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"SOCIO DEMOGRAPHIC AND PSYCHOLOGICAL FACTORS ASSOCIATED WITH HUMAN MILK DONATION IN VIJAYAPURA"

BY

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DISSERTATION SUBMITTED TO

BLDE (DEEMED TO BE UNIVERSITY)

SHRI B. M. PATILMEDICAL COLLEGE, HOSPITAL & RESEARCH CENTRE , VIJAYAPUR – 586103

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I hereby declare that this dissertation/thesis entitled "**SOCIO DEMOGRAPHIC AND PSYCHOLOGICAL FACTORS ASSOCIATED WITH HUMAN MILK DONATION IN VIJAYAPURA"** is a bonafide and genuine research work carried out by me under the guidance of **Dr.S.V Patil** Professor of Paediatrics, Shri B.M. Patil Medical College, Vijayapura, Karnataka.

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Dr. B J VASUDHA

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ABSTRACT

Introduction: INTRODUCTION

Breast feeding is the best and quintessential method for infant nutrition, providing essential nutrients and immunological protection. All mothers should be encouraged to breast-feed their infants, but is not always feasible for all mothers due to various barriers. If mother's own milk is unavailable or insufficient, the next best option is to use donated human milk (DHM).

Human milk banking (HMB) serves as a crucial intervention, ensuring that infants unable to receive direct breastfeeding can still benefit from the properties of human milk. This study aims to understand the factors influencing the willingness to donate breast milk among lactating mothers in Vijayapura, India.

Objectives:

To obtain information on knowledge and attitude in mothers of urban and rural groups and to determine awareness factors for milk bank donation and also to compare responses in different socio demographic factors.

Methods:

Type of study: Cross Sectional Study

Study period: Period of 20 months, July 2022 to March 2024

Study population:

All hospitalized lactating mothers of Shri BM Patil Medical College Hospital and research Centre, Vijayapura who met the inclusion Criteria.

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Methodology:

A cross-sectional study was conducted by department of pediatrics at Shri BM Patil Medical College Hospital and Research Centre. The study included hospital-based lactating mothers who were selected through convenience sampling. Data was collected via face-to-face interviews using a semi-standardized questionnaire designed to capture socio-demographic details, maternal factors, and knowledge and attitudes towards milk bank donation. The questionnaire included variables such as age, residence, education, marital status, income, obstetric history, mode of delivery, breastfeeding counseling, and current breastfeeding status.

Statistical analysis

Data of 420 lactating mothers were entered into Microsoft Excel and analyzed using SPSS Version 20. Descriptive statistics, inferential statistics, including logistic regression analysis identified socio-demographic and knowledge factors associated with the willingness to donate breast milk, calculating crude and adjusted odds ratios with 95% confidence intervals.

Results:

Among the 420 participants, 50% were from urban and 50% from rural areas. Significant predictors of willingness to donate breast milk included urban residence (AOR: 2.01, 95% CI: 1.30–2.96), higher education levels (Bachelor's degree: AOR: 2.57, 95% CI: 1.11–8.42; Master's degree: AOR: 6.13, 95% CI: 1.28–34.37), multigravida (AOR: 2.65, 95% CI: 1.74–4.04), normal vaginal delivery (AOR: 1.88, 95% CI: 1.15–2.88), previous knowledge about milk donation (AOR: 7.56, 95% CI: 3.73–15.8), and a history of NICU admissions for the present (AOR: 1.77, 95% CI: 1.15–2.96) or previous baby (AOR: 8.46, 95% CI: 2.84–12.46).

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Conclusion:

Urban residence, higher education levels, multi-parity, normal vaginal delivery, prior knowledge of milk donation, and history of NICU admissions are key predictors of willingness to donate breast milk. Targeted interventions are needed to bridge the gap in knowledge and promote milk donation, ultimately improving neonatal health outcomes in both urban and rural settings.

Keywords: Breastfeeding, Human Milk Banking, Milk Donation, Neonatal Health, Public Health, Socio-Demographic Factors, India

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INTRODUCTION

Breastfeeding is universally acknowledged as the optimal method for providing the essential nutrients required for the healthy growth and development of infants.(1) It is not only a source of complete nutrition but also offers significant immunological protection, reducing the incidence of various infections and diseases among infants. Human milk contains a unique blend of proteins, fats, vitamins, and carbohydrates in proportions perfectly suited to the infant's needs, fostering both physical and cognitive development.(2,3) Despite these well-documented benefits, breastfeeding is not always feasible for all mothers due to a range of medical, social, and economic barriers. In such cases, human milk banking serves as a crucial intervention, ensuring that infants who are unable to receive direct breastfeeding can still benefit from the nutritional and protective properties of human milk. Human milk banks (HMBs) play a vital role in collecting, screening, processing, and distributing donor milk, thus providing a lifesaving resource for vulnerable neonates, especially those who are premature or ill.(4, 5)

The benefits of breastfeeding extend far beyond basic nutrition, encompassing a broad spectrum of health advantages for both infants and mothers. Nutritionally, breast milk is rich in essential fatty acids, lactose, vitamins, and minerals, which are crucial for the infant's growth and brain development. Immunologically, it contains antibodies, lymphocytes, and other bioactive components that significantly reduce the risk of respiratory infections, gastrointestinal diseases, and other common childhood illnesses. (6–9) Developmentally, breastfeeding promotes sensory and cognitive development, enhancing intelligence and school performance later in life. Despite these benefits, several challenges can impede successful breastfeeding. Medical conditions such as mastitis, HIV, or insufficient milk production can hinder a mother's ability to breastfeed.

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Lactation insufficiency, often due to hormonal imbalances or previous breast surgeries, can also pose significant barriers. Additionally, socio-economic factors, including the need to return to work, lack of family support, and insufficient maternity leave policies, further complicate the ability to breastfeed exclusively.(10–12) These challenges highlight the critical need for alternative solutions, such as human milk banks, to support infants' nutritional and developmental needs when direct breastfeeding is not possible.

Human milk donation is a critical practice that involves mothers voluntarily providing their excess breast milk to human milk banks for use by infants who cannot be breastfed by their own mothers. This practice is of immense importance as it ensures that vulnerable infants, particularly those who are premature, low birth weight, or suffering from medical conditions, have access to the optimal nutrition and immune protection that human milk provides. The role of donated human milk in supporting these infants is vital; it can significantly improve neonatal health outcomes, including reducing the risk of necrotizing enterocolitis, sepsis, and other severe infections.(13–16) Human milk banks (HMBs) are specialised centers that facilitate this process by collecting, screening, processing, and distributing donated milk. The collection process involves rigorous screening of donors to ensure the safety and quality of the milk. Once collected, the milk is pasteurized to eliminate any potential pathogens, and then stored under controlled conditions until it is needed. This systematic approach ensures that donated milk retains its nutritional and immunological properties, providing a lifeline for infants in need.

The current state of human milk donation in India, reflects a mixture of untapped potential and cultural challenges.(17) Socio-cultural beliefs in the region significantly influence attitudes towards milk donation, with many mothers viewing breast milk as a personal and familial resource rather than a communal one.(18–20) This perception can hinder the willingness

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to donate. Additionally, the influence of educational background and awareness levels plays a crucial role in shaping mothers' attitudes towards milk donation. Mothers with higher educational attainment and better awareness of the benefits of breast milk are generally more open to the idea of donation.(21) Understanding these socio-demographic and psychological factors is essential for designing effective interventions to promote milk donation. By exploring these determinants, this study aims to provide insights that can help overcome cultural barriers and enhance the acceptance and practice of human milk donation in Vijayapura. The findings are expected to inform strategies that can improve the availability of donor milk, ultimately contributing to better neonatal health outcomes in the region.

The significance of this study lies in its potential to significantly impact neonatal health outcomes by enhancing the understanding of factors that influence human milk donation. By identifying the socio-demographic and psychological determinants of willingness to donate breast milk among postnatal mothers in India, the study aims to address the barriers and facilitators to milk donation. This knowledge is crucial for developing targeted educational and policy interventions that can increase the supply of donor milk. Enhanced milk bank practices and increased availability of human milk can lead to improved health outcomes for vulnerable infants, reducing mortality and morbidity rates associated with preterm birth and neonatal illnesses. Furthermore, the study's findings will contribute to the formulation of effective policies and best practices in human milk banking, ensuring that milk banks operate efficiently and safely. The insights gained will also pave the way for future research and interventions, fostering a culture of milk donation and supporting the health and development of infants who need it the most. Through these contributions, the study seeks to advance the field of neonatal care and public health, making a meaningful difference in the lives of countless families.

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AIM AND OBJECTIVES

The primary aim of this study is to understand the factors influencing the willingness to donate breast milk among postnatal mothers in Vijayapura.

Among lactating mothers in the selected tertiary care teaching hospital in Vijayapura between January 2023 and March 2024,

1. To obtain detailed information on the knowledge and attitude towards milk bank donation in mothers from urban and rural areas.
2. To compare responses regarding milk bank donation across different socio-demographic aspects between urban and rural mothers.

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REVIEW OF LITERATURE

1. Background and Importance of Breastfeeding

Breastfeeding is universally recognized as the optimal method of infant feeding, providing a myriad of benefits to both the infant and the mother. The World Health Organization (WHO) and the American Academy of Pediatrics (AAP) recommend exclusive breastfeeding for the first six months of life, followed by continued breastfeeding alongside complementary foods for up to two years or beyond. Breastfeeding is associated with a reduced risk of infant morbidity and mortality, protecting against infectious diseases such as diarrhoea and pneumonia, which are leading causes of infant death globally. (22–24)

From a developmental perspective, breastfeeding supports cognitive development, with numerous studies indicating enhanced performance on intelligence tests among breastfed children. Furthermore, breastfeeding contributes to the establishment of a strong emotional bond between mother and child, promoting better psychosocial development. For mothers, breastfeeding offers protective health benefits, including a lower risk of breast and ovarian cancers, type 2 diabetes, and postpartum depression.(25–27) Economically, breastfeeding reduces the need for infant formula and medical care costs associated with treating preventable childhood illnesses.

Breast milk is uniquely tailored to meet the nutritional needs of infants, evolving to provide the appropriate balance of nutrients as the infant grows. It contains essential macronutrients—proteins, fats, and carbohydrates—and micronutrients, including vitamins and minerals, necessary for healthy growth and development.(8,28,29) Breast milk also contains a

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diverse array of bioactive components, including hormones, enzymes, and growth factors, which contribute to the maturation of the infant's digestive system and overall development. Notably, breast milk is rich in human milk oligosaccharides (HMOs), which serve as prebiotics, promoting the growth of beneficial gut bacteria and enhancing the infant's immune system.

1.1 Challenges and Alternatives

Issues with Breastfeeding: Maternal Health, Insufficient Milk Production

Despite its benefits, breastfeeding is not without challenges. Many mothers face difficulties such as latching problems, nipple pain, and concerns about milk supply. Maternal health issues, including mastitis, postpartum depression, and chronic conditions, can further complicate breastfeeding.(30–32) Insufficient milk production, whether perceived or actual, is a significant barrier to successful breastfeeding. This issue can stem from various factors, including poor breastfeeding techniques, inadequate nutrition, and certain medical conditions. Stress and lack of support also play critical roles in hindering effective breastfeeding.

2. Introduction to Human Milk Banking

Human milk banking provides a vital alternative for infants who cannot be breastfed due to maternal health issues, premature birth, or adoption. Human milk banks collect, screen, process, and dispense donated breast milk to ensure it is safe for infant consumption. This milk is particularly beneficial for preterm or sick infants, who are most vulnerable to the risks of formula feeding. Donor human milk retains most of its beneficial properties even after pasteurisation, including many immunological components. Studies have shown that feeding preterm infants

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with donor human milk, as opposed to formula, reduces the incidence of necrotizing enterocolitis (NEC), a serious intestinal disease.(13)

Human milk banks operate under stringent guidelines to ensure the safety and quality of donated milk. Potential donors are thoroughly screened, and the milk is pasteurised and tested for contaminants. Milk banks play an essential role in supporting breastfeeding practices and ensuring that all infants have access to the benefits of human milk, especially in situations where breastfeeding is not possible.

2.1 Origin and Development of Milk Banks

The concept of human milk banking dates to the early 20th century, when the first milk bank was established in Vienna, Austria, in 1909.(33) The primary aim was to provide an alternative source of nutrition for infants who could not be breastfed by their mothers due to various reasons, including maternal illness or death. Over the decades, milk banks have evolved significantly, both in terms of technology and regulatory practices. In the 1980s, the advent of HIV/AIDS led to increased scrutiny and rigorous screening processes for donor milk to ensure safety. This period marked a critical development in the standardisation of milk banking procedures, including pasteurisation and microbial testing, which became crucial for maintaining the safety and quality of donated milk.

The establishment of professional organisations, such as the Human Milk Banking Association of North America (HMBANA) in 1985, further contributed to the development and dissemination of best practices in milk banking.(34) These organisations provide guidelines for

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the operation of milk banks, ensuring that the processes of collection, storage, and distribution of human milk adhere to stringent safety standards.

Milestones in Milk Banking History

Several key milestones have shaped the evolution of milk banks globally:

1909: The first human milk bank was established in Vienna, Austria.

1943: The first milk bank in the United States was founded in Boston, Massachusetts.

1985: The formation of the Human Milk Banking Association of North America (HMBANA) set the stage for standardised practices across North America.

2000s: The development of advanced pasteurisation techniques, such as Holder pasteurisation, improved the safety and quality of donor milk.

2010s: Increased recognition of the benefits of donor milk for preterm and sick infants led to the expansion of milk banks in developing countries, supported by organisations like PATH and UNICEF.

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2.2 Global Perspective

Status and Practices in Different Countries

Human milk banking practices vary widely across different countries, influenced by cultural, economic, and healthcare system factors. In high-income countries like the United States, Canada, and many European nations, milk banks are well-established and integrated into neonatal care practices. These countries often have multiple milk banks operating under stringent regulatory frameworks that ensure the safety and quality of donor milk.

In contrast, many low- and middle-income countries are in the early stages of developing milk banking infrastructure. Brazil is a notable success story, having established one of the largest networks of human milk banks globally. The Brazilian Network of Human Milk Banks, supported by the Brazilian Ministry of Health and the Oswaldo Cruz Foundation (Fiocruz), serves as a model for other countries aiming to develop similar systems.(35,36)

2.3 Success Stories and Challenges

Success Stories

Brazil: Brazil's extensive network of milk banks has significantly reduced infant mortality rates and improved neonatal health outcomes. The success of the Brazilian model is attributed to strong governmental support, public awareness campaigns, and effective training programs for healthcare workers.

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India: The establishment of the first public human milk bank, "SNEHA," in Mumbai in 1989, has paved the way for the growth of milk banks across India. Organisations like PATH and the Breastfeeding Promotion Network of India (BPNI) have been instrumental in promoting milk banking and breastfeeding practices.

Challenges

Funding and Resources: Establishing and maintaining milk banks requires significant financial and technical resources, which can be a barrier in low-resource settings.

