9%) concurred that DHM would be the best substitute for at-risk newborns who cannot access MOM.

Nearly all the participants (96.2%) felt donor human milk could reduce the mortality and morbidity of hospitalized newborns. Most mothers (96.5%) agreed that human milk banks are important in hospitals. Regarding financial compensation of mothers who donate milk to HMBs, 83.8% indicated it wasn't necessary to reward human milk donors with money. Additionally, 6.2% of the respondents concurred that donor mothers should receive non-financial benefits (Table 4.8).

Table 4.8: Perception on Human Milk Banking

Variables	Frequency (n=370)	Percentage (%)
DHM is deemed safe for use	329	88.9
DHM is the best alternative when MOM is unavailable	351	94.9
DHM reduces morbidity or mortality of at-risk newborns	356	96.2
HMBs are important in hospitals	357	96.5
Human milk donors should be rewarded financially	60	16.2
Human milk donors should receive non-financial benefits	282	76.2
HMBs remove all risk of disease from DHM	324	87.6

4.7 Participant's Sociocultural Aspects and Human Milk Banking

Most respondents (94.9%) who were interviewed were Christians, and the rest (5.1%) were Muslims. Among the participants, a majority (21.6%) were from the Kikuyu ethnic group followed by the Luhya (19.7%), Kamba (17.6%), and Luo (16.8%) ethnic groups respectively. The rest of the participants (24.3%) were from other ethnicities.

At least 31.4% of respondents indicated their culture would support human milk banking. Additionally, just over half (53.2%) of the respondents indicated human milk banking would be acceptable in their religion. Only 29.2% of the mothers indicated donating breast milk at an HMB or feeding infants' donor human milk would affect family relations.

Accordingly, 30% of the respondents stated donating breast milk to an HMB or feeding infant/s donor human milk would cause societal stigma. The majority (77.2%) of the participants stated that their family would support their decision to donate breast milk while 86.4% stated that their family would support their decision to give their infants DHM. Concerning whether they would take time off their work to donate breast milk at an HMB, 76.9% of the participants agreed (Table 4.9).

Table 4.9: Participant's Socio-Cultural Aspects and Human Milk Banking

Variables	Response	n=370
		n (%)
Religion	Christianity	351 (94.9)
	Islam	19 (5.1)
Ethnicity	Kamba	65 (17.6)
	Kikuyu	80 (21.6)
	Luhya	73 (19.7)
	Luo	62 (16.8)
	Other ethnicity	90 (24.3)
Culture would support human milk banking	Yes	116 (31.4)
	No	40 (10.8)
	Neutral	214 (57.8)
Religion would support human milk banking	Yes	197 (53.2)
	No	21 (5.7)
	Neutral	152 (41.1)
Donation to an HMB and/or use of DHM could affect family relations	Yes	108 (29.2)
	No	262 (70.8)
Donation to an HMB and/or use of DHM could cause societal stigma	Yes	111 (30.0)
	No	259 (70.0)
Family would support your decision to donate breast milk	Yes	269 (72.7)
	No	101 (27.3)
Family would support your decision to use DHM	Yes	108 (86.4)
	No	17 (13.6)
Take time off work to donate breast milk at an HMB	Yes	80 (76.9)
	No	24 (23.1)

4.8 Factors Associated with Acceptance to Donate Breast Milk

4.8.1 Relationship Between Participant's Socio-Demographic Characteristics and Willingness to Donate Breast Milk

Participant's socio-demographic factors and their association with willingness to donate breast milk at an HMB were investigated. The socio-demographic factors were residence, marital status, age, education level, income source, and monthly household income. Chi-square analysis was used to test for significant relationships. This study found no significant relationship between respondent's residence and willingness to donate breast milk $X^2 = 1.62$; 2df; p=0.466.

Marital status had no significant relationship with the participant's willingness to donate breast milk $X^2 = 0.70$; 2df; p=0.704. This study's findings also showed no significant relationship between the participant's income source and acceptance to donate breast milk $X^2 = 1.38$; 2df; p=0.501.

This study found a significant relationship between respondents age and the willingness to donate breast milk $X^2 = 12.14$; 4df; p=0.016. Respondents between the ages of 35-39 were more likely to donate. Education level had a significant relationship with willingness to donate breast milk $X^2 = 16.27$; 3df; p=0.001. Women who had tertiary education level were more likely to donate. Furthermore, monthly household income showed a positive relationship with the mother's willingness to donate breast milk $X^2 = 7.36$; 2df; p=0.025. Those who had a monthly household income of between 20000-4000 ksh had a higher probability of donating (Table 4.10).

Table 4.10: Relationship Between Participant's Socio-Demographic Characteristics and Willingness to Donate Breast Milk (n=370)

Variables	Category	Willingness to donate		Total	Chi square Value	p
		Yes	No			
Residence	Informal urban	159 (77.2)	47 (22.8)	206	1.615	0.446
	Formal urban	125 (80.1)	31 (19.9)	156		
	Rural	5 (62.5)	3 (37.5)	8		
Marital status	Single	54 (75.0)	18 (25.0)	72	0.702	0.704
	Married	229 (78.7)	62 (21.3)	291		
	Separated	6 (85.7)	1 (14.3)	7		
Age group	< 25 years	102 (70.3)	43 (29.7)	145	12.139	0.016
	25 – 29	87 (87)	13 (13)	100		
	30 – 34	57 (78.1)	16 (21.9)	73		
	35 – 39	30 (88.2)	4 (11.8)	34		
	> 40 years	13 (72.2)	5 (27.8)	18		
Education level	No formal education	4 (44.4)	5 (55.6)	9	16.266	0.001
	Primary school	52 (63.4)	30 (36.6)	82		
	Secondary school	174 (82.5)	37 (17.5)	211		
	Tertiary	59 (86.8)	9 (13.2)	68		
Income source	Formal employment	63 (81.8)	14 (18.2)	77	1.382	0.501
	Housewife	123 (75.5)	40 (24.5)	163		
	Self-employed	103 (79.2)	27 (20.8)	130		
Monthly house hold income	< 20000 ksh	183 (74.1)	64 (25.9)	247	7.364	0.025
	20000 – 40000 ksh	83 (87.4)	12 (12.6)	95		
	> 40000 ksh	23 (82.1)	5 (17.9)	28		

4.8.2 Relationship Between Participant's Perinatal Characteristics and Willingness to Donate Breast Milk

This investigation found no significant relationship between parity and acceptance to donate breast milk $X^2 = 2.01$; 1df; p=0.156. Antenatal clinic attendance showed no significant relationship with willingness to donate $X^2 = 0.58$; 1df; p=0.448 as shown below (Table 4.11).

Table 4.11: Relationship Between Participant's Perinatal Characteristics and Willingness to Donate Breast Milk (N=370)

Variables	Response	Willingness to donate Yes	No	Total	Chi square value	p
Parity	Primiparous	115 (74.2)	40 (25.8)	155	2.013	0.156
	Multiparous	174 (80.9)	41 (19.1)	215		
Antenatal clinic attendance	Yes	287 (78.4)	79 (21.6)	366	0.576	0.448
	No	2 (50.0)	2 (50.0)	4		

4.8.3 Relationship Between Participant's Breastfeeding Characteristics and Willingness to Donate Breast Milk

The investigation found a significant relationship between exclusive breastfeeding of previous infant/s and the willingness to donate breast milk $X^2 = 4.77$; 1df; p=0.029. Mothers who stated they feed their previous infant/s breast milk only during the initial six months after birth were more likely to donate (Table 4.12).

Table 4.12: Relationship Between Participant's Breastfeeding Characteristics and Willingness to Donate Breast Milk (N=215)

Variables	Response	Willingness to donate Yes	No	Total	Chi square value	p
Previous infant feeding method						
Breastfeeding only	No	30 (96.8)	1 (3.2)	31	4.768	0.029
	Yes	144 (78.3)	40(21.7)	184		

4.8.4 Relationship Between Awareness of Human Milk Banking and Willingness to Donate Breast Milk

This study found a significant relationship between awareness of human milk banking and acceptance to donate breast milk $X^2 = 7.27$; 1df; p=0.007. Respondents who were familiar with human milk banking were more likely to donate. There was no significant association between the source of information on human milk banking and the likelihood of donating (Table 4.13).

