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POLICY AND GUIDELINE ON BREAST MILK BANK: A SYSTEMATIC REVIEW

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Abstract:

This systematic review delves into global breast milk policies, addressing their impact on maternal and child health. Recognizing the pivotal role of breastfeeding in public health, the introduction underscores the need for a nuanced examination of existing policies. The problem statement highlights gaps in current approaches, prompting the systematic review to inform evidence-based improvements. Employing a rigorous methodology, we provided a systemically review analysis based on Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) technique for virtual reality implementation. The advanced searching into two powerful databases which are Scopus and Web of Science (WoS). Based on searching, final main data, $n = 63$ and will be analysis using synthesis approach. The five main themes, which are decided: (1) Acceptance and Perception (2), Operational Aspects and Guidelines and (3) Impact and Practices (4) Cultural Perspectives and Historical Context, and (5) Research and Innovation. Results reveal diverse policies and guidelines available across regions, influencing human milk bank initiation, duration, and associated health outcomes. The review identifies key determinants shaping human milk bank practices, assessing their alignment

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with global guidelines. The conclusion synthesizes findings, emphasizing the need for context-specific policies. This systematic review offers crucial insights for policymakers, healthcare professionals, and researchers dedicated to advancing global maternal and child health through informed breast milk bank policies.

Keywords:

Breastfeeding, Human Milk, Milk Kinship, Policies, Wet Nursing

Introduction

In the continuum of maternal and child health, the emergence and proliferation of breast milk banks have marked a transformative shift in how societies address the nutritional needs of vulnerable infants. These institutions, intricately weaving together science, compassion, and societal support, serve as vital reservoirs of life-giving sustenance for preterm and medically fragile neonates. However, as breast milk banks become increasingly integral to neonatal care, the policies governing their establishment, operation, and impact demand rigorous scrutiny. This systematic review embarks on a comprehensive exploration of these policies, unravelling the intricacies that underpin the functionality and efficacy of breast milk banks on a global scale.

Breast milk banking has evolved from a niche practice to a cornerstone of modern neonatal care. Originating in the mid-20th century as a response to the pressing needs of premature infants, these banks have expanded their scope to encompass a broader demographic of medically fragile newborns (Torres-Muñoz, Jimenez-Fernandez, Murillo-Alvarado, Torres-Figueroa, & Castro, 2021). As the demand for donor milk surges, propelled by advancements in neonatal intensive care and a growing awareness of the unique benefits of breast milk, understanding the policies governing these banks becomes paramount. At the heart of this systematic review lies an examination of the regulatory frameworks enveloping breast milk banks. Policies dictating donor screening, milk processing protocols, quality control measures, and ethical considerations constitute the backbone of these institutions (Subudhi & Sriraman, 2021). The comparative analysis of national and international policies aims to elucidate variations, commonalities, and potential areas for harmonization, ensuring that breast milk banks adhere to the highest standards of safety and efficacy across diverse healthcare landscapes (Arnold, 2006; Klotz et al., 2022; Tyebally Fang et al., 2021).

Beyond the clinical sphere, this review delves into the socio-economic dimensions of breast milk banks. The act of donation, often driven by altruism, intertwines with economic and social factors. Exploring how policies address issues of accessibility, equity, and the ethical dimensions of milk donation is integral to assessing the broader societal impact of breast milk banks. The review also considers the integration of breast milk banks within the broader healthcare ecosystem. Collaboration with neonatal care units, alignment with public health initiatives, and adherence to international guidelines all contribute to the effectiveness of breast milk banks in improving neonatal outcomes. Understanding the dynamics of this integration provides insights into the symbiotic relationship between policy frameworks and healthcare practices.

In the era of technological innovation, this review evaluates the role of advancements in ensuring the efficiency and safety of breast milk banks. From milk tracking systems to

temperature-controlled storage solutions, technology plays a pivotal role in enhancing the operational capacities of these banks (Corrêa, Neto, Pinto, Lima, & Teles, 2023; Ramanathan, Pelc, da Costa, Ramanathan, & Shenker, 2023; Razak, Rosli, Kamis, Rahim, & Abdullah, 2023). In conclusion, this systematic review aspires to unravel the complexities surrounding the policies governing breast milk banks. By scrutinizing regulatory landscapes, socio-economic considerations, healthcare integration, and technological interfaces, the review aims to provide a comprehensive foundation for future policy recommendations. It is our fervent hope that these insights contribute not only to the refinement of existing policies but also to the sustained success and impact of breast milk banks as indispensable pillars of neonatal care.

