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Breast Milk Expression Practices among Employed Mothers in Addis Ababa, Ethiopia: Institution Based Cross-Sectional Study

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Abstract

Background: The World Health Organization recommends exclusive breastfeeding for the first six month of life. However, working mothers have lower rates of exclusive breast feeding after returning to work. In such cases, expressing breast milk is identified to be an essential practice that can allow these mothers to continue feeding their babies during their separation.

Objective: The study aimed to determine practice of expressing breast milk and associated factors among employed mothers having children under the age of 2 in Gulelle sub city, Addis Ababa, Ethiopia.

Methods: A quantitative cross sectional study design was adopted to involve a sample of 418 employed mothers with children under age of 2, attending well baby clinics at selected health centers in Gulelle sub city, Addis Ababa, Ethiopia. The data was collected using a structured and pretested questionnaire and was coded, entered and stored using Epi info version 7.2.6.0. It was exported to Stata version 14.0 for cleaning and analysis. Binary logistic regression was employed to identify associated factors.

Result: Among the 418 participants in this study, 212 (51.5%, 95% CI = 46.7% - 53.4%) were expressing milk regularly or occasionally. Satisfactory knowledge on breast milk expression and storage was attained in 278 (66.5%) of the mothers and 219 (52.9%) of the mothers had favorable attitude. Tertiary level education (AOR = 2.38, 95%CI: 1.31 - 4.37), previous experience in expressing breast milk (AOR = 3.49, 95%CI: 2.02 - 6.02) and having satisfactory knowledge about expressing breast milk (AOR = 1.75, 95%CI: 1.09 - 2.80) were the identified significant factors

Conclusion: Expressing breast milk is not an uncommon practice among working mothers and it is associated with attaining higher educational level, satisfactory knowledge and previous experience with expressing. This underscores the importance of educating women, and increasing awareness concerning breast milk expression through various perinatal approaches.

Keywords: *Breast Milk Expression Practices; Employed Mothers; Addis Ababa; Ethiopia*

Introduction

Background

The American Academy of Pediatrics and the World Health Organization recommend exclusive breastfeeding for the first six month of life, followed by continued breastfeeding along with complementary feeding for up to the age of two [1,2]. Breast feeding offers numerous benefits for both mother and baby. It's the ideal source of nutrition which can suffice the baby's nutritional requirement for the first 6 months of life [3]. Several studies have indicated the association of exclusive breastfeeding for first 6 months life with decreased rates of infant mortality, lower respiratory tract infections, severe diarrhea, otitis media, and obesity [4-7].

Even though direct breastfeeding is typically the most effective and efficient way to feed a baby, situations often arise where expressing breast milk becomes necessary to ensure sustained breast milk consumption. Expressing refers to extracting milk from the breast manually or using a pump, so that it can be stored and fed to a baby at a later time [8]. It a strategy that can ensure continued breast milk consumption in the event of temporary separation of an infant from the mother. It also helps maintain or increase milk supply, allows a baby to feed while learning to suckle from an inverted nipple, and helps a mother relief engorgement [9]. Studies show that feeding expressed breast milk contributes to higher exclusive breastfeeding rates [10].

The 2018 Baby Friendly Hospital Initiative guidelines recommends that at least 80% of mothers with preterm and term infants should be able to correctly demonstrate how to express milk [13]. Guidelines for the practice and storage of expressed breast milk have also been developed by the CDC and the Academy of Breastfeeding Medicine [11,12]. The Academy of Breastfeeding Medicine clinical protocol #8 outlines optimal storage durations as four hours at room temperature, four days in the refrigerator, and six months in a freezer [12].

Expressing and storing breast milk has become an increasingly common way of feeding breast milk, particularly in developed countries. A study published in the journal of American Academy of Pediatrics had shown that breast milk expression is a very common practice in the US and that it is associated most strongly with maternal employment, which is a recognized barrier to breastfeeding [10].