Table 4.13: Relationship Between Awareness of Human Milk Banking and Willingness to Donate Breast Milk

Variables	Response	Willingness to donate Yes	No	Total	Chi square value	p
Awareness of human milk banking (n=370)	Yes	89 (88.1)	12 (11.9)	101	7.273	0.007
	No	200 (74.3)	69 (25.7)	269		
Source of information on HMBs (n=101)						
Healthcare workers	No	28 (90.3)	3 (9.7)	31	0.015	0.903
	Yes	61 (87.1)	9 (12.9)	70		
Media	No	70 (86.4)	11 (13.6)	81	0.457	0.499
	Yes	19 (95.0)	1 (5.0)	20		
Talk within the community	No	73 (88.0)	10 (12.0)	83	0.000	1.000
	Yes	16 (88.9)	2 (11.1)	18		

4.8.5 Relationship Between Perception on Human Milk Banking and Willingness to Donate Breast Milk

This study found a significant relationship between the knowledge that DHM is safe for use and acceptance to donate breast milk $X^2 = 10.83$; 1df; p=0.001. Mothers who felt DHM was safe for use were inclined to donate. The knowledge that DHM is the best substitute for at-risk infants unable to access MOM had a significant association with the participants willingness to donate $X^2 = 10.83$; 1df; p=0.001. Participants who indicated DHM is the best substitute for at-risk infants with no access to MOM were more likely to donate. Table

4.14 provides details on the relationship between participant's perception of human milk banking and acceptance to donate breast milk.

Table 4.14: Relationship Between Participant's Perception on Human Milk Banking and Willingness to Donate Breast Milk (N=370)

Variables	Response	Willingness to donate Yes	No	Total	Chi square value	p
DHM is safe for use	Yes	273 (83.0)	56 (17.0)	329	10.828	0.001
	No	16 (39.0)	25 (61.0)	41		
DHM is the best alternative when MOM is unavailable	Yes	282 (80.3)	69 (19.7)	351	10.828	0.001
	No	7 (36.8)	12 (63.2)	19		
DHM reduces morbidity or mortality of at-risk newborns	Agree	282 (79.2)	74 (20.8)	356	5.095	0.024
	Disagree	7 (50.0)	7 (50.0)	14		
HMBs are important in hospitals	Agree	282 (79.0)	75 (21.0)	357	3.283	0.070
	Disagree	7 (53.8)	6 (46.2)	13		
Breast milk donors should be rewarded financially	Agree	40 (66.7)	20 (33.3)	60	4.709	0.030
	Disagree	249 (80.3)	61 (19.7)	310		
Breast milk donors should receive non-financial benefits	Agree	224 (79.4)	58 (20.6)	282	0.914	0.339
	Disagree	65 (73.9)	23 (26.1)	88		
HMBs remove all risk of diseases from DHM	Agree	269 (83.0)	55 (17.0)	324	10.828	0.001
	Disagree	20 (43.5)	26 (56.5)	46		

4.8.6 Relationship Between Participant's Socio-Cultural Aspects and Willingness to Donate Breast Milk

This investigation found no significant relationship between ethnicity and acceptance to donate breast milk $X^2 = 8.19$; 4df; p=0.085. The belief that culture would support human milk banking had a significant association with the mother's willingness to donate $X^2 = 13.82$; 2df; p=0.001. Those who stated their culture would support human milk banking were inclined to donate.

In the study, religion had a significant relationship with the acceptance towards donating breast milk $X^2 = 6.17$; 1df; p=0.013. Christian mothers were more likely to donate compared to their Muslim counterparts. Furthermore, the belief that religion would support human milk banking was significantly associated with the mother's willingness to donate $X^2 = 13.82$; 2df; p=0.001. Respondents who stated their religion would support human milk banking practice had a higher probability of donating.

The notion that donation of breast milk or DHM use would affect family relations was positively associated with acceptance to donate $X^2 = 10.83$; 1df; p=0.001. Mothers who stated breast milk donation or DHM use would not affect family relations were inclined to donate. Additionally, the belief that donation of breast milk or DHM use would cause societal stigma showed a significant association with respondents' willingness to donate $X^2 = 10.83$; 1df; p=0.001. Those who stated donation of breast milk or DHM use would not because societal stigma were more likely to donate.

Support from family to donate breast milk had a significant association with mothers' acceptance towards donating $X^2 = 10.83$; 1df; p=0.001. Mothers who stated their family

would support their decision to donate breast milk were more likely to donate. Support from family to use DHM was significantly associated with the mother's willingness to donate X^2 = 10.83; 1df; p=0.001. Those who stated their family would support their decision to use DHM were inclined to donate. This study also found a significant relationship between taking time off work to donate breast milk and the willingness towards donating X^2 = 10.83; 1df; p=0.001 (Table 4.15).

Table 4.15: Relationship Between Participant's Socio-Cultural Aspects and Willingness to Donate Breast Milk (N=370)

		Willingness to donate			Chi square	
Variables	**Response**	**Yes**	**No**	**Total**	**value**	**p**
Religion	Christianity	279 (79.5)	72 (20.5)	351	6.169	0.013
	Islam	10 (52.6)	9 (47.4)	19		
Ethnicity	Kamba	53 (81.5)	12 (18.5)	65	8.186	0.085
	Kikuyu	70 (87.5)	10 (12.5)	80		
	Luhya	51 (69.9)	22 (30.1)	73		
	Luo	48 (77.4)	14 (22.6)	62		
	Other ethnicity	67 (74.4)	23 (25.6)	90		
Culture would support human milk banking	Yes	106 (91.4)	10 (8.6)	116	13.816	0.001
	No	26 (65.0)	14 (35.0)	40		
	Neutral	157 (73.4)	57 (26.6)	214		
Religion would support human milk banking	Yes	175 (88.8)	22 (11.2)	197	13.816	0.001
	No	15 (71.4)	6 (28.6)	21		
	Neutral	99 (65.1)	53 (34.9)	152		

Variables	Response	Willingness to donate Yes	No	Total	Chi square value	p
Breast milk donation or DHM use can affect family relations	Yes	64 (59.3)	44 (40.7)	108	10.828	0.001
	No	225 (85.9)	37 (14.1)	262		
Breast milk donation or DHM use can cause societal stigma	Yes	71 (64.0)	40 (36.0)	111	10.828	0.001
	No	218 (84.2)	41 (15.8)	259		
Family would support your decision to donate breast milk	Yes	238 (88.5)	31 (11.5)	269	10.828	0.001
	No	51 (50.5)	50 (49.5)	101		
Family would support your decision to use DHM	Yes	101 (93.5)	7 (6.5)	108	10.828	0.001
	No	6 (35.3)	11 (64.7)	17		
Take time off work to donate breast milk	Yes	70 (87.5)	10 (12.5)	80	10.828	0.001
	No	9 (37.5)	15 (62.5)	24		

4.8.7 Multivariate Analysis of Factors Associated with Willingness to Donate Human Milk

Significant variables at Chi-square analysis including age, education level, monthly household income, awareness of human milk banking, religion, and support from family to donate breast milk ($p < 0.05$), were considered for multivariate analysis. Age remained a significant predictor of willingness to donate breast milk OR=0.423[(95% CI 0.19, 0.942) p=0.0351]. Mothers above forty years were less willing to donate. This indicates that for each additional year after 40 years, there is a decrease in the odds of willingness to donate.

Support from family to donate OR=6.841[(95% CI 3.788, 12.354) p=0.000] had a positive association with willingness to donate breast milk. Participants who indicated their family would support their decision to donate had significantly increased odds of willingness to donate as shown in Table 4.16.