Literature Review

The growing interest in creating and sustaining human milk banks globally has led to the development of various guidelines and policies to ensure the quality and safety of human milk banking (Arnold, 2006). The World Health Organization (WHO) and the University of Zurich have sponsored international expert meetings to examine the operation and regulation of human milk banks, highlighting the need for global guidance on this subject (Abdulwadud & Snow, 2012). Breast milk banks play a crucial role in providing donor human milk to preterm or low birth weight infants when the needs of vulnerable infants for donor human milk exceed the supply [7]. Several studies have been conducted to identify factors influencing the sustainability of human milk donation to milk banks (Doshmangir, Naghshi, & Khabiri, 2019; Kaech, Kilgour, Fischer Fumeaux, de Labrusse, & Humphrey, 2022). A systematic review was conducted to analyse the current literature on breast milk banking and provide recommendations for policy and guidelines. The review identified several factors influencing the sustainability of human milk donation to milk banks, including donor-related, milk bank-related, and national regulation and guideline factors (Doshmangir et al., 2019; Kaech et al., 2022; Mathias et al., 2023; Tyebally Fang et al., 2021).

Donor-related factors include age, health status, and lactation practices of the donors. The review found that the majority of donors were young, healthy women with good lactation practices (Clifford, Sulfaro, Lee, Pink, & Hoad, 2020; Griffin et al., 2022; Tyebally Fang et al., 2021). Milk bank-related factors include the quality of the end product, the appropriate use of the product, and the recruitment of donors. The review also found that most human milk banks were established and run by non-governmental organizations. National regulation and guidelines are also important for the operation of human milk banks to ensure their sustainability and safety within the wider healthcare system (Tyebally Fang et al., 2021). The review emphasizes the importance of robust national regulation and guidelines for the operation of human milk banks to ensure their sustainability and safety within the wider healthcare system.

It also highlights the need for future studies to focus on the impact of different interventions and policies on milk banking sustainability and the necessity of global guidance on the quality and safety of human milk banking, considering the cultural, economic, and healthcare system differences among countries (Tyebally Fang et al., 2021). The Human Milk Foundation (HMF) is an organization that strives towards enabling great sustainability through their work to support families facing breastfeeding challenges (Griffin et al., 2022). They have launched a Crowdfunder campaign to raise £30,000, which would enable them to onboard 300 new donors, whose milk would help between 2000-3000 babies. The HMF is an example of a non-governmental organization that is working towards improving the sustainability of human milk donation to milk banks (Griffin et al., 2022).

In addition to the factors identified in the systematic review, there are also legal and ethical considerations surrounding human milk banking. The legal regime applicable to human milk transactions is fragmented and unstable, with only a handful of states having laws pertaining to human milk [4]. Some commentators have called for tighter regulation of human milk banks to ensure the safety and quality of the end product. Ethical considerations include the potential for exploitation of donors and the commodification of breast milk. These considerations highlight the need for a comprehensive approach to the regulation and operation of human milk banks (Clifford et al., 2020). The benefits of human breast milk and the role of human milk banking in international human rights and global health policies are well-documented (Lyons, Ryan, Dempsey, Ross, & Stanton, 2020; Nayak & Fernandes, 2022). Various policies and international documents support the use of banked donor human milk, highlighting its importance in the context of global health and human rights (Arnold, 2006; Kaeck et al., 2022). The study also found that the acceptance of donor human milk banking was associated with a high level of knowledge on breastmilk (Chagwena et al., 2020).

In conclusion, this systematic review provides a comprehensive analysis of the current literature on breast milk banking and offers valuable insights for policymakers and stakeholders. By addressing the identified factors and implementing evidence-based recommendations, it is possible to improve the sustainability and quality of human milk banking services worldwide. The review emphasizes the need for global guidance on the quality and safety of human milk banking, taking into account the cultural, economic, and healthcare system differences among countries (Tyebally Fang et al., 2021).

Material and Methods

Identification

The systematic review approach encompassed three key stages to select a substantial number of relevant papers for this investigation. In the initial step, keywords and related terms were identified by consulting dictionaries, encyclopaedias, thesauri, and existing research. Following the selection of relevant phrases, search strings were formulated for the databases Scopus and Web of Science (see Table 1). A total of 961 articles were successfully retrieved from both databases in the initial phase of the systematic review procedure, contributing to the ongoing research project.

Screening

In the initial screening phase, intentionally excluding duplicated papers was a deliberate step. This ensured that only unique and distinct articles were considered for further analysis. During this initial phase, a thorough screening was applied to 354 articles. Moving on to the second phase, 124 articles were excluded due to duplication, employing various inclusion and exclusion criteria meticulously developed by the researchers.

One primary criterion involved prioritizing literature, particularly research articles, as the primary source of practical information. Consequently, any publications in the form of systematic reviews, reviews, meta-analyses, meta-syntheses, book series, books, chapters, and conference proceedings were omitted from the current study. Additionally, the review exclusively focused on papers written in English, given its widespread acceptance in the academic community. This decision aimed to ensure consistency and coherence in the analysis process.