Statement of the problem

Globally, less than 1 in 2 (48 per cent) infants 0-5 months of age are exclusively breastfed [14]. According to EDHS 2019, In Ethiopia exclusive breast feeding is only about 58.8% [15]. This is below the 2030 World Health Assembly (WHA) global nutrition targets which is 70% [16]. This suboptimal practice of breast feeding is resulting in increased child malnutrition, mortality and morbidity. Evidences shows that, in Ethiopia, inadequate breastfeeding causes 14,000 unnecessary child deaths, 5 million instances of diarrhea and pneumonia, $190 million in household costs, and $2 million in healthcare costs [17].

Exclusive breast feeding is a challenge to most working mothers and they are forced to wean their children after returning to work. Studies have shown that the practice of EBF was negatively associated with maternal employment and that full-time employed mothers in the first 6 months were less likely to practice exclusive breastfeeding in comparison to mothers who are not in paid employment [18,19].

In order to combat this problem the practice of expressing breast milk has been recognized as a method that can ensure continued breastmilk feeding at a time of temporary separation of an infant from the mother, particularly when mother returns to work. Researches have also shown that feeding expressed breast milk contributes to higher exclusive breastfeeding rates [20,21].

Although expressing breast milk is quite a common practice in affiliated countries, it is poorly adapted in poor resource settings. This is mostly identified to be due to lack of knowledge on its importance and practice, as well as, availability of equipment and time [22-24]. Moreover, there remains much more to be explored regarding this subject matter in settings as Addis Ababa.

Literature Review

Breast feeding and employed mothers

Different studies across the world had shown that employment status of a mother had influence on duration of breast feeding. A cross sectional survey conducted among worker mothers in Taiwan had shown that majority of both shift and non-shift working mothers had practiced breast feeding during their maternity leave times (90.1% and 87.6%, respectively) but this percentage decreased respectively to 21.5% and 24.1% for 1 to 6 months after they returned back to work [25].

This finding is no different from the finding in a mixed method study conducted among urban population in Haiti, that had shown the significant association of maternal employment with lower rates of exclusive breast feeding as well as less frequent breast feeding [26].

This findings are also supported by studies conducted in Africa. In a cross sectional descriptive study conducted among bankers in Mainland local government in Lagos Sate, Nigeria, it is revealed that even though more than 90% of the respondents had positive attitude towards breastfeeding, only 28.5% actually practiced exclusive breast feeding for the first 6 months after delivery [27]. The study proposed that this resulted mainly from limited work place support and short maternity leaves which is comparable to the finding from the study conducted in Taiwan in which using lactation rooms and breast-pumping breaks were found to be significantly associated with continuation of breast feeding [25,27].

Besides work place related factors, knowledge and practice has also been proposed as associated factors in a qualitative study conducted in Ghana to examine working mother's experience of exclusive breast feeding. In this study it has been shown that personal knowledge and practice in breast feeding and workplace factors such as length of maternity leave, and absence of maternity policy in organizations are the two major factors that affect exclusive breast feeding among working mothers [28].

There is also a recently published systematic review titled "prevalence of exclusive breastfeeding practice and its association with maternal employment in Ethiopia" which revealed when compared to mothers who are not in a paid employment, mothers who are employed full time were 57% less likely to practice exclusive breast feeding [19]. This result is comparable to the results from another systematic review and meta-analysis conducted using studies from Ethiopia that shown a significant association of maternal employment with exclusive breast feeding practice such that employed mothers were less likely to practice exclusive breast feeding [18].

Expressing breast milk

It's been not short since expressing breast milk has become a prevalent way of feeding breast milk to babies, especially in developed countries. The tools and devices applicable in its practice had also evolved so much with the technology that it has been one major profitable area of manufacturing and business.

Remotely conducted studies had shown that expressing breast milk likely promotes longer duration of breast feeding. A cohort study of 12 months conducted in Australia had identified that "mothers who expressed breast milk (at one or more time periods) were less likely to discontinue any breastfeeding before six months (Relative Risk 0.71, 95% CI 0.52, 0.98) than those who had never expressed milk" [21].