Table 4.16: Multivariate Analysis of Factors Associated with Willingness to Donate Breast Milk

Variables	Categories	OR	95% C.I		P value
			Lower	Upper	
Age	< 25 years	Ref	-	-	-
	25 – 29	2.083	0.823	5.271	0.1214
	30 – 34	0.601	0.262	1.377	0.2286
	35 – 39	0.892	0.352	2.261	0.8093
	> 40 years	0.423	0.19	0.942	0.0351
Education	No formal education	Ref	-	-	-
	Primary school	2.391	0.799	7.158	0.1193
	Secondary school	1.153	0.488	2.721	0.7455
	Tertiary	0.7	0.385	1.275	0.2438
Monthly household income	< 20000 ksh	Ref	-	-	-
	20000 – 40000	0.757	0.326	1.757	0.5169
	> 40000 ksh	0.719	0.354	1.463	0.363
Awareness of human milk banking	No	Ref	-	-	-
	Yes	2.085	0.986	4.41	0.0545
Religion	Islam	Ref	-	-	-
	Christianity	0.39	0.12	1.268	0.1175
Support from family to donate breast milk	No	Ref	-	-	-
	Yes	6.841	3.788	12.354	0.000

4.9 Factors Associated with Acceptance to Use Donor Human Milk

4.9.1 Relationship Between Participant's Socio-Demographic Characteristics and Willingness to Use DHM

Mother's socio-demographic factors and their association with willingness to use DHM were investigated. The socio-demographic factors included residence, marital status, age, education level, income source, and monthly household income. Chi-square analysis was used to test for significant relationships. This study found no significant relationship between participant's residence and acceptance to use donated breast milk $X^2 = 1.26$; 2df; p=0.533.

The findings of this study also showed marital status had no significant relationship with acceptance to use DHM $X^2 = 1.96$; 2df; p=0.375. Respondent's age had no significant association with the mother's willingness to use DHM $X^2 = 3.47$; 4df; p=0.483. Income source had no significant relationship with willingness to use donated milk $X^2 = 0.30$; 2df; p=0.859. Furthermore, monthly household income had no significant relationship with respondents' willingness to feed their infant/s donor human milk $X^2 = 4.30$; 2df; p=0.116.

Our study found a significant relationship between participant's education level and acceptance to use donated breast milk $X^2 = 12.84$; 3df; p=0.005. Mothers with secondary school education level were more likely to use DHM (Table 4.17).

Table 4.17: Relationship Between Participant's Socio-Demographic Characteristics and Willingness to Use DHM (N=370)

Variables	Category	Willingness to use DHM Yes	No	Total	Chi square value	p
Residence	Informal urban	142 (68.9)	64 (31.1)	206	1.258	0.533
	Formal urban	115 (73.7)	41 (26.3)	156		
	Rural	5 (62.5)	3 (37.5)	8		
Marital status	Single	47 (65.3)	25 (34.7)	72	1.962	0.375
	Married	209 (71.8)	82 (28.2)	291		
	Separated	6 (85.7)	1 (14.3)	7		
Age group	< 25 years	97 (66.9)	48 (33.1)	14	3.469	0.483
	25 – 29	75 (75)	25 (25)	100		
	30 – 34	55 (75.3)	18 (24.7)	73		
	35 – 39	24 (70.6)	10 (29.4)	34		
	> 40 years	11 (61.1)	7 (38.9)	18		
Education level	No formal education	3 (33.3)	6(66.7)	9	12.838	0.005
	Primary school	51 (62.2)	31 (37.8)	82		
	Secondary school	162 (76.8)	49 (23.2)	211		
	Tertiary	46 (67.6)	22 (32.4)	68		
Income source	Employed	56 (72.7)	21 (27.3)	77	0.304	0.859
	Housewife	116 (71.2)	47 (28.8)	163		
	Self-employed	90 (69.2)	40 (30.8)	130		
Monthly household income	< 20000 ksh	169 (68.4)	78 (31.6)	247	4.301	0.116
	20000 – 40000	75 (78.9)	20 (21.1)	95		
	> 40000 ksh	18 (64.3)	10 (34.7)	28		

4.9.2 Relationship Between Participant's Perinatal Characteristics and Willingness to Use DHM

This research found no significant relationship between parity and mother's willingness to use DMH X^2 = 0.00; 1df; p=1.000. Additionally, antenatal clinic attendance had no significant relationship with participant's acceptance to use donated breast milk X^2 = 0.14; 1df; p=0.713 (Table 4.18).

Table 4.18: Relationship Between Participant's Perinatal Characteristics and Willingness to Use DHM (N=370)

Variables	Response	Willingness to use DHM		Total	Chi square value	p
		Yes	No			
Parity	Primiparous	110 (71.0)	45 (29.0)	155	0.00	1.000
	Multiparous	152 (70.7)	63 (29.3)	215		
Antenatal clinic attendance	Yes	260 (71.0)	106 (29.0)	366	0.135	0.713
	No	2 (50.0)	2 (50.0)	4		

4.9.3 Relationship Between Participant's Breastfeeding Characteristics and Willingness to Use DHM

This study found no significant relationship between exclusive breastfeeding during the initial six months and the willingness to use donated milk X^2 = 0.00; 3df; p=1.000 (Table 4.19).

Table 4.19: Relationship Between Participant's Breastfeeding Characteristics and Willingness to Use DHM (N=215)

Variables	Response	Willingness to use DHM Yes	No	Total	Chi square value	p
Previous infant feeding method						
Breastfeeding only	No	22 (71.0)	9 (29.0)	31	0.00	1.000
	Yes	130 (70.7)	54 (29.3)	184		

4.9.4 Relationship Between Awareness of Human Milk Banking and Willingness to Use DHM

This study found a significant relationship between participant's awareness of human milk banking and willingness to use donated breast milk $X^2 = 6.64$; 1df; p=0.010. Participants who were familiar with the practice were more likely to use DHM. There was no association between the source of information on human milk banking and acceptance to use DHM as shown below (Table 4.20).

Table 4.20: Relationship Between Awareness of Human Milk Banking and Willingness to Use DHM

Variables	Response	Willingness to use DHM No	Willingness to use DHM Yes	Total	Chi square value	p
Awareness of human Milk Banking (n=370)	Yes	82 (81.2)	19 (18.8)	101	6.635	0.010
	No	180 (66.9)	89 (33.1)	269		
Source of information on HMBs (n=101)						
Healthcare workers	No	25 (80.6)	6 (19.4)	31	0.00	1.000
	Yes	57 (81.4)	13 (18.6)	70		
Media	No	64 (79.0)	17 (21.0)	81	0.65	0.420
	Yes	18 (90.0)	2 (10.0)	20		
Talk within the community	No	66 (79.5)	17 (20.5)	83	0.348	0.555
	Yes	16 (88.9)	2 (11.1)	18		

4.9.5 Relationship Between Perception of Human Milk Banking and Willingness to Use DHM

This study found a significant relationship between the knowledge that donor human milk is safe for use and its acceptance as an alternative infant feeding option $X^2 = 10.83$; 1df; p=0.001. Participants who felt DHM was safe were more likely to use it. The knowledge that DHM is the best substitute for at-risk babies when mother's own milk is inaccessible or insufficient had a significant relationship with participants' acceptance to use it $X^2 = 10.83$; 1df; p=0.001. Those who stated DHM is the best substitute for at-risk babies when mother's own milk is inaccessible or insufficient were more likely to use donated breast milk.

Table 4.21 provides details on the relationship between the perception of human milk banking and willingness to utilize DHM in infant feeding.