It is essential to note that the chosen timeframe for this study spanned five years, from 2019 to 2023. This duration allowed for a comprehensive examination of relevant literature within a specific period. In total, 607 article publications were excluded based on specific parameters set forth in the screening process. These rigorous criteria were implemented to guarantee the selection of high-quality and relevant articles for the subsequent stages of the research.

Table 1: The Search Strings

Scopus	TITLE-ABS-KEY (((polic* OR guide* OR educat* OR ethic* OR belie* OR frame*) AND ("wet nurs*" OR "wet-nurs*" OR "human milk bank*" OR "human milk shar*" OR "milk shar*" OR "milk kinship" OR "donor human milk" OR "donor milk" OR "nurs* milk" OR "cross* milk" OR "milk sibling*"))) AND (LIMIT-TO (PUBYEAR , 2019) OR LIMIT-TO (PUBYEAR , 2020) OR LIMIT-TO (PUBYEAR , 2021) OR LIMIT-TO (PUBYEAR , 2022) OR LIMIT-TO (PUBYEAR , 2023)) AND (LIMIT-TO (DOCTYPE , "ar")) AND (LIMIT-TO(LANGUAGE , "English")) AND (LIMIT-TO (SRCTYPE , "j")) AND (LIMIT-TO (PUBSTAGE , "final")) Access Date: December 2023
Web of Science	(((polic* OR guide* OR educat* OR ethic* OR belie* OR frame*) AND ("wet nurs*" OR "wet-nurs*" OR "human milk bank*" OR "human milk shar*" OR "milk shar*" OR "milk kinship" OR "donor human milk" OR "donor milk" OR "nurs* milk" OR "cross* milk" OR "milk sibling*")) (Topic) and 2019 or 2020 or 2023 or 2022 or 2021 (Publication Years) and Article (Document Types) and English (Languages) Access Date: December 2023

Eligibility

During the third phase, known as the eligibility assessment, a compilation of 63 articles was assembled. At this stage, we performed a thorough examination of both titles and essential content within all articles to verify their alignment with the inclusion criteria and relevance to the current research objectives. Subsequently, 167 articles were excluded due to their lack of pertinence to the research domain, encompassing issues such as being out of the field, having insignificant titles, or abstracts not directly related to the study's objectives. Consequently, we retained 63 articles for further review (see Table 2 for details).

Table 2: The Selection Criterion In Searching

Criterion	Inclusion	Exclusion
Language	English	Non-English
Timeline	2019 – 2023	< 2019
Literature type	Journal (Article)	Conference, Book, Review
Publication Stage	Final	In Press

Data Abstraction and Analysis

An integrative analysis was used as one of the assessment strategies in this study to examine and synthesize a variety of research designs (quantitative, qualitative, and mixed methods). The goal of the competent study was to identify relevant topics and subtopics. The stage of data collection was the first step in the development of the theme. Figure 1 shows how the authors meticulously analysed a compilation of 63 articles for assertions or material relevant to the topics of the current study. The authors then evaluated the current significant studies related to policy on breast milk. The methodology used in all studies, as well as the research results, are being investigated. Next, the author collaborated with other co-authors to develop themes based on the evidence in this study's context. A log was kept throughout the data analysis process to record any analyses, viewpoints, riddles, or other thoughts relevant to the data interpretation. Finally, the authors compared the results to see if there were any inconsistencies in the theme design process. It is worth noting that, if there are any disagreements between the concepts, the authors discuss them amongst themselves. The produced themes were eventually tweaked to ensure consistency. The analysis selection was carried out by two experts, one in public health (Associate Professor Dr. Zaharah Sulaiman - expert in human lactation) and the other in law (Dr. Shaikh Mohd Saifuddeen Shaikh Mohd Salleh - expert in Islamic bioethics) to determine the validity of the problems. The expert review phase ensures the clarity, importance, and suitability of each subtheme by establishing the domain validity.