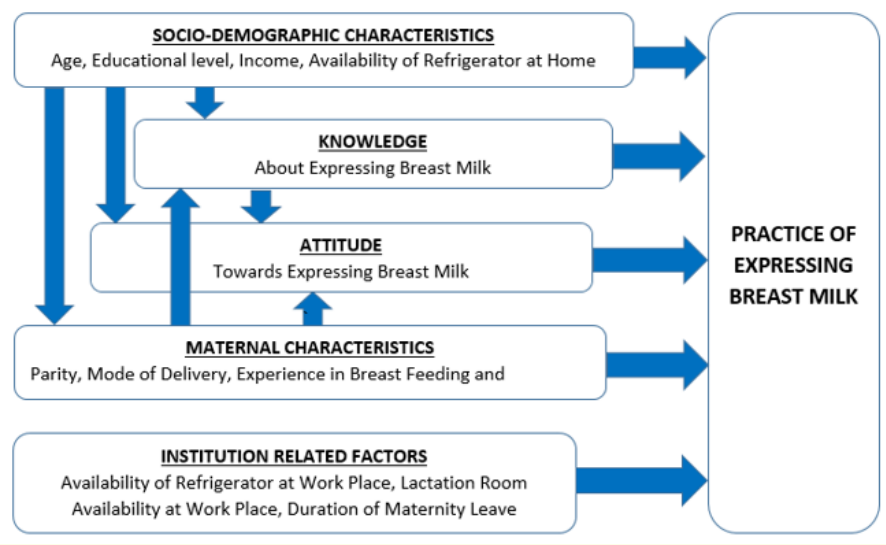

Figure 1: *Conceptual framework of factors affecting practice of expressing breast milk [20-23,29-31].*

However, this finding has been inconsistent among different studies. In a systematic review studying the prevalence and outcomes of breast milk expressing in women with healthy term infants it's been shown that the practice of expressing breast milk has grown with more complex reasons for its practice. With the limited number of papers available for the review, and the inconsistency of their definitions and results the author wasn't able to make conclusions on its association with successful breast milk feeding [10].

Across time there has been different kinds of perspectives and attitudes towards practice of expressing breast milk. A longitudinal qualitative study conducted in US had shown that although pumping was considered important among mothers, it has felt as time-consuming, unpleasant and costly compared to feeding at the breast [32].

This however was found to be worse in African mothers as it can be learned from the qualitative study conducted among breastfeeding women in rural Kenya which showed that mothers had little knowledge and skills and also a negative attitude towards expressing and storing breast milk. It was considered important only in relieving engorgement [24].

Breast milk expression among employed mothers

Even though women express breast milk for different kinds of reason, such as storing for later use, for relieving engorgements, for use in preparation of other foods, due to pain and mastitis or preference to not directly breast feed, it's no wonder that it's more practiced and more beneficial among employed women who have to be separated from their babies on daily bases [20,33].

There are different studies that were published in recent years which had shown how workplace interventions that promoted expressing breast milk had positive associations with achieving breastfeeding goals among working mothers. A recently published Australian national workplace survey had identified that work related factors such as supportive workplace environment which influence the mother's attitude and confidence to her rights to express breast milk helps breast feeding women to meet their personal breast feeding goals [34].

Another systematic review of interventions to improve workplace environments for breast feeding showed that work place interventions such as designated spaces for breastfeeding or breast milk extraction, the support from co-workers, and providing breast pumps help increase the duration of breast feeding and prevents early introduction of breast milk substitutes [35].

However there has been different factors that had been seen in different studies that potentially affected working mother's practice of expressing breast milk. A mixed method study that assessed breast milk pumping experiences of physician mothers in USA had shown that "lack of time, flexibility, dedicated and hygienic locations for pumping breast milk, disrespect and lack of support from others, and concerns about financial consequences of productivity changes were the most common barriers to pumping breast milk" [36].