Table 4.21: Relationship Between Perception of Human Milk Banking and Willingness to Use DHM

Variables	Response	Willingness to use DHM			Chi square value	p
		Yes	No	Total		
DHM is deemed safe for use	Yes	254 (77.2)	75 (22.8)	329	10.828	0.001
	No	8 (19.5)	33 (80.5)	41		
DHM is the best alternative when MOM is unavailable	Yes	259 (73.8)	92 (26.2)	351	10.828	0.001
	No	3 (15.8)	16 (84.2)	19		
DHM reduces morbidity and mortality of at-risk newborns	Agree	257 (72.2)	99 (27.8)	356	7.033	0.008
	Disagree	5 (35.7)	9 (64.3)	14		
HMBs are important in hospitals	Agree	257 (72.0)	100 (28.0)	357	5.327	0.021
	Disagree	5 (38.5)	8 (61.5)	13		
Breast milk donors should receive financial compensation	Agree	34 (56.7)	26 (43.3)	60	6.169	0.013
	Disagree	228 (73.5)	82 (26.5)	310		
Human milk donors should receive non-monetary benefits	Agree	208 (73.8)	74 (26.2)	282	4.397	0.036
	Disagree	54 (61.4)	34 (38.6)	88		
HMBs remove all risk of disease from DHM	Agree	251 (77.5)	73 (22.5)	324	10.828	0.001
	Disagree	11 (23.9)	35 (76.1)	46		

4.9.6 Relationship Between Participant's Socio-Cultural Aspects and Willingness to Use DHM

This study found no significant relationship between ethnicity and acceptance to use DHM in infant feeding $X^2 = 6.00$; 4df; p=0.199. The belief that culture would support human milk banking had a significant association with mothers' willingness to feed their infant/s donated breast milk $X^2 = 13.82$; 2df; p=0.001. Those who stated their culture would support the practice had a higher probability of using it.

In the study, religion had a significant association with willingness to use donated breast milk $X^2 = 9.55$; 1df; p=0.002. Christian mothers were more inclined to use DHM in comparison to Muslim mothers. Additionally, the belief that religion would support human milk banking showed a significant association with acceptance to use DHM $X^2 = 13.82$; 2df; p=0.001. Mothers who stated their religion would support the practice were more likely to feed their infant/s DHM.

The notion that breast milk donation or use of DHM would affect family relations had a significant relationship with acceptance to use donated milk $X^2 = 10.83$; 1df; p=0.001. Participants who didn't support the notion were likely to use DHM. Furthermore, the belief that breast milk donation or DHM use would cause societal stigma was significantly association with mothers' willingness to use donated milk $X^2 = 10.83$; 1df; p=0.001. Those who didn't support the belief had a higher likelihood of using DHM.

This study also found a significant relationship between taking time off work to donate breast milk at an HMB and willingness towards using DHM in infant feeding $X^2 = 6.47$;

1df; p=0.011 as shown below. Mothers who stated they would take time off work to donate breast milk at an HMB were more likely to use DHM (Table 4.22).

Table 4.22: Relationship Between Participant's Socio-Cultural Aspects and Willingness to Use DHM

Variables	Response	Willingness to use DHM Yes	No	Total	Chi square value	p
Religion	Christianity	255 (72.6)	96 (27.4)	351	9.55	0.002
	Islam	7 (36.8)	12 (63.2)	19		
Ethnicity	Kamba	49 (75.4)	16 (24.6)	65	6.002	0.199
	Kikuyu	61 (76.2)	19 (23.8)	80		
	Luhya	52 (71.2)	21 (28.8)	73		
	Luo	45 (72.6)	17 (27.4)	62		
	Other ethnicity	55 (61.1)	35 (38.9)	90		
Culture would support human milk banking	Yes	97 (83.6)	19 (16.4)	116	13.816	0.001
	No	25 (62.5)	15 (37.5)	40		
	Neutral	140 (65.4)	74 (34.6)	214		
Religion would support human milk banking	Yes	166 (84.3)	31 (15.7)	197	13.816	0.001
	No	12 (57.1)	9 (42.9)	21		
	Neutral	84 (55.3)	68 (44.7)	152		
Breast milk donation or DHM use could affect family relations	Yes	53 (49.1)	55 (50.9)	108	10.828	0.001
	No	209 (79.8)	53 (20.2)	262		

Variables	Response	Willingness to use DHM Yes	No	Total	Chi square value	p
Breast milk donation or use DHM use could cause societal stigma	Yes No	59 (53.2) 203 (78.4)	52 (46.8) 56 (21.6)	111 259	10.828	0.001
Family would support your decision to donate breast milk	Yes No	231 (85.9) 31 (30.7)	38 (14.1) 70 (69.3)	269 101	10.828	0.001
Family would support your decision to use DHM	Yes No	88 (81.5) 6 (35.3)	20 (18.5) 11 (64.7)	108 17	10.828	0.001
Take time off work to donate breast milk	Yes No	58 (72.5) 10 (41.7)	22 (27.5) 14 (58.3)	80 24	6.465	0.011

4.9.7 Multivariate Analysis of Factors Associated with Willingness to Use Donor Human

Significant variables at Chi-square analysis including education level, awareness of human milk banking, and religion ($p < 0.05$), were considered for multivariate analysis. Awareness of human milk banking was significantly associated with willingness to use donated breast milk OR=0.894[(95% CI 1.066, 3.364) p=0.0294]. Respondents who were aware of human milk banking were less willing to use DHM compared to those who were unfamiliar with the practice.

Additionally, religion remained a significant predictor of willingness to use donated breast milk OR =0.266[(95% CI 0.097, 0.718) p=0.0091]. Muslim mothers were less willing to use donated milk compared to Christian mothers (Table 4.23).

Table 4.23: Multivariate Analysis of Factors Associated with Willingness to Use DHM

Variables	Categories	OR	95% C.I		P value
			Lower	Upper	
Education	No formal education	Ref	-	-	-
	Primary school	2.343	0.848	6.476	0.1006
	Secondary school	0.51	0.228	1.143	0.1019
	Tertiary	0.745	0.44	1.261	0.2726
Awareness of human milk banking	No	Ref	-	-	-
	Yes	0.894	1.066	3.364	0.0294
Religion	Christianity	Ref	-	-	-
	Islam	0.2663	0.097	0.718	0.0091

CHAPTER 5: DISCUSSIONS

5.1 Introduction

Our study aimed to examine awareness, acceptance, and perceptions of human milk banking and analyze determinants of breast milk donation and DHM use among postpartum women at the Pumwani maternity hospital. Even though the majority of the respondents were unfamiliar with human milk banking, the results generally showed potential acceptability towards the practice.

5.2 Awareness of human milk banking

Overall, we found a low degree of awareness of human milk banking among the study population. The awareness level observed is slightly higher than what was recorded in a feasibility study in the country which was conducted before the start of the only HMB in Kenya (Kimani-Murage et al., 2019). The increase in awareness observed in our study might be attributed to the current human milk banking activities at the study site which may have exposed mothers to the practice. Similar studies conducted in other countries have also established low human milk banking awareness (Abhulimhen-Iyoha et al., 2015; Bhoola & Biggs, 2021; Iloh et al., 2018; Namuddu et al., 2023). Given that DHM is becoming a more popular feeding substitute for infants with no or limited access to MOM, it is crucial to raise awareness of human milk banking and the advantages of DHM to attract donor mothers and potential recipients. Proper characterization of potential donors and recipients is essential for administrating successful promotional campaigns on human milk banking.

Accordingly, our study's findings that health professionals were the most popular information source on human milk banking correspond with findings from a study conducted in south-south Nigeria (Abhulimhen-Iyoha et al., 2015). Contrarily, other studies conducted in developed countries have reported the media as the primary information source on the practice (Gürol et al., 2014; Zhang et al., 2020). These differences might be attributed to the fact that human milk banking has not yet received much attention from mainstream media in most developing countries. Promoting awareness of the significant contribution of DHM as well as addressing cultural beliefs and misconceptions among community members by providing adequate information is considered a key approach to boosting communities' acceptance of human milk banking practice (Gürol et al., 2014). Considering the speed and ease of reach of the target population, credible media sources should be fully utilized to promote human milk banking. The inclusion of healthcare providers in championing not only for breastfeeding but human milk banking as well might have a very favorable impact on the number of donor mothers and recipients as well as the sustainability of HMBs.