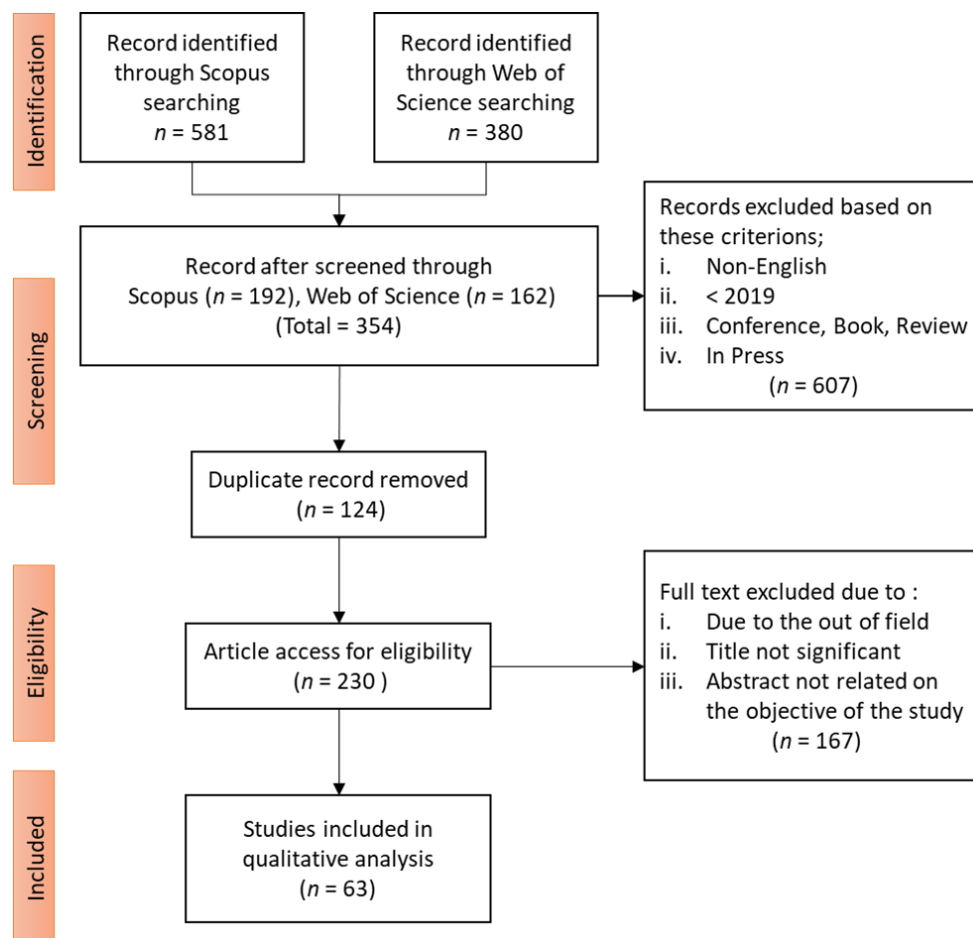


Figure 1: Flow Diagram Of The Proposed Searching Study - PRISMA (Page et al., 2021)

Results and Findings

To conduct a Systematic Literature Review (SLR) following the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) statement steps, it is essential to categorize the selected articles into themes. Based on the titles provided, we have identified five main themes related to breastfeeding policies and practices. Please note that the categorization is based solely on the titles, and further analysis of the full articles will be necessary for a comprehensive review.

Acceptance and Perception

A comprehensive examination of diverse studies on human milk donation reveals multifaceted insights into motivations, barriers, and acceptance levels across various demographic groups globally. The motivations of 50 human milk donors elucidate key themes, emphasizing practical and altruistic motives, confidence linked to milk supply and professionalism, and substantial social support (Wambach, Bateson, Matheny, & Easter-Brown, 2019). Pregnant women exhibit a 61.5% acceptability of donated breast milk, influenced by factors like higher education, being Muslim, awareness of donated milk banking, and the presence of a serious medical condition (Namuddu, Kiguli, Nakibuuka, Nantale, & Mukunya, 2023). Health workers show a 31% acceptance rate, with acceptance associated with knowledge on breast milk banks and the health profession (Chagwena et al., 2020). Cultural dimensions add complexity to the landscape, with potential rejection of donor milk among Muslim families in North America due to milk kinship and donor anonymity (Clouthier, Ulrich, & Hartman, 2019). In Bangladesh, 71.9% express willingness to use milk banks, but 28% cite religious concerns (Jahan, Rahman, Shamsi, & Sm-Rahman, 2022). Postpartum women display awareness and acceptance disparities influenced by educational levels, nationality, and neonatal intensive care unit (NICU) admission (Pal, Soontarapornchai, Noble, & Hand, 2019). In Turkey, a mixed-methods study reveals varied attitudes, with 57.9% willing to donate but only 27.7% willing to use donor milk, citing religious concerns, fear of infectious diseases, and distrust (Varer Akpinar et al., 2022).

Global perspectives emerge, with an Indian study emphasizing the need for increased efforts to inform mothers about human milk banking, considering factors like educational status and parity (Jadhav & Naregal, 2020). A Hungarian study exploring hormone content in breast milk suggests opportunities for improving nutritional guidelines based on variations (Vass et al., 2021). In Iran, low knowledge but positive attitudes toward milk banks are found, with education, income, birth type, breastfeeding experience, encouragement to donate, and knowledge serving as predictors (Hosseinzadeh et al., 2023). The literature encompasses diverse perspectives, including negative attitudes toward milk banks persisting in North Syria due to religious views (Celik, Karaca, Celik, Bereket, & Korkmaz, 2022). Conversely, a cluster randomized controlled trial in Tehran aims to enhance potential milk donors' numbers through a structured educational program based on the Theory of Planned Behaviour (Shahbazi Sigbaldeh, Moridi, Ghorban Sabagh, Kazemnejad, & Shateranni, 2023). The unique challenge of Islamic beliefs on milk kinship is addressed, urging healthcare providers to engage in informed conversations with Muslim families (Subudhi & Sriraman, 2021). In central Uganda, perceptions of donated breast milk reveal positive aspects but also concerns about safety, expenses, and impact on mother-child bonding (Namuddu, Mukunya, et al., 2023).