Cultural Barriers: In some cultures, there may be resistance to the idea of milk donation due to beliefs and taboos surrounding breastfeeding and human milk.

Regulatory and Safety Concerns: Ensuring the safety of donor milk through rigorous screening and pasteurisation processes is a major challenge, particularly in regions with limited healthcare infrastructure.(37–39)

3. Composition and Benefits of Breast Milk

3.1 Nutritional Composition

Carbohydrates

Breast milk's carbohydrate is predominantly lactose, constituting about 7% of human milk.

Lactose is crucial for energy and aids in the absorption of calcium and magnesium. Additionally, breast milk contains human oligosaccharides (HMOs), which are not digestible by infants but play a significant role as prebiotics, fostering the growth of beneficial gut bacteria.

Fats

Fats comprises about 3-5% of the breast milk. Breast milk fats include triglycerides, free fatty acids, and phospholipids. Essential fatty acids, such as docosahexaenoic acid (DHA) and arachidonic acid (ARA), are crucial for developing the nervous system and retina.

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Proteins

Proteins in breast milk are present in two main forms: whey and casein. Whey proteins, which include alpha-lactalbumin, lactoferrin, and immunoglobulins, are more easily digestible and have antimicrobial properties. Casein proteins, which become more prevalent as lactation progresses which aids in nutrient absorption and provide a steady supply of amino acids. Total protein content in breast milk is approximately 0.9-1.2 grams per 100 mL.

Vitamins

Breast milk contains a wide array of vitamins necessary for infant development which includes Vitamin A, D, E, K and B-complex.

Minerals

Key minerals found in breast milk includes Calcium, Phosphorus, Magnesium, Iron and Zinc.

3.2 Immunological Benefits

Antibodies

Breast milk is rich in antibodies, particularly secretory immunoglobulin A (IgA), which protects the infant's mucosal surfaces from pathogens. IgA antibodies help prevent the adherence of bacteria and viruses to the epithelial cells in the gastrointestinal, respiratory, and genitourinary tracts, thus providing a critical line of defence against infections.

Lymphocytes

Breast milk contains various types of white blood cells, including lymphocytes such as T cells and B cells. These cells play a role in the immune response by attacking infected cells and

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producing antibodies. They also secrete cytokines, signalling molecules that modulate the immune response and enhance the infant's ability to combat infections.

Other Immune Factors

Breast milk is rich in immune components such as lactoferrin, lysozyme, and cytokines. Lactoferrin binds iron to inhibit bacterial growth, lysozyme destroys bacterial cell walls, and cytokines regulate immunity and inflammation, aiding the development of the infant's immune system and response to infections.(40)

3.3 Long-term Health Benefits

Impact on Infections

Breastfeeding is associated with a reduced incidence of various infections during infancy, including respiratory tract infections, otitis media, and gastrointestinal infections. The immunological components of breast milk provide passive immunity, helping to protect the infant from common pathogens and reducing the severity and duration of illnesses.(41)

Necrotizing Enterocolitis (NEC)

NEC is a severe gastrointestinal disease primarily affecting preterm infants. Studies have shown that feeding preterm infants with breast milk rather than formula significantly reduces the risk of NEC. The protective factors in breast milk, such as HMOs and immunoglobulins, promote the growth of beneficial gut bacteria and enhance gut barrier function, thereby mitigating the risk of this life-threatening condition.(13)

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Cardiovascular Risk

Breastfeeding has been linked to favourable cardiovascular outcomes in later life. Breastfed infants tend to have lower blood pressure and healthier cholesterol profiles as they age. The precise mechanisms are not entirely understood, but the unique composition of breast milk and its role in shaping early nutrition and metabolism are believed to contribute to these long-term benefits.

Metabolic Diseases

Breastfeeding is associated with a reduced risk of obesity, type 2 diabetes, and metabolic syndrome in later life. Breast milk promotes healthy weight gain patterns and influences the development of appetite regulation mechanisms. It also helps establish a beneficial gut microbiota composition, which affects metabolic health.(25,42)

4. Human Milk Banking: Processes and Protocols

4.1 Collection and Screening

Procedures for Milk Collection

The milk collection process begins with recruiting and educating potential donors. Mothers interested in donating milk must undergo a thorough screening process to ensure they meet the eligibility criteria. This screening includes a detailed health history questionnaire, an assessment of lifestyle factors, and a review of any medications they may be taking. Once a donor is approved, the collection process involves the following steps:

- Sanitation: Donors are instructed on proper hand hygiene and cleaning breast pumps and storage containers to prevent contamination.

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- Pumping: Milk can be expressed using either manual or electric breast pumps. The equipment must be sterilized before use.
- Labelling and Storage: Collected milk is labelled with the donor's unique identification number, date, and time of collection. It is then stored in sterile, food-grade containers. Freshly expressed milk should be refrigerated promptly and frozen if not used within a certain period to preserve its quality.(43,44)
- Screening for Pathogens and Contaminants: Ensuring the safety of donor milk is paramount. The screening process involves several stages:

i. Initial Donor Screening: This includes a medical and lifestyle history review to rule out potential risk factors for infectious diseases.
ii. Blood Tests: Donors undergo blood tests to screen for infectious diseases such as HIV, HTLV, hepatitis B and C, and syphilis.
iii. Milk Screening: Each batch of donated milk is tested for bacterial contamination. Common tests include cultures to detect pathogenic bacteria such as Escherichia coli, Staphylococcus aureus, and Streptococcus species. If any contaminants are detected, the milk is discarded to ensure that only the highest quality, safe milk is provided to recipients.(45)

4.2 Pasteurization and Storage

Methods of Pasteurization

Pasteurization is a critical step in the milk banking process, designed to eliminate potentially harmful pathogens while preserving as many of breast milk's beneficial properties as possible. The most used method is Holder pasteurisation, which involves heating the milk to

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62.5°C (145°F) for 30 minutes and then rapidly cooling it. This method effectively reduces bacterial load and inactivates viruses without significantly compromising the nutritional and immunological quality of the milk.

Newer methods, such as high-temperature short-time (HTST) pasteurisation, are being explored. HTST pasteurisation heats the milk to 72°C (161.6°F) for 15 seconds, which may better preserve some bioactive components than Holder pasteurisation.(46,47)

Storage Techniques and Shelf-Life

Proper storage techniques are essential to maintain the quality and safety of pasteurised donor milk. Key practices include:

- *Freezing*: After pasteurisation, the milk is frozen below -20°C (-4°F). Frozen donor milk can typically be stored for up to 6 months without significantly losing nutritional and immunological properties.
- *Thawing and Handling*: When thawing frozen milk, it is recommended to do so in a refrigerator or by placing the container in warm water. Once thawed, the milk should be used within 24 hours and not refrozen.

Monitoring the storage environment, including regular checks of freezer temperatures, is critical to ensure that the milk remains safe and of high quality.(48–50)

4.3 Distribution and Usage

The distribution of donor milk is carefully managed to ensure it reaches those most in need. Milk banks prioritise hospitals, particularly neonatal intensive care units (NICUs), where preterm and critically ill infants can benefit significantly from human milk.(51,52)

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Steps in the distribution process include:

1. Order Processing: Hospitals place orders based on their needs, specifying donor milk's quantity, and required specifications.

2. Packaging and Transport: Donor milk is packaged in insulated containers with ice packs to maintain the cold chain during transport. The milk must remain frozen until it reaches the recipient's hospital or family.

3. Criteria for Usage and Prioritization

Donor milk is allocated based on a prioritisation system that ensures it benefits those most at risk.

Criteria typically include:

- Preterm Infants: Babies born before 37 weeks of gestation are given the highest priority, as they are at increased risk of complications that can be mitigated by human milk.
- Medically Fragile Infants: Infants with conditions such as necrotizing enterocolitis (NEC), congenital heart disease, or gastrointestinal disorders are prioritised.
- Infants with Special Needs: Babies who cannot tolerate formula due to allergies or other medical conditions may also receive priority.
- Adopted and Foster Infants: In some cases, milk banks provide for adopted or foster infants when the biological mother is unable to breastfeed.

To ensure equitable access, many milk banks operate on a non-profit basis and provide milk free of charge or on a sliding scale based on the family's financial situation.

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5. Attitudes and Awareness towards Milk Donation

5.1 Maternal Knowledge

Research into maternal knowledge and attitudes toward milk donation reveals a complex interplay of awareness, cultural beliefs, and personal experiences. Studies have shown that while many mothers are aware of the concept of milk donation, there is often a lack of detailed knowledge about the processes involved and the benefits for recipient infants.

Key findings from various studies include:

- *Awareness Levels:* Many mothers have heard of milk donation but lack a comprehensive understanding of how milk banks operate and the rigorous safety protocols in place.
- *Positive Attitudes*: Mothers generally express positive attitudes towards donating milk, recognizing the potential benefits for infants in need.
- *Concerns and Barriers*: Common concerns include fears about the safety of the donation process, the impact on their milk supply, and cultural or personal beliefs about sharing bodily fluids.

Educational campaigns and endorsements from healthcare providers have been shown to improve knowledge and positively shift attitudes toward milk donation significantly.(53,54)

5.2 Factors influencing willingness to donate and accept milk

Several factors influence a mother's willingness to donate her breast milk or accept donor milk for her infant. These factors include:

- *Personal Experience with Breastfeeding:* Mothers who have had successful breastfeeding experiences are more likely to consider donation.

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- *Perceived Benefits:* Understanding the health benefits of donor milk for preterm and sick infants encourages donation.
- *Trust in the System:* Confidence in milk banks' safety, efficacy, and processes is crucial.
- *Cultural Beliefs and Norms:* Cultural attitudes towards milk sharing and bodily integrity can support or hinder willingness to donate.
- *Social Support:* Encouragement and support from family, friends, and healthcare providers play a significant role.
- *Socio-demographic Influences*: Socio-demographic factors such as age, education, location, and income levels notably impact milk donation practices. Studies indicate that:
- *Age*: Younger mothers might be less likely to donate due to a lack of awareness or experience, whereas older mothers with more experience with breastfeeding and childcare may be more open to the idea.
- *Education*: Higher education levels are generally associated with greater awareness and understanding of the benefits of milk donation, leading to higher donation rates.
- *Income:* Income levels can affect both the ability and willingness to donate. Mothers from higher-income backgrounds may have more resources and support to facilitate milk donation. In contrast, those from lower-income backgrounds may face logistical challenges and may prioritise their own infants' needs.
- *Location:* There are notable differences between urban and rural mothers in terms of attitudes and practices related to milk donation:

Urban Mothers: Urban areas tend to have better access to healthcare facilities, including milk banks, and more education and awareness program opportunities. Urban mothers are often more

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exposed to information about milk donation through healthcare providers and media, leading to higher donation rates and acceptance of donor milk.

Rural Mothers: In rural areas, limited access to healthcare facilities and educational resources can lower awareness and understanding of milk donation. Additionally, cultural beliefs and practices in rural communities may differ, affecting attitudes toward milk sharing and donation. Improving awareness and infrastructure in rural areas is crucial for enhancing participation in milk donation.(37,55,56)

6.1 Infant Health Outcomes

Reduction in Infant Mortality and Morbidity

Human milk banking has significant public health implications, particularly in reducing infant mortality and morbidity. Breast milk is known to provide essential nutrients and immunological protection critical for infants' health and development. The provision of donor milk to preterm and sick infants can drastically improve their survival rates and health outcomes.

Infant Mortality: The availability of donor milk can reduce infant mortality rates, especially among preterm and low birth weight infants who are at a higher risk of complications. Studies have shown that infants who receive human milk, either from their mothers or donors, have a lower risk of death compared to those who are formula-fed.

Infant Morbidity: Donor milk helps reduce the incidence of severe infections, such as necrotizing enterocolitis (NEC), sepsis, and respiratory tract infections. The anti-infective properties of

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breast milk, including antibodies and bioactive molecules, play a crucial role in protecting infants from illnesses.

Comparative *Studies of Breastfed vs. Formula-fed Infants*

Research comparing health outcomes of breastfed versus formula-fed infants consistently highlights the benefits of breastfeeding. These studies provide compelling evidence for the importance of maternal and donor human milk in infant health.

Growth and Development: Breastfed infants tend to have better growth patterns and developmental outcomes than formula-fed infants. They exhibit enhanced cognitive development and higher IQ scores, which have long-term benefits for their educational and professional achievements.

Health Benefits: Breastfed infants show a lower incidence of acute conditions such as gastrointestinal and respiratory infections. Long-term health benefits include a reduced risk of developing chronic conditions such as obesity, type 2 diabetes, and cardiovascular diseases.

Hospitalisation Rates: Studies indicate that breastfed infants have lower hospitalisation rates due to infections and other health complications, reducing healthcare costs and less strain on healthcare systems.(57,58)

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6.2 Community Health and Awareness Campaigns

Role of Education and Advocacy in Promoting Milk Donation

Education and advocacy are vital in promoting milk donation and enhancing community health. Effective public health campaigns can raise awareness about the benefits of human milk and the importance of milk donation, thereby increasing the availability of donor milk for infants in need.

Educational Programs: Implementing educational programs in hospitals, community centres, and through media can inform mothers about breastfeeding and milk donation benefits. These programs should cover the safety protocols of milk banks, the donation process, and the impact of donor milk on infant health.

*Healthcare Provid*er Training: Training healthcare providers to educate and encourage mothers about milk donation is crucial. Providers play a key role in identifying and guiding potential donors through the donation process.

*Community Engagemen*t: Engaging community leaders and influencers to support and promote milk donation can help overcome cultural barriers and misconceptions about milk sharing.(54,59,60)

6.3 Case Studies of Successful Public Health Campaigns

Several public health campaigns have successfully increased awareness and participation in milk donation, improving infant health outcomes.

Brazil: The Brazilian Network of Human Milk Banks, supported by the Ministry of Health and the Oswaldo Cruz Foundation, has become a global model for milk banking. Their

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comprehensive approach includes widespread public education campaigns, support for breastfeeding mothers, and the establishment of numerous milk banks nationwide. This initiative has significantly reduced infant mortality rates and improved neonatal health.(61)

India: The "Amara Milk Bank" campaign in Rajasthan is an example of a successful regional initiative. This campaign focused on creating awareness through local media, engaging community health workers, and setting up milk donation camps. The campaign substantially increased milk donations and provided critical support to premature and low birth weight infants.(62)

The Breastfeeding Promotion Network of India (BPNI) is a national organization dedicated to the protection, promotion, and support of breastfeeding and infant and young child feeding (IYCF) practices. Established in 1991, BPNI operates through advocacy, training, and research, working closely with government bodies, non-governmental organizations, and international agencies. It aims to create awareness about the benefits of breastfeeding, provide support to lactating mothers, and implement policies and programs that encourage optimal feeding practices. BPNI also addresses challenges such as marketing of breast milk substitutes and inadequate maternity protection, striving to improve the health and nutrition of infants and young children across India.

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Human Milk Bank Association of India (HMBANI)

HMBANI has successfully integrated portable milk collection devices and community-based milk donation programs to enhance donors' accessibility and convenience. These portable devices are designed to be user-friendly and efficient, enabling mothers to express and store milk hygienically in remote and underserved areas. This initiative has expanded the reach of milk banking services, increasing donor participation and availability.