5.3 Acceptance of Human Milk Banking

This research established that participants who were aware of human milk banking were less willing to use DHM compared to those who were unfamiliar with the practice. A possible explanation for hesitance to use DHM would be fear of disease transmission to their infants. As much as these participants knew about human milk banking, most probably they weren't knowledgeable about the process of human milk banking hence concerns regarding the efficacy of DHM. Contrary, a study conducted in Ethiopia reported that women who were aware of human milk banking were inclined to use DHM in

comparison with those who were unfamiliar with the practice (Gelano et al., 2018). Accordingly, a cross-sectional survey in southeastern Nigeria found that acceptance of DHM was positively associated with awareness of human milk banking (Iloh et al., 2018). According to an investigation in Wuhan, China, being familiar with human milk banking was a variable that positively predicted acceptance of donor human milk (Zhang et al., 2020). Furthermore, another investigation carried out in Southeast China revealed awareness of human milk banking had a positive correlation with willingness to donate human milk as well as its use (Tu et al., 2022).

This shows that with the right information regarding DHM processing and the safety of donated milk, more women would probably utilize DHM. Although a rare practice, some communities in the country are familiar with wet nursing, hence donation of breast milk and its use is not a new practice. This would be used to support and strengthen human milk banking advocacy campaigns emphasizing on the fact that HMBs make sure donated breast milk undergoes a rigorous procedure making it safer for babies with no access to MOM.

The concerns reported by the participants regarding human milk banking are not surprising given that only a small portion of them were aware of the practice. In the study by Coutsoudis et al. (2011), the significance of being familiar with human milk banking was amply demonstrated by the fact individuals who have been previously introduced to the practice were often convinced of its importance and effectiveness (Coutsoudis et al., 2011).

Most of the women interviewed had minimal experience with DHM use and breast milk donation. A small proportion of mothers had previously donated breast milk as well as used donor human milk to feed their infants. This corresponds to a nationwide survey among

women living in America, where it was found most women interviewed had not previously donated breast milk or utilized donor human milk for their newborns through the mother-to-mother milk sharing program (Parker et al., 2013).

We were able to establish that mothers who had infants at the Special Care Nursery (SCN) at our study site had a higher likelihood of DHM use. This conclusion is in line with the rise in DHM use in caring for preterm babies across many developed nations over the previous decade (Kim &Unger, 2010). According to a national survey conducted in 2013, nearly half of NICUs in America used DHM largely to lower the incidence of necrotizing enterocolitis in premature babies who were unable to access MOM (Parker et al., 2013). The demand for DHM is anticipated to rise due to the current expansion of DHM use among NICUs and SCNs, which will increase the need for breast milk donation. To ensure a steady supply of DHM, it will be crucial to raise awareness of the different settings in which DHM is used including opportunities for human milk donation

5.4 Perception of Human Milk Banking

The findings of this research highlighted the potential acceptance of human milk banking. This was based on a sizable proportion of respondents who supported the initiative of breast milk donation at an HMB as well as the many positive responses regarding the utilization of DHM as the preferred alternative nutrition source where MOM was inadequate or unavailable. Most of the respondents also reported they would give recommendations on the use of DHM to women who may need it. In addition, most participants strongly agreed that human milk banks are important in hospitals.

According to the results of this investigation, the majority of mothers interviewed were open to the prospect of donating human milk as well as feeding their infants DHM. Kimani-Murage et al reported similar results in the country in a study conducted prior to HMB establishment (Kimani-Murage et al., 2019). Similar observations were reported in studies conducted in countries including Turkey, China, and India (Ekşioğlu et al., 2015; Tu et al., 2022; Melwani et al., 2018). Mother's primary motivation for donating breast milk to HMBs was the positive feeling they would get by helping other babies in need. Many participants were against the financial compensation of donor mothers. Similar reports from France (Azema & Callahan, 2003) and Southeast China (Tu et al., 2022) show that mothers' motivation to give their breast milk was primarily altruistic rather than motivated by financial gain.

Considering human milk banking is uncommon in many developing countries, the bright outlook regarding the practice was not without drawbacks. Even though most mothers were positive regarding donating human milk to an HMB, some were reluctant to utilize breast milk donated by other lactating women citing fear of disease transmission. The worry about the safety of DHM corresponds to observations from surveys done in South Africa, Turkey, and Nigeria (Coutsoudis et al., 2011; Ekşioğlu et al., 2015; Ighogboja et al., 1995) where concerns about the efficacy of the DHM was singled out as major obstacles to DHM acceptance. Similar to our study findings, most mothers in Australia reported they would give their infants DHM if they had the surety it was safe (Mackenzie et al., 2013). To ensure the efficacy of DHM, the use of standardized hazard management practices to inform the development of operating protocols for donor mother screening, DHM processing, and

appropriate use of donated milk is needed (De Nisi et al., 2015; Hartmann et al., 2007; NICE, 2010).

The mothers' preference for breast donating breast milk over using human donor milk is noteworthy, nevertheless. This can be explained by the maternal protective instinct; while the satisfaction of helping another infant in need makes them inclined to donate their milk, their worry of spreading disease to their babies discourages them from using DHM. The concern that donating breast milk would reduce the supply for their babies emphasizes the necessity of creating awareness of the physiology of breast milk production.

5.6 Influence of Participant's Characteristics on Acceptance to Donate Breast Milk and Use DHM

Findings of our study indicated older mothers were less willing to donate breast. Furthermore, education did not influence on willingness to donate breast milk or DHM use. Contrary, results of a New York study that examined postpartum women's attitudes toward DHM found that the majority of participants with higher education agreed that DHM is more advantageous to babies (Pal et al., 2019). Studies conducted in southeast Nigeria, and China showed that highly educated mothers had a greater likelihood of knowing about DHM and participating in human milk banking practice (Iloh et al., 2018; Tian et al., 2021).

Our study indicated parity had no significant influence on participants' likelihood of either donating human milk or using DHM in infant feeding. These findings correspond to the results of similar studies carried out in KwaZulu Natal, South Africa, and Southeast China (Bhoola & Biggs, 2021; Tu et al., 2022). In this study, breastfeeding exclusively during the initial six months had a positive association with the likelihood of donating human milk.

This negates observations of a similar study in KwaZulu Natal, South Africa which found previous infant feeding methods during the first six months had no significant influence on the likelihood of donating breast milk or using DHM (Bhoola & Biggs, 2021).

5.7 Participant's Socio-Cultural Aspects and Human Milk Banking

Human milk banking is a fairly new health practice and one that involves sensitive biological fluid. It is critical to assess the influence of socio-cultural concerns, especially in the African setup where diverse cultures and religions may interfere with its applicability. Understanding how human milk banking is perceived in different breastfeeding women's cultures is crucial for addressing hindrances to donation and usage of DHM. Systematic reviews comprising studies from developing and developed nations revealed significant challenges to human milk donation and its use, such as societal, religious, and lack of awareness (Doshmangir et al., 2019). A survey done in the USA that focused on the impact of family support, especially grandparents regarding decisions on breastfeeding brought attention to the critical role that relatives play in guidance and counseling on newborn feeding alternatives (Cisco, 2017).

In our study, religion was a significant predictor of willingness to use DHM. The belief that infants less than two years old who receive breast milk from the same mother are regarded as her biological children despite their lack of kinship explains the small proportion of Muslim mothers who would feed their infants DHM compared to Christian mothers (Ramli et al., 2010). These limitations were also observed in studies conducted in Turkey (Ekşioğlu et al., 2015; Gürol et al., 2014). In an investigation carried out in predominantly Muslim countries, religious authorities stated that the use of DHM could only be approved if it

originated from one known donor or a donor pool of not more than three mothers (Khalil et al., 2016). This demonstrates how important socio-cultural beliefs are in determining acceptance of DHM use and breast milk donation to HMBs (Kimani-Murage et al., 2019). As a result, a collaborative strategy involving all stakeholders, including the community, health professionals, and religious leaders is needed to create effective and focused advocacy and communication campaigns regarding human milk banking (Amundson et al., 2017).