Studies in Iran explore varying attitudes toward donor milk among mothers in NICUs, indicating the need for targeted educational interventions (Gürel & Erenel, 2020). In Kenya, attitudes toward donating and using donor human milk are positive but accompanied by

concerns, emphasizing the crucial factor of ensuring the safety of donor milk (Kimani-Murage et al., 2019). An electronic survey during an infant formula shortage in the U.S. highlights a surge in unsafe infant feeding practices, underscoring the need for policy changes to support families with clinical lactation support and access to pasteurized donor milk (Cernioglo & Smilowitz, 2023). Healthcare providers in Iran reveal a knowledge-attitude gap regarding donor milk, emphasizing the need to address cultural and religious factors for fostering positive attitudes (Shoghi, Nazarshodeh, & Borimnejad, 2020). Iranian healthcare providers' knowledge and attitudes are explored, indicating their moderately influential role in breast milk donation and emphasizing the importance of improving their knowledge and attitudes through education for community acceptability (Golsanamloo et al., 2022). A survey in India underscores the importance of providing knowledge to antenatal mothers and the role of nurse practitioners in enhancing awareness (Fernandes & Nayak, 2020).

Additional studies provide specific insights, such as mothers in Bursa, Turkey, exhibiting insufficient knowledge about breast milk banking and having concerns about security and religious considerations (Can & Ünülu, 2019). A nationwide survey in China reveals gaps in knowledge about donor milk, with educational level, cohabitation status, and history of delivering preterm infants influencing participants' knowledge and attitudes (Tian et al., 2021). In South Africa, barriers to milk donation are identified, including post-discharge processes, lack of awareness, and insufficient support from clinic staff (Biggs, 2021). Ethical considerations in NICUs regarding donor human milk emphasize the challenges providers face in the consenting process, recommending standardized and consistent use of informed consent to address ethical concerns (McGlothen-Bell, Cleveland, & Pados, 2019). In Eskisehir, Turkey, mothers hesitate to donate milk to human milk banks due to religious concerns, suggesting public awareness campaigns to address resistance and foster interactions between donors and recipients (Sahin, 2020). The legal ambiguity surrounding human milk in Australia highlights the need for legal definitions and a consistent network of human milk banking and sharing, aligning practices with established protocols for blood donation (Bhatia, Koplin, & Spadaro, 2022). A study in Ghana assesses readiness for a human milk bank, with concerns including perceptions of human milk bank as strange, fear of infections, religious beliefs, and insufficient information (Obeng et al., 2023).

These collective findings underscore the importance of addressing knowledge gaps, religious concerns, and practical barriers in promoting human milk donation and establishing effective human milk banking systems worldwide. Initiatives such as public awareness campaigns, standardized consent processes, and improved infrastructure are crucial in shaping positive attitudes and practices surrounding human milk donation.

Operational Aspects and Guidelines

Various studies provide valuable insights into the multifaceted landscape of human milk banking, addressing factors such as donor demographics, milk quality, nursing attitudes, and global perspectives. A study in Da Nang, Vietnam, spanning 5.5 years, identifies factors influencing donated milk volumes, including higher education, full-term newborns, and community-based donors, emphasizing the crucial role of breastfeeding support for mothers of preterm and sick infants (Tran et al., 2023). In Brazil, a study underscores concerns about microbiological quality due to inadequate procedures in milk expression and storage, emphasizing the necessity for proper guidance and stringent criteria in human milk bank (HMB) procedures (Chaves et al., 2022).

Research among NICU nurses in Turkey reveals positive attitudes toward wet-nursing and milk sharing, with religious beliefs influencing donation reluctance, emphasizing the need for addressing religious concerns through increased awareness about HMBs (Konukbay, Kapan, & Yildiz, 2023). On a global scale, a study highlights the lack of clear definitions, standards, and ethical considerations for donor human milk, recommending further research to inform evidence-based guidance and optimal support for mothers to provide their own breast milk (Fang et al., 2021). Another study examining donor screening processes internationally reveals differences between milk banks and underscores the importance of more research on donor selection impact, using key screening questions for self-screening to achieve a high acceptance rate (Clifford et al., 2020).

In Australia, a study explores the utilization of donor human milk in neonatal units across Germany, Austria, and Switzerland, revealing low utilization rates and obstacles, emphasizing the interest in introducing donor human milk if available (Klotz et al., 2020). In Ireland, variations in practices and opinions regarding donor milk use are identified, underscoring the need for a national guideline based on evidence-based best practices (Power, O'Dea, & O'Grady, 2019). Studies in the Northeast U.S. hospitals reveal diverse criteria for donor milk eligibility and highlight the importance of parent education, while emphasizing limited lactation support during donor human milk provision (Drouin et al., 2019).