7. Ethical and Legal Considerations

7.1 Ethical Issues in Milk Banking

Informed Consent: Donors should receive comprehensive information about the milk donation, including screening procedures, storage, pasteurisation, and distribution. They should be aware of potential risks to themselves or their infants and the benefits to recipient infants. Consent forms should be clear and detailed, ensuring that donors voluntarily agree to donate without any coercion.

Confidentiality: The privacy and confidentiality of donors must be protected. Personal and health information collected during the screening process should be securely stored and only accessible to authorised personnel.

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Right to Withdraw: Donors should have the right to withdraw from the donation process at any point without any repercussions. They should also be informed about how to revoke consent if they change their mind after donation.(63)

7.2 Equity in Distribution and Access

Ethical milk banking also ensures equity in distributing and accessing donor milk.

- Prioritisation Criteria: The allocation of donor milk should be based on medical needs rather than socioeconomic status. Infants at the highest risk, such as preterm or critically ill infants, should be given priority.
- Accessibility: Efforts should be made to make donor milk accessible to all infants who need it, regardless of their families' financial circumstances. This may involve subsidising costs for low-income families or providing donor milk free of charge.
- Addressing Disparities: Programs should aim to reduce disparities in access to donor milk. This includes reaching out to underserved communities and ensuring that milk donation and banking information and resources are available in multiple languages and culturally sensitive formats.(64)

7.3 Policies Supporting Milk Donation

1. Supportive Policies - Funding and Grants: Government and non-governmental organisations can provide funding and grants to support the establishment and operation of milk banks. This includes financial support for equipment, staff training, and outreach programs.

2. Public Awareness Campaigns: Policies that promote public awareness about the benefits of milk donation and breastfeeding can encourage more mothers to donate.

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3. Healthcare Integration: Integrating milk banking services into the broader healthcare system ensures that donor milk is readily available to needy infants and that healthcare providers know its benefits and uses.(65)

7.4 Policies Hindering Milk Donation:

1. Regulatory Barriers: Excessive regulatory requirements and bureaucratic hurdles can impede the establishment and operation of milk banks. Streamlining these processes can help facilitate milk banking services.

2. Lack of Insurance Coverage: In some regions, the cost of donor milk is not covered by health insurance, making it not affordable for many families. Policies that mandate insurance coverage for donor milk can improve access.

3. Cultural and Social Barriers: Some cultures may have stigma or misconceptions about milk donation. Policies that promote cultural sensitivity and community engagement can help address these barriers.(66)

8. Challenges and Future Directions

8.1 Current Challenges in Milk Banking

Individual barriers

Individual barriers to breast milk donation (BMD) included the time commitment required, personal aversion to the process, lack of knowledge, insufficient milk supply, negative opinions, and lack of information. Family-related obstacles comprised family stigma, negative rumors, less educated family members, and the illness of a family member.(66) Mothers from families with poor educational backgrounds and those lacking family support for child care while

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donating were particularly discouraged from donating breast milk. The illness of a family member also left mothers with insufficient time to donate.(66) Workplace barriers included lack of emotional support or encouragement to donate milk or breastfeed, and the absence of milk collection or transportation services. The distance to human milk banks (HMB) was also a barrier, as was the concern that breastfeeding their own child could reduce donation frequency.

Regarding infant-related factors, women with preterm infants were found to donate larger volumes of donor human milk (DHM) compared to mothers of term infants. Two studies indicated that mothers of infants born before 37 weeks gestation donated significantly more milk than those of full-term infants, and one study showed that mothers of infants born before 32 weeks gestation donated more than those with older gestational ages. Additionally, mothers of low birthweight infants donated more DHM than those with higher birthweight infants, regardless of gestational age. The amount of milk donated generally increased with the duration of the donation period.(67) Furthermore, women at the extremes of the reproductive age spectrum and those with higher parity needed more motivation to donate breast milk.(68)

Operational and Logistical Issues

Human milk banking faces numerous operational and logistical challenges that can hinder its effectiveness and reach. One significant issue is the collection, processing, and distribution infrastructure required to maintain high standards of milk safety and quality. According to Arslanoglu et al. (2010), milk banks need to adhere to stringent protocols for donor screening, pasteurization, and storage, which necessitates specialized equipment and trained personnel. This can be particularly challenging in low-resource settings where funding and resources are limited. Additionally, the transportation of donated milk, which requires

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refrigeration to prevent spoilage, poses logistical difficulties, especially in regions with inadequate infrastructure.

Misconceptions and Cultural Barriers

Cultural beliefs and misconceptions about milk donation represent another major challenge. Many communities view breast milk as a personal and familial resource rather than a communal one, which can create resistance to the idea of donating or accepting milk from others (Coutsoudis et al., 2011). In some cultures, there is a stigma associated with using another woman's breast milk, rooted in concerns about genetic inheritance and identity (Gribble, 2013). These cultural barriers are compounded by a lack of awareness about the benefits of human milk donation and the safety measures employed by milk banks. Efforts to promote milk banking must therefore include culturally sensitive education and outreach to dispel myths and encourage acceptance.(69,70)

8.2 Innovations and Future Research

Technological Advancements in Milk Preservation

Recent technological advancements have the potential to address some of the operational and logistical challenges in milk banking. HPP has shown promise in inactivating pathogens without the use of heat, thereby preserving the bioactive components of breast milk better than traditional pasteurization.(50) Freeze-drying, on the other hand, reduces the volume and weight of milk, making storage and transportation more efficient. (71)

Future Research Directions

Future research in human milk banking should focus on optimizing these technological advancements and evaluating their long-term impact on milk safety and efficacy. Additionally,

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research should explore the psycho social aspects of milk donation, including the motivations and barriers faced by potential donors. Studies that examine the outcomes of infants fed with donor milk versus formula could provide further evidence to support the expansion of milk banking services. Lastly, research into the development of more cost-effective and scalable solutions for milk processing and preservation will be crucial for making milk banking accessible in low-resource settings.

9. Lessons Learned and Best Practices

Comprehensive Training and Education

Effective training programs for staff and donors are crucial. Ensuring that all individuals understand the importance of hygiene, proper milk handling, and the use of advanced technologies can significantly improve the quality and safety of donor milk. Regular training updates and refresher courses can help maintain high standards.(72)

Robust Quality Control Systems

Implementing automated and precise quality control systems, such as milk analyzers and temperature monitoring devices, ensures that donor milk meets the highest safety and nutritional adequacy standards.(73)

Community Engagement and Support

Engaging the community through awareness campaigns and support programs is essential for building trust and encouraging milk donation. Programs that involve community leaders and healthcare providers in promoting milk banking have been particularly successful in increasing donor participation and acceptance of donor milk.

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Invest in Advanced Pasteurization Technologies

New milk banks should consider investing in advanced pasteurization technologies, such as HTST pasteurization, to enhance the preservation of bioactive components in breast milk. Researching and adopting the latest methods can help improve the quality and efficacy of donor milk.

Develop Portable and Efficient Milk Collection Systems

Implementing portable milk collection systems can make the donation process more accessible and convenient for mothers, especially in remote or underserved areas. Designing user-friendly and efficient collection devices can help increase the volume of donor milk.(74)

Ensure Comprehensive Training and Support

Providing comprehensive training for staff and donors is essential for maintaining high milk collection, storage, and handling standards. Regular training sessions and ongoing support and resources can help sustain these standards.

Foster Community Engagement and Awareness

Engaging the community through targeted awareness campaigns and support programs can build trust and encourage milk donation. Collaborating with community leaders and healthcare providers can enhance the effectiveness of these initiatives.

10. Psychological Aspects of Mothers Allowing Milk Donation

Altruism and Helping Others

Altruism is a significant motivator for many mothers who donate their milk. The desire to help other infants, particularly those sick or premature, can provide a strong sense of purpose and

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fulfillment. Knowing that their milk can save lives and improve health outcomes for other babies often outweighs personal reservations or discomfort.(75)

Positive Reinforcement and Support

Positive reinforcement and support from family, friends, and healthcare providers can greatly influence a mother's decision to donate milk. Encouragement and validation from trusted sources can boost confidence and reduce fears or anxieties about the donation process.

Knowledge and Education

Educating mothers about milk donation's scientific and medical benefits, including the rigorous safety protocols in place, can alleviate concerns and misconceptions. When mothers understand the impact of their donation and feel assured about the safety of the process, they are more likely to participate.

Community and Social Responsibility

A sense of community and social responsibility can drive mothers to donate their milk. In cultures where communal support and collective well-being are valued, mothers may feel a duty to contribute to the health of other infants in their community, particularly in times of need.

Personal Experience with Breastfeeding Challenges

Mothers who have faced breastfeeding challenges may strongly empathize with other mothers and infants in similar situations. Their experiences can inspire them to donate milk to support others struggling to provide adequate nutrition for their babies.

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Psychological Benefits

Donating milk can provide psychological benefits to mothers, including a sense of accomplishment and enhanced self-esteem. Knowing they are making a meaningful contribution can positively impact their mental health and emotional well-being, fostering a sense of pride and satisfaction.(75,76)

Social Networks and Peer Influence

Belonging to social networks where milk donation is discussed and normalized can encourage mothers to donate. Hearing about the positive experiences of peers who have donated milk can reduce apprehensions and motivate others to follow suit.

Overcoming Initial Reluctance

While initial reluctance is common, many mothers find their concerns diminish once they start the donation process and experience the support and gratitude of milk banks and recipient families. This positive feedback loop can reinforce their decision and encourage continued participation.

11. Previous literature review on breast milk donation:

1. The study conducted by Zhang N et al. aimed to investigate postpartum women's knowledge, attitudes, and practices regarding human milk banks and milk donation in Wuhan, China. Conducted from February to July 2019 with 1,078 participants, the survey revealed that only 20% had prior knowledge of human milk banks. While 75.3%

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supported establishing milk banks and 81.3% were willing to donate, only 38.3% were open to accepting donor milk. Factors positively influencing knowledge and attitudes included age, education, newborn weight, and prior awareness of milk banks, whereas medication use during pregnancy negatively impacted knowledge. The study concluded that enhancing public awareness and education about the safety and importance of human milk banks is crucial for increasing acceptance and donation rates, which can significantly benefit preterm infants.(77)

2.

3. Bhoola P et al. investigated factors influencing mothers' willingness to donate or receive donor human milk, focusing on socio-demographics, pregnancy, breastfeeding history, prior knowledge of milk banks, and other general factors. Conducted with 148 participants, the cross-sectional, prospective, descriptive study found that 81.1% of predominantly single, Black African mothers aged 24.8 years on average had no prior knowledge of human milk banks. Despite this, 52.7% were significantly likely to donate, driven mainly by altruism, hospital/clinic staff information, milk production volume, concerns about having enough milk for their own child, and support from family and friends. The findings highlight the need for increased visibility and information dissemination to potential donor mothers to maintain a sustainable supply for human milk banks.(78)

4. The study conducted by Sankar MN et al. analyzed factors influencing breast milk use in the NICU, considering maternal, neonatal, and family aspects, alongside lactation support systems. In a retrospective study of 865 infants born between 23 and 41 weeks gestation,

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the findings showed breast milk usage at discharge was 89.3% overall, with variations across different gestational ages. Notably, prematurity, low birth weight, certain morbidities, Black maternal race, and public insurance were linked to lower breast milk usage, while early initiation of feeds positively influenced it. The study highlights the critical need for enhanced social and hospital support systems to close the gaps in breast milk utilization in the NICU.(79)

5. The study by Mondkar J et al. explored perceptions and practices regarding donor human milk (DHM) and human milk banks (HMBs) as part of the "Mother Baby Friendly Initiative Plus" (MBFI+) model, aimed at saving vulnerable newborns. Conducted through qualitative research with 56 service recipients and 9 service providers, the study found that while service providers viewed DHM as safe and lifesaving, challenges included low awareness of milk donation, staff shortages, and risks of milk contamination. Mothers were generally willing to donate but had concerns about milk shortages for their own babies and potential weakness from milk expression. Recipient mothers accepted DHM but worried about donor health and milk safety, while most grandmothers were resistant to both donating and receiving DHM. Fathers were supportive once informed of DHM's benefits. Recommendations for scaling up HMBs included improving awareness and infrastructure, providing skilled lactation counseling, fostering a supportive hospital environment, and establishing HMBs widely. Strengthening HMBs as part of the MBFI+ model requires targeted behavior change communication, capacity-building for service providers, and strong government support.(80)

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6. In a study conducted by Monti L et al. the psychological factors influencing the donation and reception of human milk from human milk banks (HMBs), were reviewed using data from 28 studies spanning 1995 to 2023. HMBs, established to provide safe breast milk, faced stricter regulations since the 1980s to ensure safety due to infection risks. Psychological barriers, however, affect decisions regarding milk donation and reception. The review found that factors facilitating milk donation included altruistic desires to help, support from healthcare professionals, and personal well-being. Conversely, concerns about breast milk exclusivity and discomfort from health checks were deterrents. For recipients, awareness of the benefits of donated milk was positive, while safety concerns were negative. Altruism played a significant role in motivating donors. The review highlighted the importance of proper awareness and support from healthcare professionals and families to help women understand the value of milk donation, aiding in personal and identity reintegration, especially after child loss.(81)

7. The study by Roshani M et al. aimed to assess the knowledge and attitudes regarding human milk donation among postnatal mothers in selected hospitals of Pune city, India. Utilizing a non-experimental descriptive design, data were collected from postnatal mothers using structured questionnaires and Likert scales. The sample consisted of mothers primarily aged 23-26 years. The results revealed that the majority of participants had no prior knowledge about human milk donation. The mean knowledge score was 8.89 (SD = 3.06), and the mean attitude score was 28.56 (SD = 9.62), indicating a wide range of attitudes from highly favorable to unfavorable. The study found no significant

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correlation between knowledge and attitude regarding milk donation, and demographic variables such as age, education, type of family, occupation, family income, and area of residence showed no significant association with either knowledge or attitude. The findings highlight that knowledge about breast milk donation among postnatal mothers was generally poor, and attitudes were varied. The lack of correlation between knowledge and attitude suggests that enhancing awareness alone may not be sufficient to influence attitudes towards milk donation, emphasizing the need for comprehensive educational and motivational strategies.(82)

8. The study by Jayanandan R et al. assessed the perceptions, practices, and associated factors of breast milk donation and acceptance among mothers registered with a breast milk bank at a tertiary care hospital in Chennai. Conducted from July to September 2019, this cross-sectional study involved 70 donor mothers and 70 beneficiary mothers of children under 6 months of age. Data were collected through interviews using a predesigned semi-structured questionnaire. The results indicated that 74% of participants were aware of breast milk bank services, and 67.1% of recipients had used the milk bank services more than twice. The study found that complications during delivery and NICU treatments were significantly higher among recipient mothers ($p < 0.001$). The findings highlight the need to increase awareness of breast milk bank services, particularly among mothers of premature babies, low birthweight neonates, and those with newborns in the NICU. This suggests that targeted educational initiatives could improve the utilization and support of breast milk banking services.(83)

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9. The study by Mantri N et al. investigated the challenges in implementing Mother Milk Banks (MMBs) in Rajasthan, India, emphasizing the importance of donated human milk (DHM) as an alternative when mother's milk is unavailable. Using a qualitative approach, in-depth interviews with key stakeholders were conducted and analyzed through the Root Cause Analysis framework. The findings identified several system challenges, such as lack of recurring funds, absence of dedicated lactational counselors, and insufficient trained technicians. Additionally, there were no comprehensive databases for demand-supply estimates. Community challenges included low acceptance of DHM due to safety concerns, fear of disease transmission, and doubts about the quality of donated milk. Cultural and religious beliefs, particularly concerns about the transfer of hereditary traits and potential reduction in mother-child affection, also hindered milk donation. The study concluded that Social Behavior Communication Change (SBCC) interventions should be introduced early during antenatal check-ups to improve DHM acceptance. Education and motivation by healthcare providers were highlighted as crucial for influencing infant feeding choices. These findings provide essential baseline information to address barriers and develop frameworks for mother milk banks in India.(84)

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METHODS

Study Design

A cross-sectional study design was used to assess the factors influencing the willingness to donate breast milk among lactating mothers.