These factors has been mostly related to work place environments for mothers in developed country but that has not been the case for women in countries in low socioeconomic status. In 2016, a study investigating constraints to breast milk expression among 85 working Kenyan women showed that only 19% were expressing milk which was a little lower from a 33.7% practice seen in Nigeria and a 41% practice seen among working Kenyan mothers in 2022 [22,23,29]. In the study conducted in Kenya in 2016, identified constraints were lack of knowledge on how to express breast milk (20%), lack of time to express milk (10%), poor perception of the community on the practice of expressing breast milk and lack of breast pumps and fridges by 13% of the women [29]. Significant knowledge gap was also identified in the study conducted in Kenya in 2022 [23].

Most of the recent studies about the practice of breast milk expression and storage were qualitative types. Although there is a recent study done in Ethiopia in an analytical cross-sectional study design, it focuses only on premature infants, indicating the main reason women use to express breast milk [37]. There is limited number of available recent literatures that discuss the magnitude and associated

factors of breast milk expression and storage among mothers of term-well infants [10,23] i.e. most are outdated and there is lack of such study in our study area. For this reason, undergoing an analytical type cross sectional study is best way to address the research question.

Justification/Rational of the study

In Ethiopia, the current rate of exclusive breast feeding is below the World Health Assembly (WHA) global nutrition target [15,16]. Furthermore, maternal employment has been identified as one of the significant factors that negatively affect exclusive breast feeding for 6 months [18,19]. Although the practice of breast milk expression and storage have been proposed as a strategy to address this issue, the practice is not widely adopted in poor resource settings [9,20]. This has been primarily due to knowledge and attitude gap as well as time and financial constraints [22-24,29]. Nevertheless, the practice of breast milk expression and storage as well as the factors affecting the practice remain underexplored in the study area. Therefore, this study aims at determining the practice of breast milk expression and associated factors employed mothers who have children under the age of two in Gullele sub-city, Addis Ababa.

This study, navigating through the prevalence and nature as well as the factors associated with the practice of expressing breast milk, can provide valuable insights to inform interventions aimed at promoting breast feeding, leading to improved practice of breast feeding among employed mothers and ameliorate the overall breastfeeding rates. Serving as a pilot evidence, as well as, as an input for further large scale studies and related interventions, the generated results can also provide insights to the Ministry of Health and Regional Heath Bureau.

Study Objective

General objective: To assess the practice and associated factors of breast milk expression among employed mothers having children under the age of 2, in Gulelle sub-city, Addis Ababa from February-March, 2024

Specific objectives:

1. To describe the practice of breast milk expression among employed mothers having children under the age of two, in Gulelle sub-city Addis Ababa, from February - March, 2024.
2. To identify factors affecting the practice of expressing breast milk among employed mothers having children under the age of two, in Gullele sub-city Addis Ababa, from February-March, 2024.

Methods

Study setting

The study area for this study was in Gulelle sub city, which is one of the 11 sub cities of Addis Ababa. This study was limited to a single sub-city due to cost and time constraints. Gullele is located in the northern suburb of the city. It has a population size of 377,032 with a population density of 12,493/km^2. The percentage share of male and female is 47.9% and 52.1% respectively [38,39].

Gulelle sub city has a total of 13 health centers and 2 tertiary level government hospitals. There are different units with in each public health center including family planning clinic, antenatal care (ANC) and postnatal follow up clinic, delivery ward/unit, well baby clinic, and under 5-year children clinic. Data was collected at well baby clinics in 4 selected health centers. The 4 health centers are Shegole health center, Selam health center, Addisu Gebeya health center and Hedase health center. All selected health centers provide all EPI services at different schedules and each health center monthly provide services to about 300, 230, 270 and 250 children respectively (Data source: Gullel Sub-city Health Bureau).

Study design

An institution based quantitative cross sectional study design was employed in this study.

Study population

The source population was all employed mothers having children under the age of two in Gullele sub city, from February - March 2024. The study population included all employed mothers having children under the two attending immunization services at the selected 4 health facilities in Gullele sub city from February-March, 2024.

Eligibility criteria

Inclusion criteria

- Employed mother.
- Having a child under the age two.
- Age above 18.
- Visiting well baby clinics in selected health centers.