CHAPTER 6: SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

6.1 Introduction

In this section, we outline the conclusions and recommendations drawn from the results of this investigation.

6.2 Conclusions

Awareness of human milk banking was low among mothers interviewed. Health professionals were the primary information source on human milk banking. Most of the women interviewed had minimal experience with the utilization of DHM and breast milk donation considering a small proportion had previously donated breast milk to an HMB as well as used DHM for their infants.

The major concern reported by the participants regarding the use of DHM was fear of disease transmission. Mother's primary motivation for donating breast milk was purely altruistic. The majority of the participants were against the financial compensation of human milk donors.

The results of this study highlighted the potential acceptability of human milk banking based on a sizable proportion of respondents who supported the practice of donating breast milk to an HMB as well as the many positive responses regarding the use of DHM as the preferred alternative nutrition source where MOM was inadequate or unavailable.

6.3 Recommendations

Given that DHM is becoming a more popular feeding substitute for infants with no or limited access to mother's milk, it is crucial to raise awareness of human milk banking and the advantages of DHM to attract donor mothers and potential recipients. To ascertain that all infants benefit from human milk whether through breastfeeding or the safe supply of DHM if mother's milk is unavailable, a comprehensive strategy to safeguard, encourage, and support breastfeeding is required. A strong breastfeeding culture which is often dependent on supportive family and the community at large is a basis for the establishment of an efficient human milk banking program.

6.3.1 Recommendations for PHC workers at Maternal and Child Health (MNCH)

Primary Health Care (PHC) workers at MNCH should educate pregnant mothers and post-natal mothers on the importance of donor human milk and the benefits to infants compared to infant formula and cow's milk.

6.3.2 Recommendations for the Ministry of Health

The Kenya Ministry of Health should continually ensure that health workers in MNCH are trained on human milk banking and encouraged to promote donor human milk as an alternative where necessary. To enhance the availability and accessibility of DHM, the Health Ministry in collaboration with key technical experts should consider opening additional HMBs in other hospitals in the country.

6.3.3 Recommendations for Researchers

Subsequent research work should tackle attitudes, perceptions, and knowledge pertaining to human milk banking in diverse cultures and demographics with all relevant stakeholders involved. Qualitative surveys may offer valuable perspectives on specific factors that impact the donation of human milk and the utilization of DHM.

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APPENDICES

Appendix I: Research Questionnaire

RESEARCH QUESTIONNAIRE

RESEARCH TITLE: FACTORS ASSOCIATED WITH BREAST MILK DONATION AND USE OF DONOR HUMAN MILK AMONG POSTPARTUM WOMEN AT THE PUMWANI MATERNITY HOSPITAL

Name of researcher: Ms. Jane Wanjiku Kanyi

I am a postgraduate student at Amref International University, pursuing a Master of Public Health Degree in Applied Epidemiology.

I am undertaking a study on factors associated with donation of breast milk and utilization DHM. The purpose of this study is to obtain information on participant's socio-demographic characteristics, previous maternal experiences (breastfeeding history, perinatal characteristics), awareness on human milk banking, perception towards the practice other general factors that might influence willingness to donate human milk and willingness to use DHM in infant feeding. Information obtained will be used for academic purposes and the findings will be published.

Date of interview: ……. Participant code: ☐

SECTION 1: SOCIO-DEMOGRAPHIC CHARACTERISTICS

1. Where do you currently reside? ☐

   a) Informal urban area =1

   b) Formal urban area =2

   c) Rural area =3

2. What is your marital status: ☐

   a) Single =1

   b) Married =2

   c) Divorced / Separated =3

   d) Widowed =4

3. If applicable, please specify your religion: ☐

   (Code: Christianity =1, Islam =2, Hindu =3, African traditional =4)

   Other: Please specify_____

4. What is your age (years): ☐☐

5. What is the highest level of education completed: ☐

   a) No formal education =1

   b) Primary school incomplete =2

   c) Primary school complete =3

   d) Secondary school incomplete =4

   e) Secondary school complete =5

   f) More than secondary school (tertiary) =6

5. What is your MAIN source of income? (**Select ONE option only**): ☐

   a) Employed =1

b) Housewife =2

c) Self-employed =3

6. Approximately how much do you earn/make per month in KESH?

Please indicate_____

SECTION 2: PREVIOUS MATERNAL EXPERIENCE

1. Pregnancy History

1.1 Number of children you have given birth to (including most recent pregnancy) ☐

(Code: 1= Primiparous, 2=Multiparous).

1.2 Did you attend antenatal clinic during your most recent pregnancy? ☐

(Code: 1=Yes, 2=No)

1.2.1 Number of visits to the antenatal clinic in your most recent pregnancy? ☐

2. Breastfeeding History

This question applies only to multipara.

2.1 What mode of feeding did you use for your previous babies during the first six months? **(Select ALL that apply)**

a) Breastfeeding only ☐

2.2 Indicate which of the following people (if any) supported and encouraged you at the following stages, to breastfeed your current baby **(Select ALL that apply)**

2.2.1 Before giving birth.

a) Healthcare professionals ☐

b) Family Friends ☐

c) No one ☐

2.2.2 While in the hospital having given birth.

a) Healthcare professionals ☐

b) Family Friends ☐

c) No one ☐

2.3 Was breastfeeding information provided at antenatal care? ☐

(Code: 1=Yes, 2=No)

SECTION 3: AWARENESS OF HUMAN MILK BANKS

1. Awareness of human milk banking

1.1 Have you heard of Human Milk Banks before? ☐

(Code: Yes =1, No =2)

If no to question 1.1 skip to section 4

1.1.1 Source of information? **(Tick ALL that apply)**

a) Healthcare staff ☐

b) Media (print, electronic) ☐

c) Talk within the community. ☐

Other: **(Please specify)**_____

2. Experience with Human Milk Bank

(Code: Yes =1, No =2)

2.1 Have you previously donated breast milk to an HMB? ☐

2.1.1 If yes, what motivated you to donate your breastmilk? **(Tick ALL that apply)**

a) To help other infants in need ☐

b) To contribute to the health promotion of children ☐

c) To support other mothers ☐

d) Because I have excess milk ☐

e) Breast milk is the best food for infants ☐

f) Breast milk prevents diseases ☐

g) Breast milk is better for growth ☐

Other: (Please specify) _____

2.2 Do you know of anyone who has donated breast milk to an HMB before? ☐

2.3 Has your child/children received donor breast milk from an HMB? ☐

2.3.1 If yes, why did you accept donor human milk for your infant/infants? **(Tick ALL that apply)**

a) Human milk is nutritionally superior to formula milk. ☐

b) Health care provider suggested using human milk. ☐

c) Other infants receiving donor human milk result in better health. ☐

d) Knowing donor milk is convenient and safe. ☐

Other: (Please specify) _____

2.4 Do you know of anyone whose baby/babies have received donor breast milk from an HMB? ☐

2.5 Has a member of the medical team informed you of the benefits of human milk for your infant? ☐

2.6 Has a member of the medical team informed you of opportunities to donate human milk or use donated human milk for your infant? ☐

If the participant has not heard about HMB the concept and process below will be discussed before asking the rest of the questionnaire.