Setting

The study will be conducted in post natal ward by department of pediatrics at Shri BM Patil Medical College Hospital and Research Centre in Vijayapura. Study will involve lactating mothers who are hospitalised or receiving postnatal care at the medical college hospital .

Study Population

Inclusion Criteria

The study will include lactating mothers who are hospitalized at Shri BM Patil Medical College Hospital and Research Centre, Vijayapura .These participants must met the inclusion criteria to be part of the study.

Exclusion Criteria

- Lactating mothers with sexually transmitted diseases (STDs)
- Mothers with COVID-19 infection
- Post natal mothers admitted in ICU
- Post natal mothers with psychiatric conditions like postpartum depression and anxiety
- Mothers who are on drugs i.e anti-epileptics
- Mothers who are not willing to participate will be excluded from the study.

These exclusion criteria ensure the safety of the participants and the integrity of the study data.

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Sampling

The sampling technique employed in this study is convenience sampling, which allows for the inclusion of participants based on their availability and willingness to participate. This method is particularly suitable for the study setting at Shri BM Patil Medical College Hospital and Research Centre, as well as community-based settings in Vijayapura. Convenience sampling facilitates the recruitment of a sufficient number of participants within the study's time frame. Mothers who meet the inclusion criteria and provide written informed consent will be interviewed using a semi-standardized questionnaire. While convenience sampling may introduce some selection bias, it is effective in accessing a diverse population of lactating mothers, providing valuable insights into their attitudes and factors influencing breast milk donation.

Sample Size

The sample size for this study has been determined to ensure adequate statistical power and precision. Based on an anticipated proportion of 11% of mothers willing to donate breast milk for banking, a minimum of 420 lactating mothers is required to achieve a 95% confidence level with a 3% absolute precision. The sample size calculation was performed using the Statulator software, employing the formula: $n = \frac{Z^2 P * Q}{d^2}$

Where Z= Z statistic at α level of significance

d^2= Absolute error

P= Proportion

q= 100-p

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This sample size will allow for meaningful comparisons between urban and rural groups, each consisting of 210 lactating mothers, enabling the study to draw robust conclusions about the factors influencing breast milk donation in these populations.

Data Collection Procedure:

Data will be collected using a semi-standardized questionnaire through an interview technique. Mothers who meet the selection criteria and provide written informed consent will be included in the study. The sampling technique employed is convenience sampling, allowing for the inclusion of eligible participants based on their availability and willingness to participate.

The semi-standardized questionnaire is designed to capture detailed information on the lactating mothers' attitudes towards milk banking, factors influencing their willingness to donate and accept donated breast milk, and the potential impact of milk banking awareness on their attitudes. The data collection process will involve direct interviews with the participants, conducted by trained research assistants. These interviews will ensure accurate and comprehensive data capture, allowing for a thorough assessment of the factors influencing breast milk donation among the study population.

Study Tools

The data collection for this study will be conducted using a structured proforma, which encompasses sociodemographic data, maternal factors, and the assessment of mothers' knowledge and attitudes towards milk donation. The sociodemographic section includes variables such as the baby’s name, mother’s name, IP number, age, place, religion, residential

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area (rural or urban), education status, marital status, spouse's education status, husband's occupation, monthly income, obstetric score, mode of delivery, number of antenatal and postnatal visits, and the number of antenatal visits during the last pregnancy. The maternal factors section assesses the history of NICU admissions for the present and previous babies, history of baby death after breastfeeding initiation, receipt of breastfeeding counseling during antenatal visits, current breastfeeding status, and belief in formula feeding. The final section evaluates the mother's knowledge and attitude towards milk bank donation, including prior awareness of milk banks, emotional response to the impact of milk donation, willingness to donate with or without previous knowledge, willingness to receive or accept stored breast milk, requirement of spousal consent, beliefs about the benefits and adequacy of human milk, and concerns about milk donation. This comprehensive tool ensures a thorough collection of relevant data, facilitating an in-depth analysis of the factors influencing the willingness to donate breast milk among lactating mothers.

Statistical Analysis

The data obtained from the study were entered into a Microsoft Excel spreadsheet and subsequently analyzed using the Statistical Package for the Social Sciences (SPSS) Version 20. Descriptive statistics were employed to summarize the sociodemographic characteristics, maternal factors, and attitudes towards milk donation among the study participants. Data were presented as Mean ± Standard Deviation (SD) for normally distributed continuous variables, and as Median and Interquartile Range (IQR) for non-normally distributed continuous variables. Categorical variables were summarized using frequencies and percentages.

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For inferential statistics, normally distributed continuous variables were compared between two groups (urban vs. rural) using the independent t-test. The comparison of categorical variables was conducted using the Chi-square test. A p-value of less than 0.05 was considered statistically significant for all tests, and all statistical tests were two-tailed.

Additionally, logistic regression analysis was performed to identify the socio-demographic and knowledge factors associated with the willingness to donate breast milk. Both crude odds ratios (COR) and adjusted odds ratios (AOR) with 95% confidence intervals (CI) were calculated to assess the strength and significance of these associations. The logistic regression models adjusted for potential confounding variables, and provide a clearer understanding of the independent effects of each factor on the willingness to donate breast milk.

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RESULTS

A total of 420 participants were included in the study. Table 1 and Figure 1 show the distribution of study participants based on their place of residence. Out of the 420 mothers who participated in the study, 210 (50%) were from urban areas (Group 1) and 210 (50%) were from rural areas (Group 2). This equal distribution highlights the representation of both urban and rural mothers in the study.

Table 1. Distribution of study population by place of residence

Place	**Frequency n (10%)**
Urban (Group1)	210 (50)
Rural (Group 2)	210 (50)
Total	420 (100)

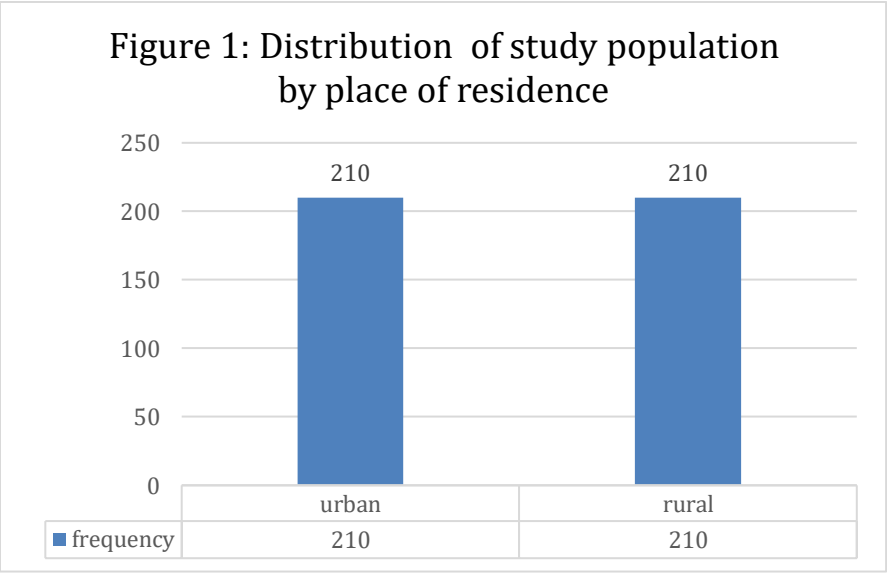

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Table 2. Distribution of age groups based on the location of study population

Age in years	Urban n (%)	Rural n (%)
18 - 25	110 (52.4)	134 (63.8)
26 - 36	100 (47.6)	76 (36.2)
Total	210 (100)	210 (100)

Chi square- 5.6334; P-value - 0.018

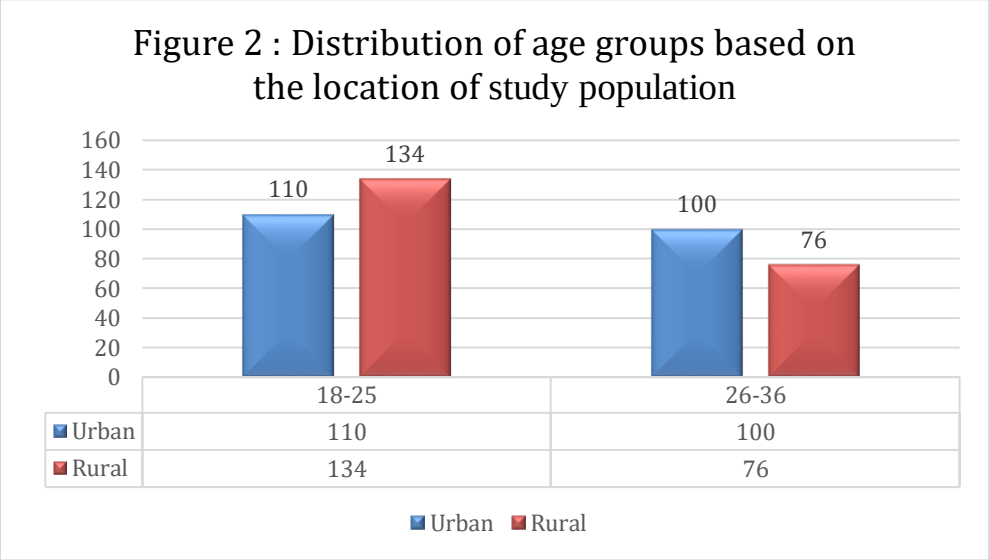

Table 2 and Figure 2 present the distribution of age groups among the study participants, categorized by their place of residence. In the urban group, 52.4% (n=110) of participants were aged 18-25 years, while 47.6% (n=100) were aged 26-40 years. In the rural group, a higher proportion of participants, 63.8% (n=134), were aged 18-25 years, and 36.2% (n=76) were aged 26-36 years. The difference in age group distribution between urban and rural participants was statistically significant, with a chi-square value of 5.6334 and a p-value of 0.018.

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Table 3: Distribution of marital status among Urban and Rural study population.

Marital status	**Urban** **n (%)**	**Rural** **n (%)**
Married	207 (98.6)	208 (99.05)
Separated	3 (1.43)	2 (0.95)
Total	210 (100)	210 (100)

Chi square - 0.2024; P-value – 0.653

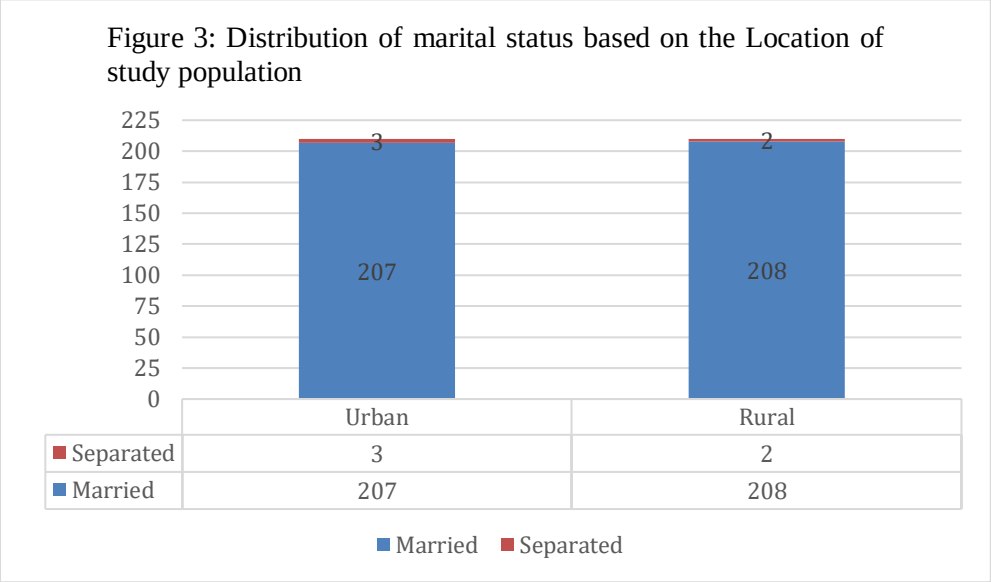

Table 3 and Figure 3 present the distribution of marital status among the study participants, categorized by their place of residence. In the urban group, 98.6% (n=207) of participants were married, and 1.43% (n=3) were separated. In the rural group, 99.05% (n=208) of participants were married, and 0.95% (n=2) were separated. The difference in marital status distribution between urban and rural participants was not statistically significant, with a chi-square value of 0.2024 and a p-value of 0.653.