Exclusion criteria:

- Mothers who are allowed to carry their children to work.
- Mother who have contraindications to breastfeeding [40].

Sample size

For the first specific objective, sample size is determined by using a single population proportion formula ($n = Z_{\alpha/2}^2 P (1-P)/d^2$). Assuming 41% of prevalence of breast milk expression from a previous study a 95% certainty and precision of 5%, a sample size of 372 participants is determined [23].

From previous study, previous feeding experience and household income have been found to be significantly associated with breast milk expression [31]. Therefore, the sample size for the second specific objective is determined by using double population proportion formula, assuming 81.7% of mothers who didn't have previous breast feeding experience practice breast milk expression, a 19.2 lower prevalence of breast milk expression among mothers who has previous breast feeding experience (OR = 0.38), 80% power to detect this difference, and a type I error of 5%. From this assumption the determined sample size is 180 (Table 1).

Factor	Percent of controls exposed	Percent of cases with exposure	CI	Power	Ratio of controls to cases	OR	Sample size
Household income	59.4%	79.7	95%	80%	1	2.67	162
Previous feeding Experience	81.7%	62.5%	95%	80%	1	0.38	180

Table 1: *Summary table for sample size determination for the second objective.*

From the above calculation, the highest sample size of 372 was taken and considering:

- 10% non-response rate (1/ (1-0.1) x 372 414),
- Finite population correction formula (414/ (1+414/420 209), and
- Design effect (209 x 2 = 418),
- A final sample size of 418 was acquired.

Note that, the data on the finite population was sourced from the health bureau and a pre-test observation. On average, 1,050 children are provided with vaccinations in the four health centers monthly. Based on pre-test observation, 40-50% of the mothers were employed. Since there was no prior data on employment status, the finite population was estimated using the pre-test figure, calculating 40% of the 1,050 total population, resulting in 420 employed mothers.

Sampling procedures

Gullele sub city, which is selected from the 10 sub-cities of Addis Ababa city by lottery method, has 13 health centers. Immunization services are provided in all of these health centers. Of these, 4 health centers are selected by simple random sampling, i.e. by lottery method. These health centers are Shegole health center, Selam health ceter, Addisu Gebeya health center and Hedase health center. These health centers in total provide immunization services to about 1050 children monthly (data source: from Gullele Health Bureau). Since the population is a small finite population of about 400-500 individuals (assuming that 40-50% of the mothers attending well baby clinic are employed - based on a pre-test observation), all working mothers attending well baby clinic in the selected health centers during the study period were included in the study.

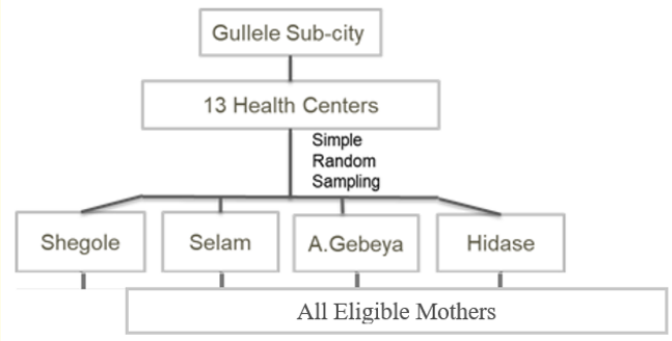

Figure 2: *Sampling procedure.*

Data collection procedures

Data was collected through a face to face interview using a structured questionnaire that consists of all study variables. Socio demographic, maternal and work-place related characteristics as well as knowledge and attitude were assessed as independent variables. Knowledge, attitude and practice was assessed by using questions adapted form Academy of Breastfeeding Medicine protocol #8 revised in 2017, different literatures and factsheets developed by WHO/UNICEF [9,23,30,41]. The study tool was pretested on 5% individuals and necessary amendment on the data collection tool was made. Data was collected from February-March 2024.