HMBs are designed to collect breast milk from recruited donors after which, the donated milk is pasteurized, screened, and safely stored to ensure it's free from any form of contamination. Upon prescription, the DHM is distributed to cater to the unique nutritional and health requirements of infants in need

SECTION 4: ACCEPTANCE OF DONOR HUMAN MILK BANKING

4.1 Likelihood of donating breast milk.

(Code: Yes =1, No =2)

4.1.1 Would you consider donating your breast milk to a human milk bank? ☐

4.2 Likelihood of receiving breast milk.

(Code: Yes =1, No =2)

4.2.1 Would you consider giving donor human milk to your baby? ☐

4.3 Would you require spousal consent before receiving or donating breast milk? ☐

(Code: Yes =1, No =2)

4.2 Would you recommend donor breast milk for babies of other mothers? ☐

(Code: Yes =1, No =2)

4.3 Feeding preference in serious medical conditions where breastfeeding is contraindicated or impossible ☐

(Code: Donor breast milk =1, Infant formula =2)

4.4 Perceived reasons for and against human milk donation and use for feeding infants.

4.4.1 Indicate whether the following factors would encourage/influence you to donate your breast milk.

(Code: Yes =1, No =2)

a) Information received from the staff at hospitals/clinics attended. ☐
b) The positive feeling you would get by helping other babies if you donated your breast milk. ☐
c) Knowing that breast milk is needed at Human Milk Banks ☐
d) The support you would get from family/friends/partner if you were to donate your breast milk ☐

Other reasons: Please indicate.

_____

4.4.2 Indicate whether the following factors would influence your decision not to use donor breast milk or donate to a Human Milk Bank

(Code: Yes =1, No =2)

a) Fear of disease transmission ☐

b) Fear of genetics mixing ☐

c) Preference for infant formula ☐

d) Unhygienic milk collection ☐

e) Lack of support from spouse and family if you were to use or donate breast milk ☐

f) Fear that you won't have enough breast milk left for your baby ☐

g) Not accepted in our religion ☐

h) Not accepted in our culture ☐

i) The time and commitment needed to express and donate breast milk ☐

j) Societal stigma ☐

k) Not a common practice and generally unacceptable ☐

Other reasons: Please indicate.

_____

4.5 What would you most like to know about human milk banking? **Select ALL that apply.**

a) Qualifications for human milk donor ☐

b) Procedure of human milk donation ☐

c) Who will benefit from human milk donation ☐

d) Current status of human milk banks in Kenya ☐

SECTION 5: PERCEPTIONS TOWARDS THE CONCEPT OF HUMAN MILK BANKING

(Code: Yes =1, No =2)

5.1 Donor human milk is deemed safe for use. Do you agree? ☐

5.2 Donor human milk is the best alternative for at-risk infants when the mother's own milk is insufficient or unavailable. Do you agree? ☐

5.3 Please indicate whether you agree or disagree with the following statements.

(Code: Agree =1, Disagree =2)

5.3.1 Donor human milk reduces morbidity and mortality of at-risk newborns in hospitals? ☐

5.3.2 Human milk banks are important in our hospitals? ☐

5.3.3 Breast milk donors should receive financial compensation when they donate breast milk? ☐

5.3.4 Breast milk donors should receive non-financial compensation when they donate breast milk? ☐

5.3.5 Human milk banks are effective in removing all risks of disease or infection including HIV from donated breast milk? ☐

SECTION 6: BELIEFS SOCIO-CULTURAL RELATED TO HUMAN MILK DONATION AND USE

6.1 Please specify your ethnicity.

_____

(Code: Yes =1, No =2)

6.2 Does your culture support breast milk donation or the use of donated breast milk? ☐

If yes, what are these views:_____

_____

_____

If not, what are the reasons?_____

___

_____

___

6.3 Does your religion support breast milk donation or the use of donated breast milk?

If yes, w ☐ are these views:_____

_____

_____

If not, what are the reasons?_____

_____

_____

6.4 Do you think milk donation to HMB, or the use of donor breast milk can affect family relations? ☐

6.5 In your opinion, do you believe donation to HMB, or the use of donor breast milk can cause societal stigma? ☐

6.6 Have you ever heard about milk donation in the media? ☐

6.7 Would your family support you donating breastmilk to a human milk bank? ☐

6.8 Would your family support your decision to give donated breast milk to your infant?

☐

6.9 In your workplace, can you take time off to go to a Human Milk Bank to donate breast milk? ☐

Thank you.

Appendix II: Consent Form

Study Title	Factors Associated with Donation of Breast Milk and Use of Donor Human Milk at The Pumwani Maternity Hospital Nairobi, Kenya
Investigator	▪ Ms. JANE WANJIKU KANYI MOBILE NUMBER: +254 707 227 279

This Consent Form contains two sections:

- Information Template (to inform you about the study)
- Consent Certificate (to signed by those who agree to participate)

You will receive a copy of the filled Informed Consent Form

SECTION 1: DESCRIPTION OF THE RESEARCH STUDY

This is a research study to assess variables associated with breast milk donation and use its use among postpartum women receiving care at the Pumwani Maternity Hospital.

Donor Breast Milk is deemed the best alternative feeding option in the event that mother's milk is not accessible. Its applicability in resource-limited regions is not well demonstrated. Your participation in this research will help in the identification of variables associated with Human Milk donation and utilization. The findings will aid in the accurate categorization of donors and users, which is essential for effectively promoting the concept of Human Milk Banking.

ELIGIBILITY

Postpartum mothers above 18 years receiving care at Pumwani Maternity Hospital newborn unit including those referred from different hospitals during the study duration are eligible to take part.

KEY INFORMATION TO CONSIDER

Voluntary consent: You are being requested to participate in a study. It is entirely up to you to determine whether or not to take part. There won't be any penalties if you decline to take part in the research.

You have the right to revoke your consent to the study at any time. You will not be required to provide justification for your withdrawal. The services to which you and your child are entitled at this hospital medical institution and other medical centers won't be impacted by your withdrawal from the research.

Duration of Research: Three months

Confidentiality: Every effort shall be made to protect your privacy and confidentiality. We will use a coded numerical to identify you in a computer database that is password-protected and all documents shall be kept safely in a file cabinet. The information will only be accessible to study personnel.

Risks: No risks are involved in the study.

Benefits: Education and information concerning donation of breast milk and utilization of donated will be shared on request.

There is no financial reward for participation.

Results Dissemination Plan: The study findings will be submitted to Amref International University, School of Public Health as a requirement for the MPH program both in hard and soft copies. Printed copies of the findings shall be sent to the AMIU repository for reference. The office of the HOD for pediatrics at Pumwani Maternity Hospital will also be informed of the findings with a view to disseminate the insights generated to enhance human milk banking services at the hospital for the betterment infants' health.

Questions about the research study

Kindly get in touch with lead researcher at +254 707227279 if you have any additional queries or concerns about taking part in this study. You can get in touch with the secretary of the Amref ESRC through the following channels for more details regarding your rights as a study participant: Mobile: +254 795 746777; landline: +254 20 699 4000; email: ESRC. Kenya @amref.org.

SECTION II: CERTIFICATE OF CONSENT

I the undersigned have had the opportunity of reading, listening and comprehending the study's purpose. I got the opportunity to ask questions regarding it, and all of them were addressed satisfactorily. By signing here, I voluntarily agree to participate in the research.

Name of Subject	
Signature of Subject	

DD/MM/YYYY	

If case of visual, physical, mental impairment, or illiteracy

I have witnessed the prospective study subject being accurately read the Consent Form and given the chance to ask questions. I certify that the person freely provided their consent.

Name of Subject	
Thumb/Footprint of Subject	
Signature of Witness	

DD/MM/YYYY	

Statement by the researcher/person taking consent

I confirm that the study subject was offered a chance to raise concerns about the study, and that I have answered all their questions truthfully and to the highest level of my abilities. As a result I confirm that the consent was granted freely, voluntarily and was not obtained through coercion.

The research subject has been given a copy of this informed consent form.