In Ghana, a qualitative study explores informal breast milk sharing, revealing reasons and attitudes, suggesting potential for establishing HMBs but underscoring the need for health promotion efforts to educate on risks and benefits (Obeng et al., 2022). Investigations into the psychosocial and lactation aspects of Human Milk Sharing (HMS) in Washington, DC, indicate the potential for improving breastfeeding outcomes with additional support for vulnerable recipients (Peregoy, Pinheiro, Geraghty, Dickin, & Rasmussen, 2022). A European study underscores the lack of clear regulations for donor human milk across countries, calling for a regulatory framework to ensure equitable access (Klotz et al., 2022). However, there is a wide variability in milk banking practices across Europe, including practices that could further improve the efficacy of donor human milk banking (Kontopodi et al., 2021). In the United States, barriers related to legislative, regulatory, and economic factors hinder the use of donor human milk, emphasizing the need for changes in public policy (Rose et al., 2022). A global perspective highlights the importance of government support for HMBs, integrating them with national infrastructures and guidelines (Bertino, 2021).

Studies exploring barriers to breastmilk donation and utilization in South Africa emphasize concerns about safety, HIV screening, and cultural beliefs, suggesting that addressing these barriers could enhance the donation and utilization of HMBs (Lubbe, Oosthuizen, Dolman, & Covic, 2019). The Neo-MILK study in Germany aims to improve breastfeeding outcomes through a participatory intervention based on a comprehensive needs assessment (Scholten et al., 2023). A randomized study in Italy investigates the impact of supplementing very low birth weight infants with preterm or term donor milk, revealing positive effects of preterm donor milk on protein intake and growth (Gialeli et al., 2023). In the U.S., a study examining practices related to medically indicated supplementation in newborns emphasizes the need for standardized evidence-based management to improve care (Kair et al., 2020). In Japan, a survey of NICUs highlights changes in enteral feeding practices after the establishment of the first human milk bank (HMB) in 2017, emphasizing the need to address issues related to the HMB (Wada et al., 2023). A comprehensive survey of NICUs in China reveals variations in human milk feeding and enteral feeding strategies, emphasizing the importance of establishing

national guidelines for consistency and quality of care (Hu et al., 2023). Collectively, these studies underscore the importance of addressing various aspects to optimize the functioning of HMBs worldwide, including robust support systems, stringent procedures, and clear regulatory frameworks.

Impact and Practices

A global survey of 59 milk bank leaders from 30 countries sheds light on the diverse landscape of human milk banking, with five companies, including private milk companies (PMCs), engaging in the trade of human milk products. PMCs, operating as commercial entities, offer more expensive products and financially compensate milk providers, while lactation support is not their core function. The regulatory frameworks for human milk vary widely on a global scale, with the majority of countries lacking any specific framework, and most placing human milk within food legislation. Safety and ethical concerns regarding the commodification of human milk are highlighted, underscoring the need for policymakers to address potential exploitation and prioritize breastfeeding (Shenker et al., 2023). Management accounting, utilizing an activity-based costing approach, assessed the cost model for donor human milk in China, revealing that the operating costs of human milk banks in China are comparable to those in other countries. However, sustainable operation requires crucial support from the government and society. The study advocates for ongoing breastfeeding support and measures to reduce operating costs (Daili, Kunkun, & Guangjun, 2020).

In Italy, a similar study at Bambino Gesù Children's Hospital in 2019 analysed the operational costs of a HMB, identifying a significant difference in costs between collected litres in 2019 and the maximum capacity of the bank. The study emphasizes the potential for cost reduction through increased milk collection, highlighting that the highest costs are associated with salaries of medical staff and transportation. The study recommends centralization to achieve cost savings and reduce the cost per litre of donor human milk (Salvatori et al., 2022).

In India, efforts to increase human milk donation are explored, revealing that structured awareness programs, counselling strategies, and education for grandmothers and husbands effectively increase human milk donation. The study underscores the importance of periodic announcements, targeted counselling, and addressing lactation issues to motivate mothers to become donors, especially in the context of the COVID-19 crisis (Lakhkar, Damke, & Meshram, 2022). In Nigeria, a study exposes poor awareness and perception of human milk banking, with respondents lacking knowledge about wet nursing and HMB. The findings emphasize the critical need for appropriate information, education, and counselling to promote the adoption and establishment of HMB in the country (Ogundare et al., 2023). These studies collectively highlight the global diversity in HMB practices, ranging from regulatory frameworks and commercial involvement to cost considerations and efforts to increase awareness and donation. Addressing ethical concerns, ensuring financial sustainability, and promoting awareness emerge as key factors in optimizing human milk banking worldwide.