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Table 4: Distribution of Spouse Monthly Income among Urban and Rural study population

Spouse monthly income	Urban n (%)	Rural n (%)
0-10000	13 (6.2)	40 (19.1)
10001 - 20000	37 (17.6)	112 (53.3)
20001 - 30000	97 (46.2)	33 (15.7)
>30000	63 (30.0)	25 (11.9)
Total	210 (100.0)	210 (100.0)

Chi square - 99.4232; P-value <0.001

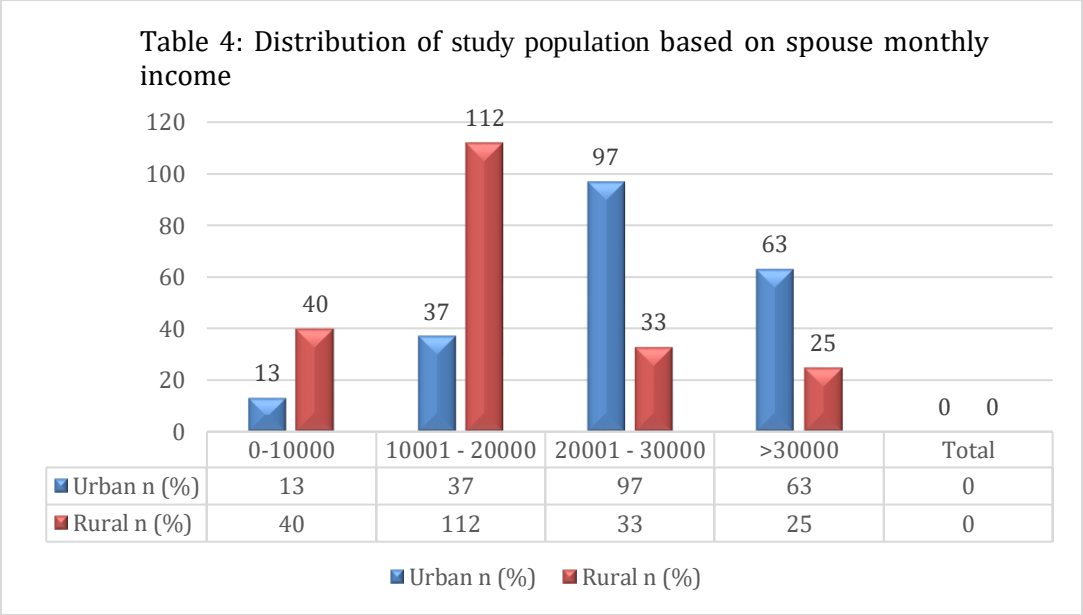

Table 4 and Figure 4 show the distribution of the study population based on the spouse's monthly income, divided by urban and rural residence. In the urban group, 6.2% (n=13) had a monthly income of 0-10,000, 17.6% (n=37) had an income of 10,001-20,000, 46.2% (n=97) had an

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income of 20,001-30,000, and 30.0% (n=63) had an income of over 30,000. In the rural group, 19.1% (n=40) had a monthly income of 0-10,000, 53.3% (n=112) had an income of 10,001-20,000, 15.7% (n=33) had an income of 20,001-30,000, and 11.9% (n=25) had an income of over 30,000. The difference in income distribution between urban and rural participants was statistically significant, with a chi-square value of 99.4232 and a p-value of <0.001.

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Table 5. Distribution of Religion Among Urban and Rural study population

Religion	Rural n (%)	Urban n (%)
Hindu	195 (92.9)	184 (87.6)
Others	15 (7.1)	26 (12.4)
Total	210 (100)	210 (100)

Chi square- 3.8970; P-value – 0.142

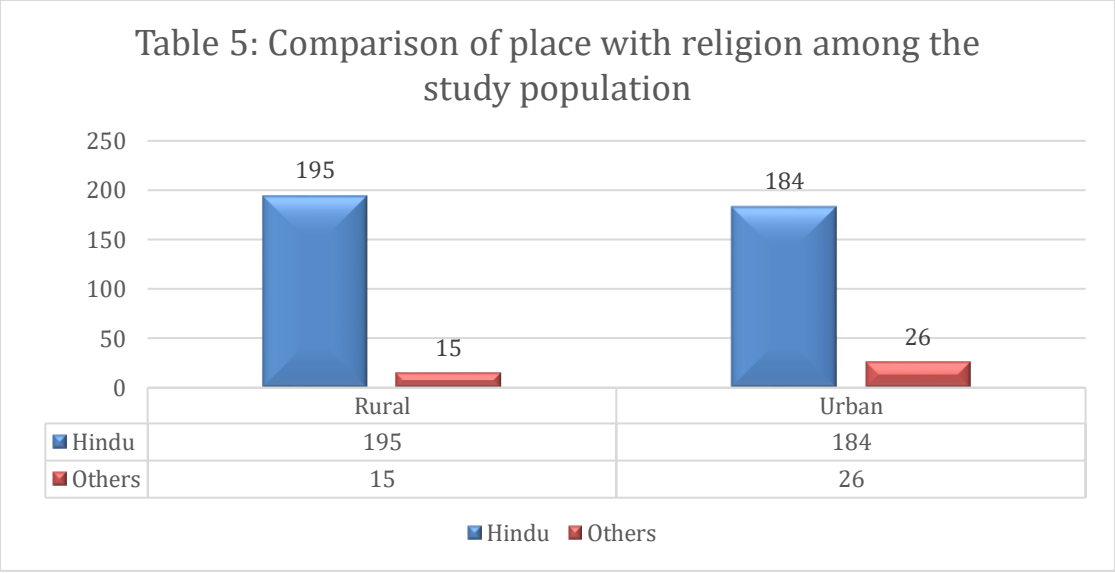

Table 5 and Figure 5 present the distribution of religion among the study participants, categorized by their place of residence. In the rural group, 92.9% (n=195) of participants were Hindu, 7.2% (n=15) were others. In the urban group, 87.6% (n=184) of participants were Hindu, 12.4% (n=26) were others. The difference in the distribution of religions between urban and rural participants was not statistically significant, with a chi-square value of 3.8970 and a p-value of 0.142

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Table 6. Distribution of Type of Delivery Among Urban and Rural study population.

Type of delivery	Rural n (%)	Urban n (%)
NVD	81 (38.6)	90 (42.9)
LSCS	129 (61.4)	120 (57.1)
Total	210 (100)	210 (100)

Chi square – 0.7990; P-value – 0.371

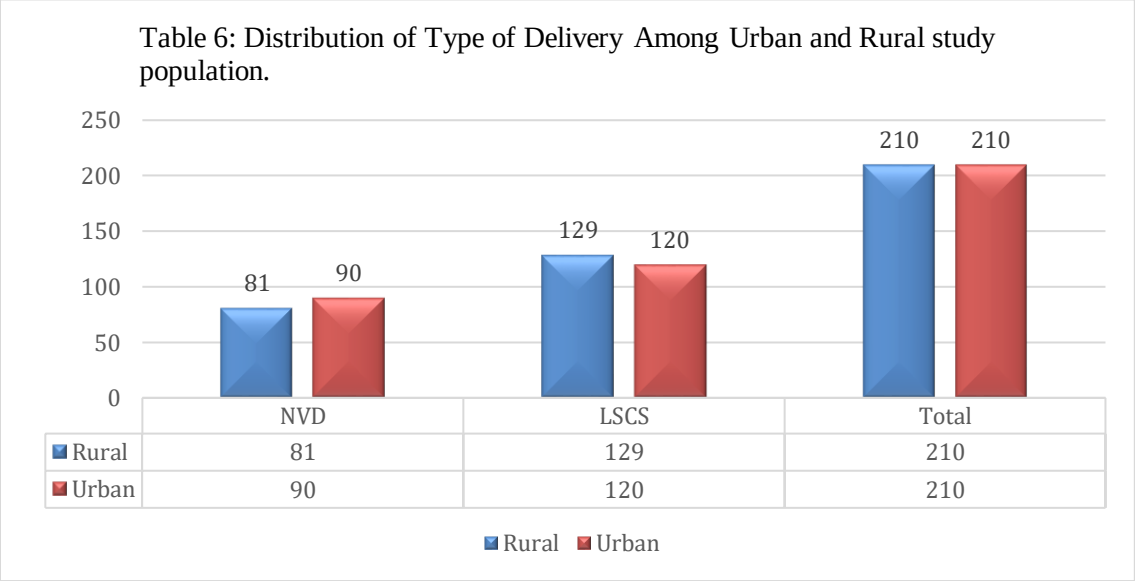

Table 6 and Figure 6 show the distribution of the type of delivery among the study participants, categorized by their place of residence. In the rural group, 38.6% (n=81) of participants had a normal vaginal delivery (NVD), and 61.4% (n=129) had a lower segment cesarean section (LSCS). In the urban group, 42.9% (n=90) of participants had a normal vaginal delivery, and 57.1% (n=120) had a cesarean section. The difference in the type of delivery between urban and rural participants was not statistically significant, with a chi-square value of 0.7990 and a p-value of 0.371

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Table 7. Distribution of Obstetric Score among Urban and Rural study population

Obstetric score	Rural n (%)	Urban n (%)
Primigravida	73 (34.8)	80 (38.1)
Multigravida	137 (65.2)	130 (61.9)
Total	210 (100)	210 (100)

Chi square – 0.5038; P-value - 0.478

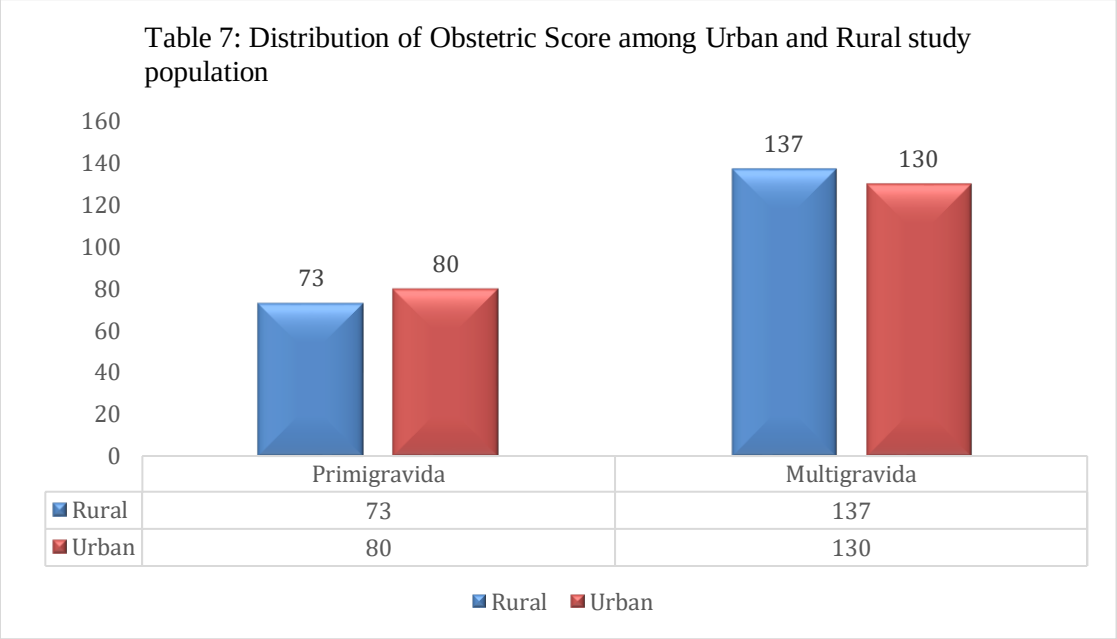

Table 7 and Figure 7 show the distribution of obstetric scores among urban and rural participants. In the rural group, 34.8% (n=73) were primigravida (first pregnancy) and 65.2% (n=137) were multigravida (multiple pregnancies). In the urban group, 38.1% (n=80) were primigravida and 61.9% (n=130) were multigravida. The difference in the distribution of obstetric scores between urban and rural participants was not statistically significant, with a chi-square value of 0.5038 and a p-value of 0.478.

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Table 8: Comparison of spouse occupation with place among the study population

Occupation	Urban n (%)	Rural n (%)
Government employee	21	10
Private employee	79	60
Farmer	20	60
Business	90	80
Total	210	210

Chi square- 425.0 p value<0.001

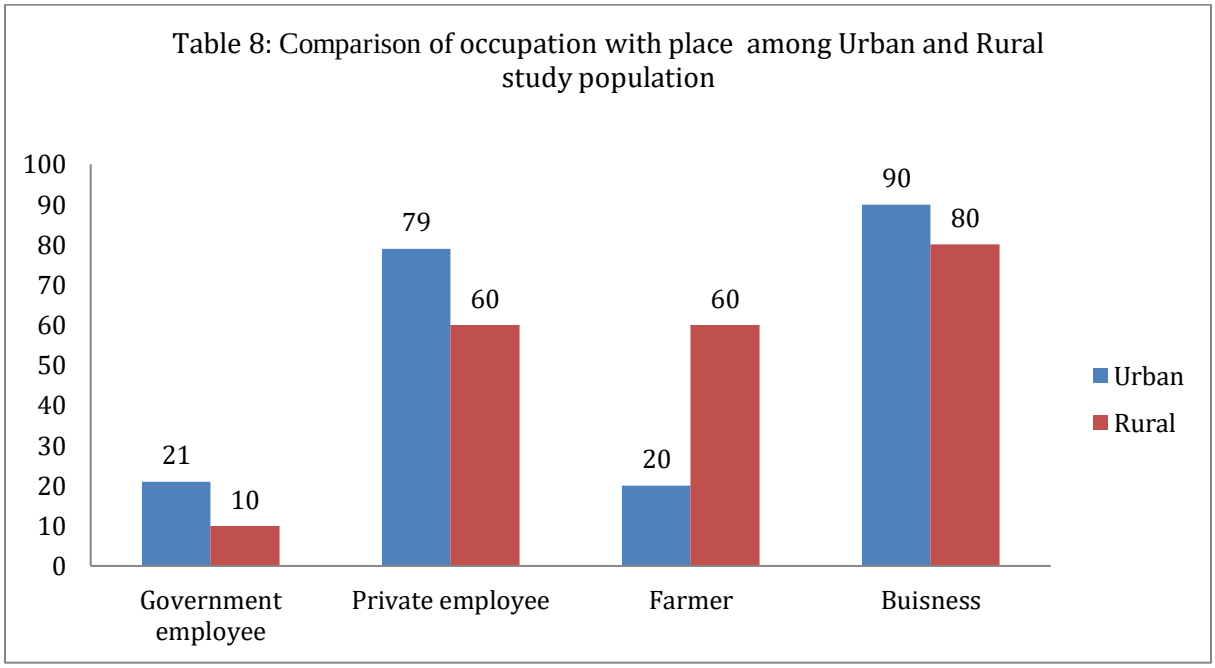

Table and Figure 8 shows the distribution of occupations in which there is a higher number of private employees and business persons reside in urban areas compared to rural areas, with 79 and 90 individuals in urban areas against 60 and 80 in rural areas, respectively. Conversely, the rural areas have a significantly higher number of farmers, with 60 compared to 20 in urban areas. Government employees are relatively few in both settings, with 21 in urban and 10 in rural areas.