Data quality control

Four Bachelor of Science (BSc) health professionals, one Master of public health (MPH) candidates, were involved in the data collection. They were priorly provided with training on the basics of the questionnaire and the procedures of the data collection for two days. The collected data was being verified for consistency and completeness on daily basis. Careful and strict attention for data entry as well as a real time support was being provided by the investigator.

Data analysis procedures

The collected data was coded and entered into Epi info version 7.2.6.0. It was, stored and exported into Stata version 14.0 software for cleaning and analysis. Descriptive statistics was presented with frequency tables, and graphs.

Binary logistic regression model was used to assess the association between independent variables and the practice of expressing breast milk among working mothers. Bivariable analysis was performed to calculate crude odds ratio (COR) and to screen out potentially significant independent variables at 25% level of significance to be included in the multivariable binary logistic regression model.

Adjusted odds ratio (AOR), P-value and 95% CI for odds ratio was used for testing significance and interpretation of results in the multiple regression model. Variables with p-value </ = 0.05 was considered as statistically associated with the outcome variable. The assumption of multicollinearlty was checked using correlation matrix and the adequacy of the final model was checked using the Hosmer and Lemeshow goodness of fit test where p-value of >0.05 shows that the final model fitted for the data well.

Operational definitions

- **Breast milk expression:** Extracting/squeezing milk out from a mother's breast, manually or by using pump, so that it can be stored and fed to a baby at later time.
- **Well baby clinic:** One of the clinics within health centers that is devoted to care and prevention of diseases among children. It is a department where vaccination, nutritional assessment, developmental screening, nutritional counselling and parent education is provided for young children.
- **Practice:** It is measured by using a set of 5 items questions and those mothers who answered greater than or equal to the median value of these practice questions were considered as having the practice. From the collected data, the median value for having the practice was 2.
- **Knowledge:** It is measured by using a set of 17 item questions and those mothers who answered greater than or equal to the median value of these knowledge questions were considered as having satisfactory knowledge. From the collected data, the median value for having the satisfactory knowledge was 8.
- **Attitude:** It is measured by 13 questions with three point Likert's scale and those mothers who answered greater than or equal to the median value of these attitude questions were considered as having the favorable attitude. From the collected data, the median value for having the favorable attitude was 7.

Ethical consideration

Ethical clearance to conduct this research was taken from the Research and Ethical Review Committee of the Addis Continental Institute of Public Health and Addis Ababa Health Bureau. Participants of the study were informed about the purpose and relevance of the study before they provide informed written consent. They were free to opt in or out of the study at any point in time. Anonymity was assured about the identity as no name or other personal identifier was used in data collection or the research report. Access to the collected data was limited to the principal investigator and confidentiality was maintained throughout the project. Prior to data collection proper partnerships with the study sites i.e., the health centers was developed in order to facilitate quick and efficient referrals/links of the study participants if there exists any event of health concern identified during data collection.

Result

Socio-demographic characteristics

This study included a total of 418 working mothers with median age of 30 years (IQR = 28 - 32). About 50% the mothers had received tertiary level education and were currently employed in public sector with a median monthly income of about 6000 ETB (IQR = 4500 -8000). Majority (80.5%) of the participants claimed to have refrigerator at their homes (Table 2).

Variable	Median IQR	
Age of mother (years)	30 (IQR = 28-32)	
Income	6000 (IQR = 4500 -8000)	
Variable	**Categories**	**n (%)**
Highest level of education `	No formal education	7 (1.69)
	Primary	81 (19.61)
	Secondary	119 (28.81)
	Tertiary	206 (49.88)
Type of Job	Government employee	208 (50.00)
	Private employee	145 (34.86)
	Daily laborer	14 (3.37)
	Self-employee	49 (11.78)
Availability of refrigerator at home	Yes	334 (80.48)
	No	81 (19.52)

Table 2: *Socio-demographic characteristics of employed mothers having children under age of two (n = 418).*

Maternal characteristics

In this study, majority of the mothers identified as multiparous (74.52%) while 25.35 reported to have had no previous breastfeeding experience. More than 60% (254) had spontaneous vaginal delivery on their latest delivery. The median age of their children during the study period was 9 months (IQR = 6 - 12 months). The median age of infants when mothers resumed work was 5 months with (IQR = 4 - 6) (Table 3).