Name of the researcher/person taking the consent	
Signature of the researcher/person taking the consent	
DD/MM/YYYY	

Appendix III: Amref ESRC Approval Letter

amref
health africa

REF: AMREF— ESRCP **1548f2022** **JanuaryZ6,3023**

Jane Kanyi
Amref Intcrnatinnal University
P O Box 27691-OO506
Nairnbi, Kenya
Tel: -+-254 707 227 279
Email. kai\s i janc? 3 ¿mail com

Dear Jane Karr yi,

RESEARCH PROTOCOL: FACTORS ASSOCIATED W rr ii aR EAs r mixx DONATiON AND USE AT THE PUMWAN I MATERNITY HOSPITAL T-IUMAN MILK BANKING IN IT

'reek you for submitting your protncol to the A mref Ethics and Scientific Review Committee (ESRC).

This is to inform you that the ESRC has reviewed and approved your protocol. Ynur application approval nurribcr is **ESRC** P1348/2022. The approval period is from Jan uary 26, 2023. io January 25 2024, and is subject to Compliance with the following requirements.

a) Only approved documents (including informed consents, study instruments, advertising materi als, material transfer cements. etc.) will be used
b) All changes includ ing (amendments, deviations, vioiations, eto.) are submitted for review and apprnx'al by Amref ES RC before implementation.
c) Death and life-threatening problems and serious ads arse events (SAEs) or unexpected adverse events whether related nr unrelated to the study must be reported to the Amref ESRC within 72 hours of notification
d) Any changes, miticipated or otherwise that may increase the risks or affect safety or welfare of' study participanls arict others or alTect the integrity Of the research must be repnrted ter Amref ESRC within 72 hours.
e) Clearance *r r* export of biological specimen must be obtainecl from the rele -‹ s•vemment auth mitres for each batch of shipment/export.
f) SubI\1ission o£a request for renew at ed approx al at lease 60 days prfor to *e* pi *or ‹ Sri* peri od. Anach a comprehensive progress report to support file renewal.
g) Irt case of tate renewal, the Amref' ESRC sltalJ rtot be held respon sibte for arty serious adverse events (SARS) that may occur as a result of research acti x*ities that were carrie‹2 out after the
h) Subrn ission of an executive summary report within 90 days upon completion of the study to lhe Amref ESRC.
i) All go vemment regulations for prevention and control of the spread of COVID- 1 9 include B social distancing, provision of personal protective er[uipment for participants and research assistants should be adhered to during datzt collection. AJI research assi **stants** should be monitored for COVID 19 symptoms and referred *Ear* **testing** in case they present with symptoms.

PU OF tO Gom mcsricing your study, you wi11 be expected to obtain a research I ioense from NationaJ C ominission for Science, Technology and Innervation (t•i ACOSTI) shha and also obtain other clearances needed.

P ease do not hesitate to contact the ESRC Secretariat fesrc kenyaGamref o£y) for any clarific$_a$tic›n or query.

AMREF - ESRC
P.O. Box 30125 - 00100, NAIROBI
25 JAN 2023

Yours sincerely,

Prof. Mohamed Karama
Chair, Am ref ESRC

CC Sarnuel Muhulq Mc›rntorirg & Ev-aluation and Research MHftJ€m, Amref Health Africa in Kerr ya.

Appendix IV: NACOSTI Research License

REPUBLIC OF KENYA

NATIONAL COMMISSION FOR SCIENCE, TECHNOLOGY & INNOVATION

Ref No: **110449**

Date of Issue: **28/February/2023**

RESEARCH LICENSE

This is to Certify that Ms.. Jane Wanjiku Kanyi of Amref International University, has been licensed to conduct research as per the provision of the Science, Technology and Innovation Act, 2013 (Rev.2014) in Nairobi on the topic: FACTORS ASSOCIATED WITH BREAST MILK DONATION AND USE AT THE PUMWANI MATERNITY HOSPITAL HUMAN MILK BANKING UNIT. for the period ending : 28/February/2024.

License No: **NACOSTI/P/23/23495**

110449

Applicant Identification Number

Director General
NATIONAL COMMISSION FOR SCIENCE, TECHNOLOGY & INNOVATION

Verification QR Code

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See overleaf for conditions

Appendix V: Research Authorization Letter

INTERNAL MEMO

TO : **INCHARGE POSTNATAL WARD– PM&RH**

REF : PMH/MS/76/0205/2023

DATE : 3RD MAY 2023

RE: APPROVAL TO CONDUCT RESEARCH BY MS. JANE WANJIKU KANYI

This is to notify your department that the above named officer has been cleared to conduct research in Pumwani Maternity and Referral Hospital having submitted the research proposal and ethical approval from approved institution.

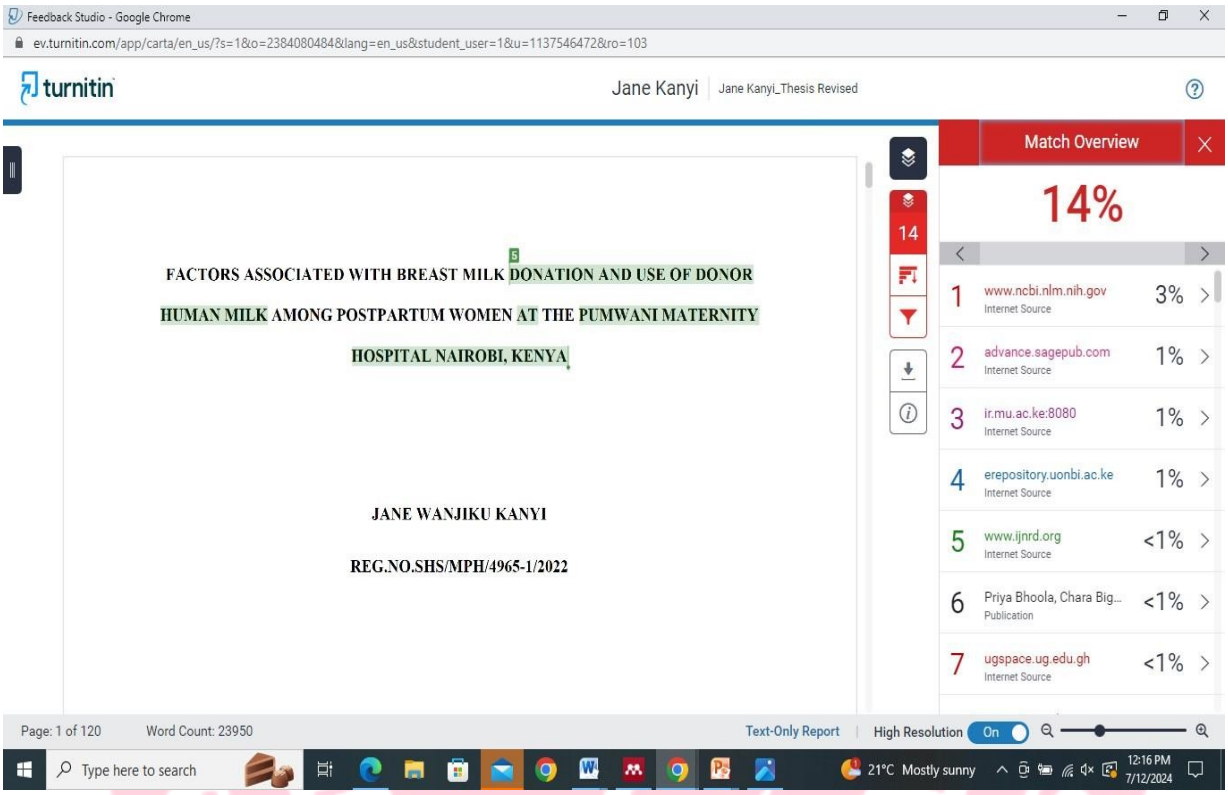
The title of the research is "**Factors associated with breast milk donation and use at the Pumwani Maternity Hospital Human Milk Banking Unit.**".

Please accord her necessary assistance.

DR. CATHERINE MUTINDA
MEDICAL SUPERINTENDENT

PUMWANI MATERNITY HOSPITAL
MEDICAL SUPERINTENDENT
04 MAY 2023
TEL: NRB 6763291
P.O BOX 42849-00100, NAIROBI

Appendix VI: Plagiarism Report



Appendix VII: Publication Progress