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Table 9. Educational Status among Urban and Rural study population

Educational status	Rural n (%)	Urban n (%)
Illiterate	15 (7.1)	4 (1.9)
Class 1 – 12	127 (60.5)	38 (18.1)
Bachelor's degree	65 (31.0)	158 (75.2)
Master's degree	3 (1.4)	10 (4.8)
Total	210 (100)	210 (100)

Chi square – 96.9285; P-value – 0.000

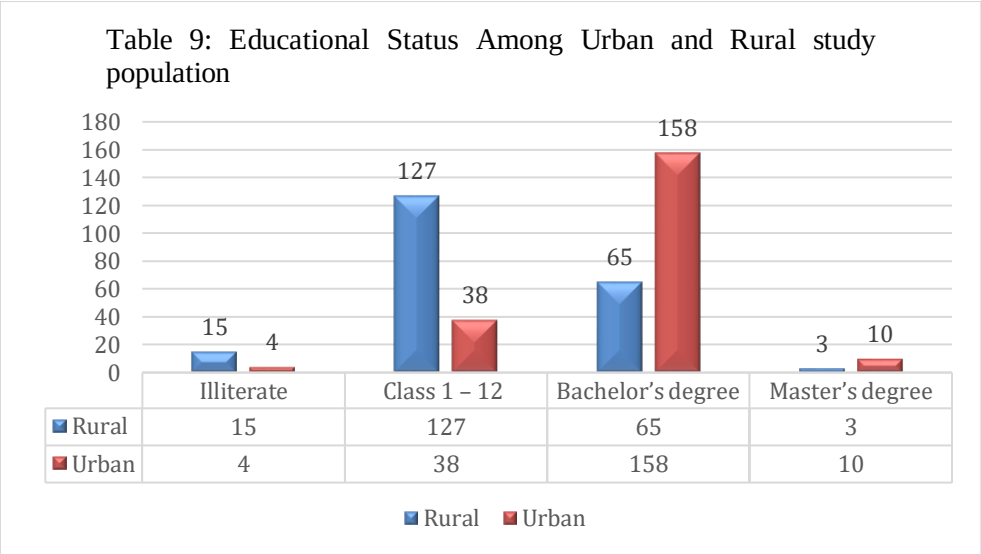

Table 9 and Figure 9 show the educational status of study participants categorized by rural and urban residence. In the rural group, 7.1% (n=15) were illiterate, 60.5% (n=127) had education ranging from class 1 to 12, 31.0% (n=65) had a bachelor's degree, and 1.4% (n=3) had a master's degree. In the urban group, 1.9% (n=4) were illiterate, 18.1% (n=38) had education ranging from class 1 to 12, 75.2% (n=158) had a bachelor's degree, and 4.8% (n=10) had a master's degree. The difference in educational status between urban and rural participants was statistically significant, with a chi-square value of 96.9285 and a p-value of 0.000.

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Table 10: Number of Antenatal Visits among Urban and Rural study population

No. of antenatal visit	Rural n (%)	Urban n (%)
≤ 5 visits	36 (17.1)	19 (9.1)
> 5 visits	174 (82.9)	191 (90.9)
Total	210 (100)	210 (100)

Chi square – 6.0463; P-value – 0.014

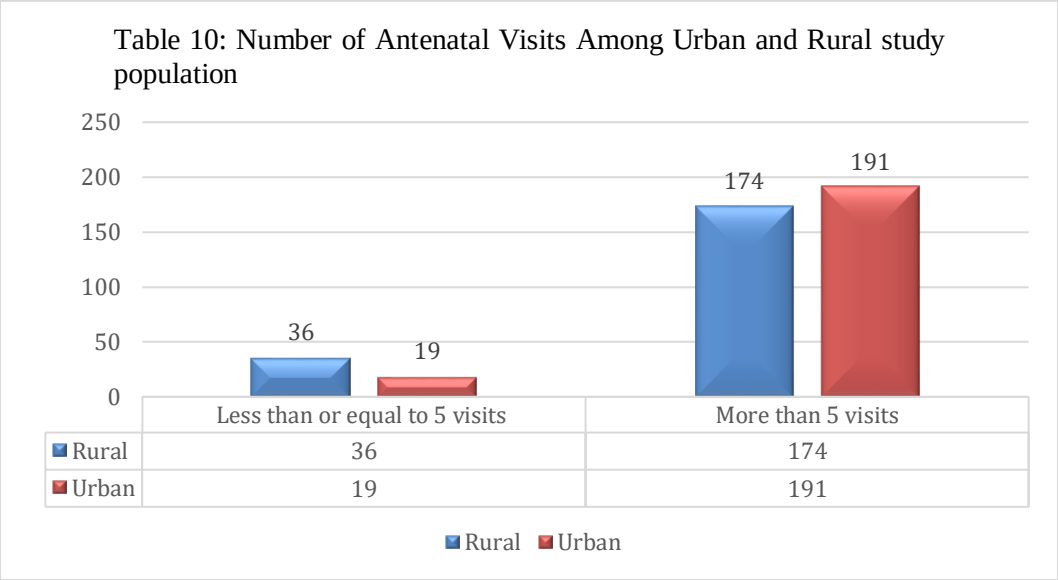

Table 10 and Figure 10 show the number of antenatal visits among study participants, categorized by rural and urban residence. In the rural group, 17.1% (n=36) had five or fewer antenatal visits, while 82.9% (n=174) had more than five visits. In the urban group, 9.1% (n=19) had five or fewer antenatal visits, while 90.9% (n=191) had more than five visits. The difference in the number of antenatal visits between urban and rural participants was statistically significant, with a chi-square value of 6.0463 and a p-value of 0.014.

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Table 11: Responses to Key Questions on NICU Admissions, Breastfeeding, and Formula Feeding.

S.NO	Questions	Overall	
		Yes **n (%)**	**No** **n (%)**
1.	H/o NICU admission for present baby?	158 (37.6)	262 (62.4)
2.	H/o NICU admissions for previous baby? (n=243)	62 (25.5)	181 (74.5)
3.	H/o Death of previous baby after breast feeding initiation?	30 (7.1)	390 (92.9)
4.	Received counselling for Breast feeding during antenatal visits?	206 (49.1)	214 (50.9)
5.	Currently breast feeding?	331(78.8)	89 (21.2)
6.	Do u believe in Formula feeding?	205 (48.8)	215 (51.2)

Table 11 summarizes the responses to key questions related to NICU admissions, breastfeeding, and formula feeding among the study participants. A history of NICU admission for the present baby was reported by 37.6% of the mothers, while 25.5% reported NICU admissions for a previous baby. A history of the death of a previous baby after breastfeeding initiation was reported by 7.1% of participants. Regarding counseling for breastfeeding during antenatal visits, 49.1% of mothers received it. Most of the participants, 78.8%, were currently breastfeeding, while 48.8% believed in formula feeding.

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Table 12. Comparison of Responses to Key Questions on NICU Admissions, Breastfeeding, and Formula Feeding Between Urban and Rural study participants

S.NO	Questions	Urban		Rural		p-value
		Yes n (%)	No n (%)	Yes n (%)	No n (%)	
1.	H/o NICU admission for present baby	75 (35.7)	135 (64.3)	83 (39.5)	127 (60.5)	0.420
2.	H/o NICU admissions for previous baby? (n=243)	36 (30.5)	82 (69.5)	26 (20.8)	99 (79.2)	0.083
3.	H/o Death of previous baby after breast feeding initiation	18 (8.6)	192 (91.4)	12 (5.7)	198 (94.3)	0.256
4.	Received counselling for Breast feeding during antenatal visits	119 (56.7)	91 (43.3)	87 (41.4)	123 (58.6)	0.002
5.	Currently breast feeding	176 (83.8)	34 (16.2)	155 (73.8)	55 (26.2)	0.012
6.	Do u believe in Formula feeding	96 (45.7)	114 (54.3)	109 (51.9)	101 (48.1)	0.204

Table 12 presents the responses to key questions on NICU admissions, breastfeeding, and formula feeding, comparing urban and rural participants. A history of NICU admission for the present baby was reported by 35.7% of urban mothers and 39.5% of rural mothers (p=0.420). NICU admissions for a previous baby were reported by 30.5% of urban mothers and 20.8% of rural mothers (p=0.083). A history of the death of a previous baby after breastfeeding initiation

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was reported by 8.6% of urban participants and 5.7% of rural participants (p=0.256). Counseling for breastfeeding during antenatal visits was received by 56.7% of urban mothers compared to 41.4% of rural mothers (p=0.002). Currently, 83.8% of urban mothers and 73.8% of rural mothers were breastfeeding (p=0.012). Belief in formula feeding was expressed by 45.7% of urban mothers and 51.9% of rural mothers (p=0.204).

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Table 13: Responses to Key Questions on Awareness, Willingness, and Beliefs About Milk Bank Donation.

S.NO	Questions	Overall	
		Yes n (%)	No n (%)
1.	Previously heard about milk bank donation?	66 (15.7)	354 (84.3)
2.	Do you feel very happy that my donated milk is the reason for the survival of a sick baby.	241(57.3)	179 (42.6)
3.	Is mother willing to donate?	57 (13.6)	8 (1.9)
4.	Is Mother willing to receive milk from milk bank?	171 (40.7)	249 (59.3)
5.	Is mother willing to accept stored breast milk?	51 (12.1)	21 (5.0)
6.	Requirement of spousal consent?	264 (62.9)	156 (37.1)
7.	I believe that human milk donation can save babies.	252 (60.0)	168 (40.0)
8.	I believe that human milk contains all essential nutrients required for healthy existence and complete development of baby	326 (77.6)	94 (22.4)
9.	I believe that donating breast milk is good for mother's health too as it reduces the breast engorgement.	231(55.0)	189 (45.0)
10.	I believe that donating breast milk does not cause malnutrition to mother or her baby.	213 (50.7)	207 (49.3)
11.	I believe that there is nothing wrong in donating milk in case of excess production of milk.	238 (56.7)	181(43.1)
12.	I believe that my milk should be given only to my baby and not to others.	197 (46.9)	223 (53.1)
13.	I am interested to donate milk but I am scared of expressing it using the machine	100 (23.8)	125 (29.8)
14.	I believe mother willing to donate breast milk after previous baby NICU admission?	58 (13.8)	4 (1.0)

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15.	I believe that if I am giving my milk to other babies then it may not be sufficient to my baby.	209 (49.8)	211 (50.2)
16.	I will donate milk only to my family members and friend's babies and not to any strangers.	200 (47.6)	220 (52.4)

Table 13 summarizes the responses to key questions on awareness, willingness, and beliefs about milk bank donation among the study participants. Only 15.7% of mothers had previously heard about milk bank donation, while 57.3% felt very happy that their donated milk could help save a sick baby. Regarding willingness to donate, 13.6% of mothers were willing to donate milk. Additionally, 40.7% were willing to receive milk from a milk bank, and 12.1% were willing to accept stored breast milk. A majority of 62.9% of participants believed that spousal consent was required for milk donation. Furthermore, 60.0% believed that human milk donation can save babies, and 77.6% believed that human milk contains all essential nutrients required for a baby's healthy development. About 55.0% believed that donating breast milk is good for the mother's health as it reduces breast engorgement, while 50.7% believed that donating milk does not cause malnutrition to the mother or her baby. Moreover, 56.7% saw no issue with donating excess milk, whereas 46.9% felt that their milk should only be given to their own baby. While 23.8% of mothers were interested in donating milk, they were scared of expressing it using a machine. Among mothers with previous NICU admissions for their babies, 13.8% were willing to donate breast milk. Concerns about the sufficiency of milk for their own baby were noted by 49.8% of mothers. Finally, 47.6% stated they would donate milk only to family members and friends' babies.

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Table 14. Comparison of Responses to Key Questions on Awareness, Willingness, and Beliefs About Milk Bank Donation Between Urban and Rural study participants

S.no	Questions	Urban		Rural		p-value
		Yes n (%)	No n (%)	Yes n (%)	No n (%)	
1.	Previously heard about milk bank donation?	42 (20.0)	168 (80.0)	24 (11.4)	186 (88.6)	0.016
2.	Do you feel very happy that my donated milk is the reason for the survival of a sick baby.	119 (56.7)	91 (43.3)	122 (58.1)	88 (41.9)	0.767
3.	Is mother willing to donate?	107 (50.9)	103 (49.1)	106 (50.5)	104 (49.5)	0.922
4.	Is Mother willing to receive milk from milk bank?	83 (39.5)	127 (60.5)	88 (41.9)	122 (58.1)	0.619
5.	Is mother willing to accept stored breast milk?	80 (38.1)	130 (61.9)	89 (42.4)	121 (57.6)	0.370
6. .	Requirement of spousal consent?	138 (65.7)	72 (34.3)	126 (60.0)	84 (40.0)	0.226
7.	I believe that human milk donation can save babies.	126 (60.0)	84 (40.0)	126 (60.0)	84 (40.0)	1.000
8.	I believe that human milk contains all essential nutrients required for healthy existence and complete development of baby.	161 (76.7)	49 (23.3)	165 (78.6)	45 (21.4)	0.640
9.	I believe that donating breast milk is good for mother's health too as it reduces the breast engorgement.	118 (56.2)	92 (43.8)	113 (53.8)	97 (46.2)	0.624
10.	I believe that donating breast milk does not cause malnutrition to mother or her baby.	111 (52.9)	99 (47.1)	102 (48.6)	108 (51.4)	0.380

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11.	I believe that there is nothing wrong in donating milk in case of excess production of milk.	120 (57.1)	90 (42.9)	118 (56.2)	92 (43.8)	0.844
12.	I believe that my milk should be given only to my baby and not to others.	93 (44.3)	117 (55.7)	104 (49.5)	106 (50.5)	0.282
13.	I am interested to donate milk but I am scared of expressing it using the machine (n=225)	51 (45.1)	62 (54.9)	49 (43.8)	63 (56.3)	0.602
14.	I believe mother willing to donate breast milk after previous baby NICU admission? (n=225)	33 (97.1)	1 (2.9)	25 (89.3)	3 (10.7)	0.215
15.	I believe that if I am giving my milk to other babies then it may not be sufficient to my baby.	105 (50.0)	105 (50.0)	104 (49.5)	106 (50.5)	0.922
16.	I will donate milk only to my family members and friend's babies and not to any strangers.	97 (46.2)	113 (53.8)	103 (49.1)	107 (51.0)	0.558

Table 14 presents the responses to key questions on awareness, willingness, and beliefs about milk bank donation, comparing urban and rural participants. A higher percentage of urban mothers (20.0%) had previously heard about milk bank donation compared to rural mothers (11.4%), which was statistically significant (p=0.016). Both urban and rural mothers felt similarly happy that their donated milk could help save a sick baby, with 56.7% of urban and 58.1% of rural mothers expressing this sentiment (p=0.767). Willingness to donate milk was nearly equal, with 50.9% of urban and 50.5% of rural mothers willing to donate (p=0.922). Additionally, 39.5% of urban mothers and 41.9% of rural mothers were willing to receive milk from a milk bank (p=0.619), and 38.1% of urban and 42.4% of rural mothers were willing to accept stored breast milk (p=0.370). Regarding the need for spousal consent, 65.7% of urban

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mothers and 60.0% of rural mothers believed it was necessary (p=0.226). Belief that human milk donation can save babies was equally held by 60.0% of both urban and rural mothers (p=1.000). The belief that human milk contains all essential nutrients was held by 76.7% of urban and 78.6% of rural mothers (p=0.640). On health benefits, 56.2% of urban and 53.8% of rural mothers believed that donating breast milk reduces breast engorgement (p=0.624). Similarly, 52.9% of urban and 48.6% of rural mothers believed that donating breast milk does not cause malnutrition (p=0.380). The perception that there is nothing wrong with donating excess milk was held by 57.1% of urban and 56.2% of rural mothers (p=0.844). Concerns about milk being given only to their own baby were noted by 44.3% of urban and 49.5% of rural mothers (p=0.282). Interest in donating milk but fear of expressing it using a machine was reported by 45.1% of urban and 43.8% of rural mothers (p=0.602). Among mothers with previous NICU admissions, 97.1% of urban and 89.3% of rural mothers were willing to donate breast milk (p=0.215). Concerns that donating milk might not leave enough for their own baby were reported by 50.0% of urban and 49.5% of rural mothers (p=0.922). Furthermore, 46.2% of urban mothers and 49.1% of rural mothers indicated they would donate milk exclusively to family members and friends (p=0.558).