Cultural Perspectives and Historical Context

Various studies provide insights into diverse aspects of human milk sharing, exploring practices, cultural nuances, historical perspectives, and psychosocial dimensions. Informal milk sharing is examined in a survey involving 435 participants in Turkey, revealing that 14.7% engaged in the practice. Concerns related to milk kinship in Islam were reported by 19.5% of participants, indicating potential religious considerations. The study emphasizes the lack of consistently implemented measures to minimize disease transmission during informal milk sharing, highlighting associated risks (Onat & Karakoç, 2019). In Orthodox Jewish

communities, a study delves into milk-sharing practices, uncovering positive and empowering experiences associated with informal milk sharing. Themes such as faith, mistrust of the medical establishment, and the importance of sacred cultural traditions shape milk-sharing phenomena within these communities. Healthcare providers are encouraged to be aware of these cultural factors to provide culturally sensitive care and ensure safer milk-sharing practices (Bressler, Dambra-Candelaria, & Spatz, 2020).

A study in Brazil explores "cross-nursing," an act contraindicated by the Ministry of Health due to the risk of disease transmission. The analysis reveals ambiguities around breastfeeding and the establishment of human milk banks, emphasizing historical processes and discussing the cultural script surrounding breastfeeding, shedding light on different ways of experiencing family, motherhood, and breastfeeding (Nucci & Fazzioni, 2021). Examining late seventeenth-century French fairy tales, another study traces evolving attitudes toward breastfeeding during a time when wet-nursing was the cultural norm. The tales illustrate examples of breastfeeding practices that challenge and support traditional customs, contributing to changing beliefs about maternal breastfeeding at the end of the seventeenth century (Bastin, 2022). Examining Brazil's extensive, publicly funded donor human milk banking network, another study explores historical exploitative wet-nursing, depicting human milk sharing as a multi-scalar metabolism entwining global and national health policy with intimate dynamics and effects of breast engorgement and care (Prouse, 2021). These studies collectively provide a comprehensive understanding of human milk sharing practices, encompassing cultural, historical, and psychosocial dimensions, emphasizing the need for cultural sensitivity, awareness, and safety measures.

A study focuses on bereaved mothers' donation of human milk to nonprofit human milk banks, shedding light on the psychosocial aspects of this phenomenon. The research highlights the transformative role of a donor identity for bereaved mothers, helping them cope with loss and reconstruct their identities as mothers and healthy females (Oreg, 2019). In the context of Islamic law, another study investigates Shi'i guidelines on milk kinship, exploring gendered rulings on milk mahramiyat/kinship within the patrilineal system of Shi'a Islam (Rahbari, 2020). The role of milk in shaping moral and biomedical epistemologies is explored, emphasizing its significance as a cultural signal of prevailing conceptions of bodies and social identities. The article discusses milk's symbolic power and its implications within the responsibilities of women's bodies and potential risks to offspring's health (Malcolm, 2021). A survey of human milk donors in Israel analyses milk-sharing practices and participants' knowledge of associated health risks, indicating the need to improve awareness, particularly in the religious sector, regarding safe milk storage temperature and hygiene practices (Oreg & Negev, 2023).

Research and Innovation

Over the period from January 1, 2018, to December 31, 2021, a human milk bank (HMB) operation revealed that the donated milk volume slightly exceeded the consumed milk, with 1364 donors contributing 2434.63 litres of qualified human milk. The cost per litre was RMB 385.3 (USD 55.3), showcasing the economical operation of the bank. Notably, 97.8% of donors were preterm puerperae, and 59% donated between 1 week and 1 month post-delivery. All recipients were preterm infants, receiving donated human milk for an average of 9.4 days. The structure of donors, the economic efficiency of operation, and the minimal impact on breastfeeding make this HMB operation mode worthy of promotion (Wang, Hu, Li, Zhou, & Wu, 2023). In an international collaborative effort involving countries such as France, Italy, the UK, and others, evidence-based recommendations for HMBs were established. The

resulting consensus statements from the European Milk Bank Association aim to ensure safe establishment and operation of HMBs throughout Europe. These recommendations cover various aspects, including general guidelines, donor recruitment and screening, expression, handling, storage, pooling, screening, treatment (pasteurization), and delivery to recipients. The initiative contributes to the Guide to the quality and safety of tissues and cells for human application (Weaver et al., 2019).

The REAMIT project introduced innovative technology, utilizing Internet of Things (IoT) sensors and big data to monitor and record human milk quality during transportation. The project efficiently addressed conditions that could compromise milk quality, such as temperature and humidity. The IoT sensors demonstrated effectiveness in maintaining quality, reducing waste, assuring quality control, improving availability, reducing costs, and enhancing sustainability in the human milk supply chain. This technological approach holds promise for other supply chains of rare and precious commodities (Ramanathan et al., 2023) (Ramanathan et al., 2023). A consensus approach modelled on the James Lind Alliance identified the top 10 research priorities in human milk banking and the use of donor milk. Through an iterative process involving stakeholders, evidence uncertainties were gathered, consolidated, ranked, and workshopped to determine research priorities. Key questions focused on the risks and benefits of using donor milk, processing techniques, nutrient profiles, and clinical criteria for prioritizing milk receipt. These priorities aim to guide future research in the field (Matthews et al., 2020).