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Table 15: Willingness to Donate Milk Among study participants with and without Previous Knowledge.

S.NO	Questions	Willing to donate milk		P-value
		Yes n (%)	No n (%)	
1	Mothers with previous knowledge	57 (87.7)	8 (12.3)	<0.001
2	Mothers with no previous knowledge	156 (43.9)	199 (56.1)	

Table 15 shows the willingness to donate milk among mothers with and without previous knowledge about milk bank donation. Among mothers with previous knowledge, 87.7% (n=57) were willing to donate milk, whereas only 12.3% (n=8) were not willing. In contrast, among mothers without previous knowledge, 43.9% (n=156) were willing to donate, and 56.1% (n=199) were not willing. The difference in willingness to donate milk between these two groups was statistically significant ($p<0.001$).

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Table 16: Willingness to Accept Milk Among study participants with and without Previous Knowledge

S.NO	Questions	Willing to accept milk		P-value
		Yes n (%)	No n (%)	
1	Mothers with previous knowledge	49 (75.4)	16 (24.6)	<0.001
2	Mothers with no previous knowledge	122 (34.4)	233 (65.6)	

Table 16 shows the willingness to accept milk among mothers with and without previous knowledge about milk bank donation. Among mothers with previous knowledge, 75.4% (n=49) were willing to accept milk, whereas 24.6% (n=16) were not willing. In contrast, among mothers without previous knowledge, 34.4% (n=122) were willing to accept milk, while 65.6% (n=233) were not willing. The difference in willingness to accept milk between these two groups was statistically significant ($p<0.001$).

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Table 17: Factors Associated with Willingness to Donate Milk Among study participants.

Explanatory variable	Willingness to donate milk		COR (95%CI)	AOR (95% CI)	P-value
	Yes n (%)	No n (%)			
Age (in years)					
18 - 25	112 (45.9)	132 (54.1)	1	1	
26 - 36	101 (57.4)	75 (42.6)	1.59 (1.07 – 2.35)	1.52 (0.97 – 2.39)	0.069
Residence					
rural	85 (40.5)	125 (59.5)	1	1	
urban	128 (61.0)	82 (39.0)	2.29 (1.55 – 3.39)	2.01 (1.30 – 2.96)	<0.001
Educational status					
Illiterate	9 (47.4)	10 (52.6)	1	1	
Class 1 -12	82 (49.7)	83 (50.3)	2.06 (0.73 – 6.63)	1.37 (0.50 – 3.76)	0.546
Bachelor degree	112 (50.2)	111 (49.8)	3.75 (1.34 – 11.98)	2.57 (1.11 – 8.42)	<0.001
Master degree	10 (76.9)	3 (23.1)	8.58 (1.73 – 53.45)	6.13 (1.28 – 34.37)	<0.001
Monthly household income in a year					
0 -10000	31 (58.5)	22 (41.5)	1	1	
10001 – 20000	68 (45.6)	81 (54.4)	0.60 (0.32 – 1.12)	0.58 (0.29 – 1.15)	0.122
20001 - 30000	61 (46.9)	69 (53.1)	0.63 (0.33 – 1.20)	0.64 (0.27 – 1.48)	0.298
>30000	53 (60.0)	35 (40.0)	1.07 (0.54 – 2.15)	0.98 (0.40 – 2.42)	0.972
Religion					
Hindu	194 (51.2)	185 (48.8)	1	1	
Others	19 (46.3)	22 (53.7)	0.82 (0.43 – 1.57)	0.88 (0.43 – 1.77)	0.711
Gravida					
Primigravida	52 (34.0)	101 (66.0)	1	1	
Multigravida	161 (60.3)	106 (39.7)	2.94 (1.95 – 4.48)	2.65 (1.74 – 4.04)	<0.001
Type of delivery					

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LSCS	92 (40.4)	136 (59.6)	1	1	<0.001
NVD	100 (58.5)	71 (41.5)	2.08 (1.39 – 3.12)	1.88 (1.15 – 2.88)	
No. of antenatal visit					
≤ 5	33 (60.0)	22 (40.0)	1	1	
> 5	180 (49.3)	185 (50.7)	0.65 (0.36 – 1.16)	0.77 (0.40 – 1.48)	0.430
Previously heard about milk donation					
No	156 (44.1)	198 (55.9)	1	1	
Yes	57 (86.4)	9 (13.6)	8.04 (3.86 – 16.7)	7.56 (3.73 – 15.8)	<0.001
Mothers with previous baby death					
No	186 (47.7)	204 (52.3)	1	1	
Yes	27 (90.0)	3 (10.0)	9.87 (2.95 – 33.07)	7.87 (2.12 – 24.76)	<0.001
Mothers with H/o NICU admission for previous baby					
No	69 (38.1)	112 (61.9)	1	1	
Yes	54 (87.1)	8 (12.9)	10.96 (4.92 – 24.40)	8.46 (2.84 – 12.46)	<0.001
Mothers with H/o NICU admission for present baby					
No	114 (43.5)	148 (56.5)	1	1	
Yes	99 (62.7)	59 (37.3)	2.17 (1.45 – 3.26)	1.77 (1.15 – 2.96)	<0.001

Table 17 presents the factors associated with willingness to donate milk among the study participants. Urban mothers had significantly higher odds of being willing to donate milk compared to rural mothers (AOR: 2.01, 95% CI: 1.30–2.96, p<0.001). Higher education levels

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were also positively associated with willingness to donate milk, with mothers holding a bachelor's degree (AOR: 2.57, 95% CI: 1.11–8.42, p<0.001) and a master's degree (AOR: 6.13, 95% CI: 1.28–34.37, p<0.001) being significantly more likely to donate compared to illiterate mothers. Multigravida mothers had higher odds of donating milk compared to Primigravida mothers (AOR: 2.65, 95% CI: 1.74–4.04, p<0.001). Mothers who had a normal vaginal delivery (NVD) were more willing to donate milk compared to those who had a lower segment cesarean section (LSCS) (AOR: 1.88, 95% CI: 1.15–2.88, p<0.001). Previous knowledge about milk donation significantly increased the likelihood of willingness to donate (AOR: 7.56, 95% CI: 3.73–15.8, p<0.001). Additionally, mothers who had experienced the death of a previous baby (AOR: 7.87, 95% CI: 2.12–24.76, p<0.001) and those with a history of NICU admission for a previous baby (AOR: 8.46, 95% CI: 2.84–12.46, p<0.001) or for their present baby (AOR: 2.17, 95% CI: 1.45–3.26, p<0.001) were significantly more willing to donate milk. Other factors, such as age, monthly household income, religion, and the number of antenatal visits, did not show significant associations with willingness to donate milk

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DISCUSSION

This study aimed to investigate the factors influencing the willingness to donate breast milk among postnatal mothers in Vijayapura, focusing on socio-demographic and psychological determinants, and comparing the attitudes of urban and rural mothers. The study found that awareness and prior knowledge of milk bank donation significantly impacted mothers' willingness to donate. Specifically, mothers with previous knowledge about milk bank donation were significantly more willing to donate breast milk compared to those without such knowledge. Urban mothers were found to have higher odds of being willing to donate milk compared to rural mothers, indicating a disparity in awareness and educational outreach between these populations. Higher educational levels were positively associated with the willingness to donate milk, with mothers holding bachelor's or master's degrees showing a greater propensity to donate. Additionally, multigravida mothers and those who had undergone normal vaginal delivery (NVD) were more inclined to donate breast milk. Personal experiences, such as having a baby previously admitted to the NICU or a history of NICU admissions for the present baby, were also significant factors influencing the willingness to donate. These findings highlight the critical role of targeted educational interventions and the need for policies to improve milk donation rates, thereby enhancing neonatal health outcomes in both urban and rural settings.

The study's findings underscore the importance of increasing awareness and providing education about milk bank donation, especially in rural areas where knowledge about this practice is less prevalent. The significant difference in willingness to donate between urban and rural mothers suggests that urban mothers may have better access to information and resources related to milk banking. This disparity points to the need for targeted interventions in rural areas to bridge the gap in knowledge and encourage milk donation. Educational status emerged as a key determinant

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of willingness to donate, with more educated mothers showing a higher propensity to donate.

This suggests that educational interventions that increase general awareness and knowledge about the benefits and processes of milk donation could be effective in promoting milk donation among less educated mothers. The study also found that previous knowledge about milk donation significantly increased both the willingness to donate and accept milk from a milk bank, emphasizing the need for comprehensive educational programs that inform mothers about the benefits of milk donation and the safety protocols involved.

Personal experiences, such as a history of NICU admissions for the current or previous baby, also played a significant role in influencing the willingness to donate. Mothers who had such experiences were more likely to understand the critical importance of donated breast milk for the survival and health of sick infants, making them more inclined to donate. This finding suggests that sharing personal stories and testimonials from mothers who have experienced the benefits of donated milk could be a powerful tool in encouraging others to donate. The study also highlighted significant differences in the socio-demographic characteristics of urban and rural mothers, such as age, marital status, spouse's monthly income, and educational status. These differences suggest that socio-economic factors may also influence attitudes towards milk donation and should be considered when designing interventions to promote milk donation. For instance, urban mothers generally had higher educational levels and higher household incomes compared to rural mothers, which may contribute to their greater willingness to donate milk.

In our study, 15.7% of mothers had prior knowledge about breast milk donation, and 50.7% were willing to donate breast milk. These findings are somewhat lower compared to **Zhang N et al**.'s (2019) study in Wuhan, China, which reported that 20% of participants had prior knowledge, and 81.3% were willing to donate.(77) Both studies underscore the importance

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of prior knowledge in enhancing the willingness to donate. However, the higher willingness rate in the Wuhan study suggests that additional cultural or contextual factors may play a role, indicating a need for more targeted educational campaigns in Vijayapura. **Bhoola P et al**. (2019) conducted a study in South Africa and found that 81.1% of predominantly single, Black African mothers had no prior knowledge of human milk banks, but 52.7% were willing to donate.(78) Our findings align with this study regarding the impact of prior knowledge on willingness to donate. However, the percentage of mothers willing to donate in our study (50.7%) is slightly lower than in the South African study. This difference could be attributed to varying levels of community support and healthcare infrastructure between the two regions.

Sankar MN et al. (2019) analyzed factors influencing breast milk use in the NICU and found that maternal experiences significantly impacted breast milk usage.(79) Similarly, our study found that mothers with a history of NICU admission for a previous baby (AOR: 8.46) or the present baby (AOR: 1.77) were more willing to donate. These findings suggest that personal experiences with neonatal health challenges increase empathy and willingness to support milk donation initiatives. **Jahan Y et al.** (2018) in Bangladesh reported that 98.3% of participants had not heard about human milk banks before the study, and 71.9% were willing to obtain milk from banks if necessary.(85) In our study, a similar lack of prior knowledge (15.7%) was observed, but the willingness to donate (50.7%) and accept milk (40.7%) was lower. These differences highlight the potential influence of regional cultural norms and the effectiveness of local health education programs. **Mondkar J et al.** (2020) identified low awareness and cultural concerns as significant barriers to milk donation in India.(80) Our study corroborates these findings, as the willingness to donate was strongly associated with higher educational levels and urban residence, suggesting that increased education and awareness are critical for improving donation rates.

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Additionally, concerns about milk shortages for their own children and safety of expressed milk were prevalent in both studies, indicating common barriers that need to be addressed through targeted education and supportive healthcare environments.

Monti L et al. (2023) reviewed psychological factors influencing milk donation and found that altruism and support from healthcare professionals were key facilitators.(81) Our study also highlighted the significant role of prior knowledge (AOR: 7.56) and positive personal experiences, such as previous baby NICU admissions, in motivating mothers to donate. This alignment suggests that fostering a supportive environment and emphasizing altruistic benefits can enhance donation rates.

Kimani-Murage EW et al. (2019) in Kenya reported that 80% supported breast milk donation, but only 59% were willing to use donor milk due to concerns about safety and disease transmission.(86) Similarly, our study found that willingness to accept milk (40.7%) was lower than willingness to donate (50.7%), reflecting common concerns about the safety of donor milk. These findings highlight the need for effective communication strategies to address safety concerns and promote acceptance. **Ahmed MAM et al.** (2018) in Uganda found a high acceptance rate (77.6%) for HBM donation, driven by positive experiences with wet-nursing and confidence in the effectiveness of HBM.(87) While our study showed lower overall willingness to donate (50.7%), the significant association of prior knowledge and personal experiences with willingness suggests that positive reinforcement and success stories could enhance donation rates in our context as well. **Verma A et al.** (2016) in Bhopal, India, reported high willingness to accept (85.4%) and donate (84.9%) breast milk, despite low awareness (10%) about milk banks.(88) In contrast, our study showed moderate willingness to donate (50.7%) and accept (40.7%) breast milk, with 15.7% having prior knowledge. These differences underscore the need

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for more effective awareness programs in Vijayapura to bridge the gap between awareness and willingness. **Varer Akpinar C et al.** (2019) in Turkey found that 57.9% of women were willing to donate breast milk, while only 27.7% were willing to use donor milk.(89) Negative attitudes were driven by religious concerns and fear of infectious diseases. Our study found similar concerns, with lower willingness to accept stored breast milk (12.1%) compared to willingness to donate (50.7%). These findings suggest that addressing cultural and religious beliefs through targeted education is crucial for improving acceptance.

Roshani M et al. (2019) in Pune, India, found that the majority of postnatal mothers had no prior knowledge about human milk donation, and there was no significant correlation between knowledge and attitude.(82) In contrast, our study showed a strong association between prior knowledge and willingness to donate (AOR: 7.56). This discrepancy highlights the importance of not only raising awareness but also addressing underlying attitudes and beliefs through comprehensive educational strategies. **Jayanandan R et al.** (2019) in Chennai, India, emphasized the need to increase awareness of breast milk bank services, particularly among mothers of premature babies and those with NICU experiences.(83) Our study similarly found that mothers with a history of NICU admissions were more willing to donate, underscoring the importance of targeted educational initiatives for this group. **Mantri N et al.** (2019) in Rajasthan, India, identified several system and community challenges in implementing Mother Milk Banks, including safety concerns and cultural beliefs.(84) Our study also highlighted similar barriers, such as concerns about milk safety and cultural norms, indicating the need for comprehensive SBCC interventions and healthcare provider education to improve acceptance. **Jadhav IB et al.** (2019) found that antenatal mothers had moderate awareness about HMBs, with significant associations between awareness and educational status.(90) Our study also identified

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higher educational levels as a significant factor associated with willingness to donate (Bachelor's degree: AOR: 2.57; Master's degree: AOR: 6.13). These findings emphasize the critical role of education in promoting milk donation.

The findings from our study have significant implications for enhancing human milk donation practices and policies in India. The strong association between prior knowledge and willingness to donate suggests that increasing awareness through targeted educational campaigns can significantly boost donation rates. Educational interventions should focus on highlighting the benefits of breast milk donation and addressing safety concerns to build trust among potential donors. The significant impact of higher educational levels on willingness to donate indicates that literacy programs could indirectly promote milk donation. Additionally, tailored messaging and support should be provided to urban mothers, who showed higher willingness to donate, to leverage their potential as key contributors to milk banks. Policy initiatives should include comprehensive lactation support services in hospitals, particularly for mothers with NICU experiences, to encourage donation. Implementing social behavior change communication (SBCC) strategies during antenatal visits could effectively address cultural and religious barriers to donation. Healthcare providers should receive training to counsel mothers on the benefits of milk donation and to provide the necessary support for expressing and storing breast milk. Furthermore, policies should focus on establishing and maintaining robust milk bank infrastructures, ensuring safety and quality standards to gain public trust. Finally, collaboration with community leaders and religious figures can help dispel myths and foster a supportive environment for milk donation, ultimately improving neonatal health outcomes.

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STRENGTHS & LIMITATIONS

Our study boasts several strengths that contribute to the robustness and reliability of its findings. The inclusion of a large sample size of 420 lactating mothers enhances the generalizability of the results across urban and rural settings in Vijayapura. By employing a cross-sectional design, we captured a comprehensive snapshot of the socio-demographic and psychological factors influencing milk donation attitudes. The use of a semi-standardized questionnaire ensured consistency and accuracy in data collection, allowing for reliable comparisons between groups. Additionally, our focus on both urban and rural populations provided a balanced perspective, revealing critical insights into geographic disparities in knowledge and willingness to donate breast milk. The study's rigorous statistical analysis, including the calculation of adjusted odds ratios, helped identify significant predictors of milk donation, offering valuable targets for intervention. Furthermore, the ethical considerations, such as obtaining informed consent, ensured that the study adhered to high ethical standards, safeguarding participant welfare. Overall, the study's methodological rigor and comprehensive approach significantly contribute to the understanding of factors affecting human milk donation.

Despite its strengths, our study also has several limitations that need to be acknowledged. The use of convenience sampling might have introduced selection bias, as participants were chosen based on their availability and willingness to participate, potentially limiting the representativeness of the sample. Additionally, the cross-sectional nature of the study precludes the ability to infer causality between the identified factors and willingness to donate breast milk. The reliance on self-reported data could lead to response bias, where participants may have provided socially desirable answers rather than reflecting their true beliefs and practices. Furthermore, the study was conducted in a specific geographic region, which may limit the

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applicability of the findings to other settings with different cultural, social, or healthcare contexts. The exclusion of mothers with certain health conditions, such as STDs and COVID-19, might have also skewed the results, as these groups may have different attitudes towards milk donation. Finally, the lack of qualitative data limits our understanding of the deeper motivations and barriers experienced by mothers regarding milk donation, which could have provided richer insights into the findings.

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CONCLUSION

Our study revealed that urban residence, higher education levels, multi parity, normal vaginal delivery, previous knowledge of milk donation, and history of NICU admissions are significant predictors of willingness to donate breast milk among lactating mothers in Vijayapura. The findings underscore the need for targeted educational interventions to overcome the challenges faced such educating about the importance and need for milk donation not only to mothers but also their family members especially their spouses, it is also important explaining about the safety and key measures taken during the donation and storage of milk and assure them about the safety in using the donated milk. Repeated counselling during antenatal visits will enhance the knowledge, emotional and social support systems to boost milk donation and acceptance among the mothers in both rural and urban areas. These insights can guide policymakers and healthcare providers in developing strategies to improve human milk banking practices and neonatal health outcomes.

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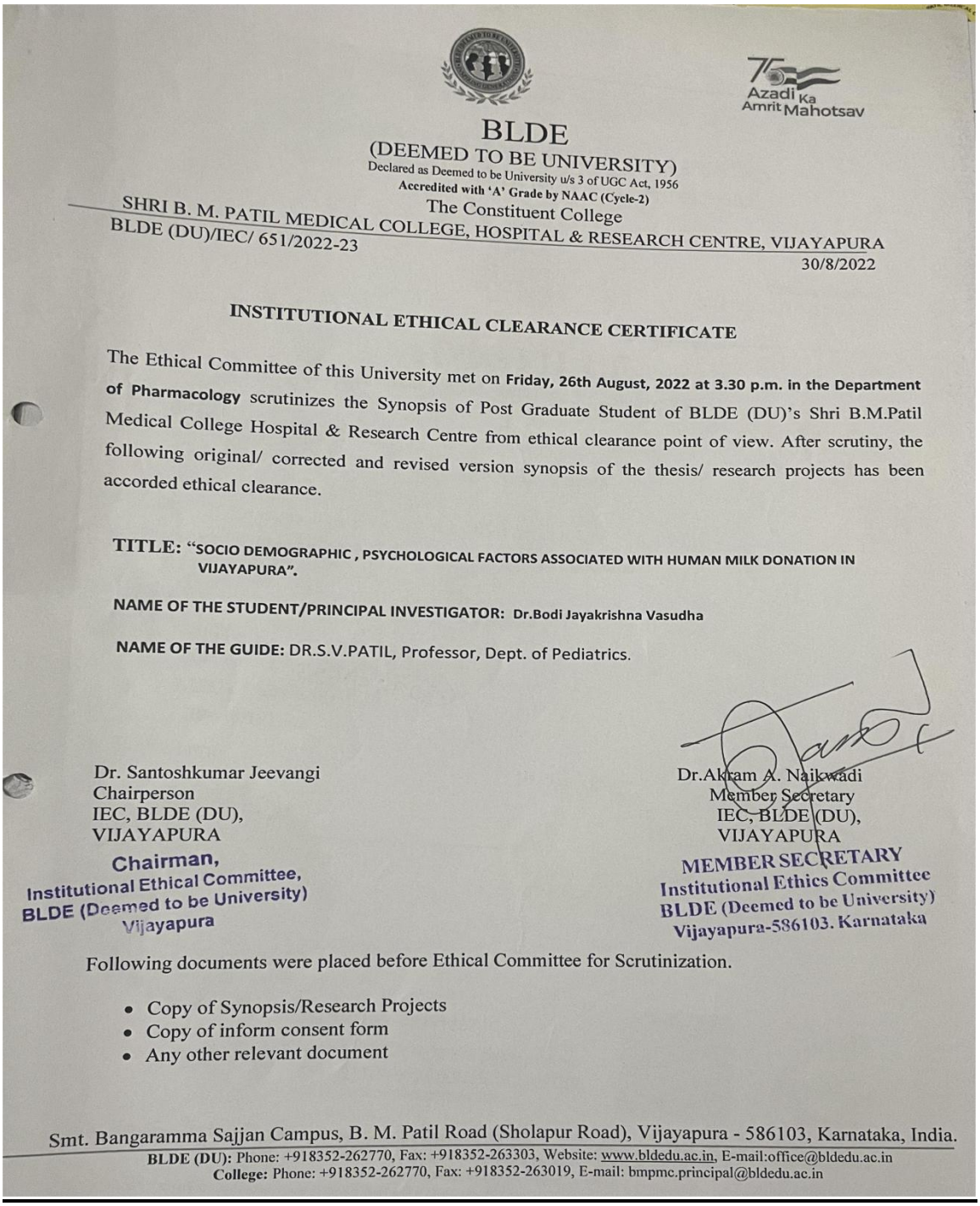
ANNEXURE – I

ETHICAL CLEARANCE CERTIFICATE



BLDE
(DEEMED TO BE UNIVERSITY)
Declared as Deemed to be University u/s 3 of UGC Act, 1956
Accredited with 'A' Grade by NAAC (Cycle-2)
The Constituent College
SHRI B. M. PATIL MEDICAL COLLEGE, HOSPITAL & RESEARCH CENTRE, VIJAYAPURA

BLDE (DU)/IEC/ 651/2022-23

30/8/2022

INSTITUTIONAL ETHICAL CLEARANCE CERTIFICATE

The Ethical Committee of this University met on **Friday, 26th August, 2022 at 3.30 p.m. in the Department of Pharmacology** scrutinizes the Synopsis of Post Graduate Student of BLDE (DU)'s Shri B.M.Patil Medical College Hospital & Research Centre from ethical clearance point of view. After scrutiny, the following original/ corrected and revised version synopsis of the thesis/ research projects has been accorded ethical clearance.

TITLE: "SOCIO DEMOGRAPHIC , PSYCHOLOGICAL FACTORS ASSOCIATED WITH HUMAN MILK DONATION IN VIJAYAPURA".

NAME OF THE STUDENT/PRINCIPAL INVESTIGATOR: Dr.Bodi Jayakrishna Vasudha

NAME OF THE GUIDE: DR.S.V.PATIL, Professor, Dept. of Pediatrics.

Dr. Santoshkumar Jeevangi
Chairperson
IEC, BLDE (DU),
VIJAYAPURA

Chairman,
Institutional Ethical Committee,
BLDE (Deemed to be University)
Vijayapura

Dr.Akram A. Naikwadi
Member Secretary
IEC, BLDE (DU),
VIJAYAPURA

MEMBER SECRETARY
Institutional Ethics Committee
BLDE (Deemed to be University)
Vijayapura-586103. Karnataka

Following documents were placed before Ethical Committee for Scrutinization.

- Copy of Synopsis/Research Projects
- Copy of inform consent form
- Any other relevant document

Smt. Bangaramma Sajjan Campus, B. M. Patil Road (Sholapur Road), Vijayapura - 586103, Karnataka, India.
BLDE (DU): Phone: +918352-262770, Fax: +918352-263303, Website: www.bldedu.ac.in, E-mail:office@bldedu.ac.in
College: Phone: +918352-262770, Fax: +918352-263019, E-mail: bmpmc.principal@bldedu.ac.in

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ANNEXURE II

RESEARCH INFORMED CONSENT FORM

BLDE (Deemed to be University)

Shri. B.M. PATIL Medical College, Hospital & Research Centre,

VIJAYAPURA-586103

TITLE OF THE PROJECT: SOCIO DEMOGRAPHIC, PSYCHOLOGICAL FACTORS ASSOCIATED WITH HUMAN MILK DONATION IN VIJAYAPURA

GUIDE: DR. S.V PATIL, MD

PROFESSOR

DEPARTMENT OF PEDIATRICS

PG STUDENT: Dr B J VASUDHA

PG DEPARTMENT OF PEDIATRICS

(MD PEDIATRICS)

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PURPOSE OF RESEARCH:

I have been explained about the reason for doing this study and selecting me as a subject for this study. I have also been given free choice for either being included or not in this study.

PROCEDURE:

I do understand that after having obtained a relevant clinical history, and in detail interview of various factors about milk bank donation.

RISK AND DISCOMFORTS:

I understand there is no risk involved and that the mother may experience some discomforts during the interview. This is mainly the observational study and no risk is involved in the study. All the data collected would be kept safe and private.

BENEFIT:

I do understand that my participation in this study will have no direct benefits to me, other than the potential benefit of the research and education.

CONFIDENTIALITY:

I understand that the medical information produced by this study will become a part of hospital records and will be subjected to confidentiality. Any information about sensitive, personal nature will not be a part of the medical record but will be stored in the

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investigations research file. If any of the data are used for publication in the medical literature or for teaching purpose, no name will be disclosed, and other identifiers such as photographs will be used only with special written permission taken priorly. I also understand that I may visualize the photograph before granting permission.

REQUEST FOR MORE INFORMATION:

I understand that I may ask questions about the study at any time; Dr.BJ Vasudha at the department of Pediatrics is available to answer my questions or concerns. I understand that I will be informed of any significant new findings discovered during the course of the study, which might influence my continued participation. A copy of this consent form will be given to me to keep for careful reading.

REFUSAL FOR WITHDRAWAL OF PARTICIPATION:

I understand that my participation is voluntary and that I may refuse to participate or may withdraw consent and discontinue participation in the study at any time without prejudice. I also understand that Dr B J Vasudha may terminate my participation in the study after he has explained the reasons for doing so.

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INJURY STATEMENT:

I understand that in the unlikely event of injury to me / my baby, resulting directly for participation in this study; if such injury were reported promptly, the appropriate treatment would be available to the mothers. But no further compensation would be provided by the hospital. I understand that by my agreements to participate in this study and not waiving any of my legal rights.

I have been explained about the purpose of the research, the procedures required and the possible risks to the best of my ability.

_____
_____

Dr. B J Vasudha Date

(Investigator)

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PARENTS / GUARDIAN CONSENT STATEMENT:

We confirm that Dr B J Vasudha is doing a study " Sociodemographic and psychological factors associated with human milk bank donation in, Vijayapura". Dr B J Vasudha has explained to us the purpose of research and

the study procedure. We are willing to give as much as information required for the study and consent for interview and the possible discomforts as well as benefits. We have been explained all the above in detail in our own language, and we understand the same. Therefore, we agree to give consent for mother's participating as a subject in this research project.

_____
_____

(Parents / Guardian) Date

_____
_____

(Witness to signature) Date:

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PROFORMA

Sociodemographic data:

S.NO	DETAILS	
1.	Baby name -	
2.	Mother name-	
3.	IP NO:	
4.	Age-	
5.	Place -	
6.	Religion-	
7.	Rural / urban	
8.	Education status	
9.	Marital status	
10.	Spouse education status	
11.	Husband occupation	
12.	Monthly income	
13.	Obstetric score	
14.	Mode of delivery	
15.	No of antenatal visits	
16.	No of antenatal visits during last pregnancy?	
17.	No of postnatal visits?	

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Maternal factors

S.NO		YES	NO
7.	H/o NICU admission for present baby?		
8.	H/o NICU admissions for previous baby?		
9.	H/o Death of previous baby after breast feeding initiation?		
10.	Received counselling for Breast feeding during antenatal visits?		
11.	Currently breast feeding?		
12.	Do u believe in Formula feeding?		

To asses mother's Knowledge and attitude

S.NO		YES	NO
17.	Previously heard about milk bank donation?		
18.	Do you feel very happy that my donated milk is the reason for the survival of a sick baby.		
19.	Is mother willing to donate who has previous knowledge?		
20.	Is mother willing to donate who doesn't have any previous knowledge?		
21.	Is Mother willing to receive milk from milk bank?		
22.	Is mother is willing to accept stored breast milk who has prior knowledge?		
23.	Is mother willing to accept stored breast milk who doesn't have any prior knowledge?		
24.	Requirement of spousal consent?		
25.	I believe that human milk donation can Save babies.		
26.	I believe that human milk contains all essential nutrients required for healthy existence and complete development of baby		
27.	I believe that donating breast milk is good for mother's health too as		

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	it reduces the breast engorgement.		
28.	I believe that donating breast milk does not cause malnutrition to mother or her baby.		
29.	I believe that there is nothing wrong in donating milk in case of excess production of milk.		
30.	I believe that my milk should be given only to my baby and not to others.		
31.	I am interested to donate milk but I am scared of expressing it using the machine		
32.	I believe mother willing to donate breast milk after previous baby NICU admission?		
33.	I believe that if I am giving my milk to other babies then it may not be sufficient to my baby.		
34.	I will donate milk only to my family members and friend's babies and not to any strangers.		

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MASTER CHART

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