A study spanning four years (February 1, 2017, to January 31, 2021) examined the operation of a HMB, involving 433 donors who contributed 7642 L of milk. While 66% of the milk came from the community, the pasteurization process-maintained efficiency, with 98% of the donated milk being pasteurized, and 82% passing pre- and post-pasteurization tests. The bank served 16,235 newborns, mainly in postnatal wards, with the primary prescription reason being insufficient mothers' own milk. Operational adjustments over time improved donor recruitment, raw milk quality, pasteurization processes, and better met the needs of newborns, even during the COVID-19 pandemic (Tran et al., 2021).

Discussions and Conclusions

Human milk bank (HMB) is a global issue with diverse motivations, barriers, and acceptance levels. Factors such as education, Muslim identity, awareness of milk banking, and medical conditions influence acceptance rates. Cultural dimensions also contribute to complexity, with potential rejection among Muslim families in North America, Bangladesh, and Turkey. In India, there is a need for increased efforts to inform mothers about human milk banking, while in Iran, targeted educational interventions are needed. In Turkey, standardized informed consent is recommended, while in Australia, consistent definitions are needed. Addressing knowledge gaps, religious concerns, and practical barriers is crucial for promoting human milk donation globally.

Other than that, human milk banking is influenced by factors such as donor demographics, milk quality, nursing attitudes, and global perspectives. Studies in Vietnam, Brazil, Turkey, Australia, Ireland, and the Northeast U.S. have highlighted the importance of donor screening processes, donor selection impact, and the need for more research. In Australia, low utilization rates and obstacles in neonatal units are highlighted, while variations in practices and opinions are identified. In Ghana, informal breast milk sharing is explored, with potential for establishing HMBs but underscoring the need for health promotion efforts. In the U.S., barriers related to legislative, regulatory, and economic factors hinder the use of donor human milk.

Globally, government support for HMBs is crucial, integrating them with national infrastructures and guidelines. Barriers to breastmilk donation and utilization in South Africa, Italy, the U.S., Japan, and China highlight the need for standardized evidence-based management and national guidelines for consistency and quality of care. Overall, these studies emphasize the need for robust support systems, stringent procedures, and clear regulatory frameworks to optimize the functioning of human milk banks worldwide.

A global survey of 59 milk bank leaders from 30 countries reveals the diverse landscape of human milk banking. Five companies, including private milk companies (PMCs), engage in the trade of human milk products. The regulatory frameworks for human milk vary globally, with most countries lacking specific frameworks and placing human milk within food legislation. Safety and ethical concerns regarding commodification of human milk are highlighted, underscoring the need for policymakers to address potential exploitation and prioritize breastfeeding. In China, operating costs of HMBs are comparable to other countries, but sustainable operation requires government and societal support. In Italy, cost reduction through increased milk collection is recommended. In India, awareness programs, counselling strategies, and education for grandmothers and husbands effectively increase human milk banking donation.

Studies on human milk sharing reveal diverse aspects, including cultural nuances, historical perspectives, and psychosocial dimensions. In Turkey, 14.7% of participants engage in informal milk sharing, with concerns about milk kinship in Islam. Orthodox Jewish communities reveal positive experiences and empowering aspects of milk sharing, while Brazil's study on cross-nursing highlights ambiguities around breastfeeding and the establishment of HMBs. French fairy tales reveal evolving attitudes towards breastfeeding during a time when wet-nursing was the cultural norm. Bereaved mothers' donation of human milk to nonprofit banks highlights the psychosocial aspects of this phenomenon. Milk's symbolic power and implications for women's bodies and potential health risks are also explored. A survey of human milk donors in Israel highlights the need for improved awareness about safe milk storage temperature and hygiene practices. Brazil's publicly funded donor network highlights historical exploitative wet-nursing.

A human milk bank (HMB) operation from 2018 to 2021 saw 1364 donors contributing 2434.63 litres of qualified human milk, with 97.8% of donors being preterm puerperae. The bank's economic efficiency and minimal impact on breastfeeding make it a worthy operation mode. The European Milk Bank Association established evidence-based recommendations for human milk banks, covering various aspects such as donor recruitment, storage, screening, treatment, and delivery. The REAMIT project introduced IoT sensors and big data to monitor milk quality during transportation, demonstrating effectiveness in maintaining quality, reducing waste, and enhancing sustainability. A consensus approach identified top 10 research priorities in HMB, donor milk use and guide for future research. A study spanning four years examined the operation of a HMB, revealing improved donor recruitment, raw milk quality, pasteurization processes, and better newborn needs, even during the COVID-19 pandemic.

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