Variable	Median (IQR)	
Age of child (months)	9 (IOR = 6-12)	
Age of child when mother resumed work (months)	5 (IOR = 4-6)	
Birth order of index child	2 (IQR = 1-2)	
Variable	**Categories**	**n (%)**
Parity	Primiparous Multiparous	106 (25.48) 310 (74.52)
Mode of delivery	Vaginal C/S	254 (61.35) 160 (38.65)
Previous experience in breast feeding	No Yes	118 (28.43) 297 (71.57)
Previous experience in expressing	No Yes	207 (49.88) 208 (50.12)

Table 3: *Maternal characteristics of employed mothers having children under age of two (n = 418).*

Knowledge of breast milk expression and storage

Satisfactory knowledge on expressing and/or storing breast milk was attained in 66.51% (278) of the mothers. Participants demonstrated varying levels of knowledge across different areas related to breast milk expression and storage. Table 3 presents the summary of responses for each knowledge item.

Notably, more than 95% of participants correctly identified the importance of hand washing and having a clean dry container prior to expressing breast milk. However more than 75% of the mothers believed that there is a difference in contamination of milk when expressing by hand as compared to using pump. Most mothers (>50%) were aware that breast milk can be stored at room temperature as well as in the refrigerator. However, a majority of them didn't know the recommended duration that the milk can be stored safely, in the refrigerator (56.7%) or freezer (95.22%).

Indicators	Response	n (%)
What can be used to express breast milk?	Not known	191 (45)
	Hand/pump	227 (54)
Is hand washing important before expressing breast milk?	No	8 (1.91)
	Yes	410 (98.09)
Is cleaning the breast important before expressing milk?	Yes	398 (95.22)
	No	20 (4.78)
Is it important to stimulate the mother's breast prior to expressing?	No Yes	94 (22.49) 324 (77.51)
Is massaging the back of the mother prior to expressing useful?	No Yes	306 (73%) 112 (26.79)
Is it important to have a clean and dry container prior to expressing?	No Yes	19 (4.55) 399 (95.45)
Is it useful to look at the baby or his/her picture while expressing?	No Yes	339 (81.1) 79 (18.9)
Is there any difference in contamination of milk when expressing by hand or pump?	Yes No	347 (83) 71 (17)
Is it correct to discard the first few drops of milk before expressing milk?	Yes No	311 (74.4) 107 (25.6)
Can breast milk be stored at room temperature?	No	159 (38.04)
	Yes	259 (61.96)
Can breast milk be stored in a refrigerator?	No	202 (48.33)
	Yes	216 (51.67)
Can breast milk be stored in a freezer?	No	353 (84.45)
	Yes	65 (15.55)
How long can breast milk be stored in room temperature?	Other	172 (41.15)
	4-8hr	246 (58.85)
How long breast milk can be stored in a refrigerator?	Other	237 (56.7)
	4-8 days	181 (43.3)
How long can breast milk be frozen?	other	398 (95.22)
	6-12 months	20 (4.78)
Can breast milk be boiled and given to a baby?	Yes	70 (16.75)
	No	348 (83.25)
Have you ever heard or learned about expressing breast milk before?	No Yes	54 (12.92) 364 (87.08)

Table 4: *Knowledge on breast milk expression and storage (1 = correct response, 0 = incorrect response/not known).*

About 54% of the participants heard about expressing breast milk from family and friends, while the 54% and 18% of them learned from healthcare professionals and media, respectively. However, 13% the mothers claimed that they have never heard of expressing breast milk before.

Attitudes towards breast milk expression and storage

Favorable attitude was seen in 219 (52.90%) of the mothers. Although the majority of the mothers acknowledged that expressing breast milk could benefit breastfeeding infants by ensuring steady supply of breastmilk many expressed concerns about the practicality and convenience of this practice for themselves (Table 5).

Indicators	Disagree n (%)	Neutral n (%)	Agree n (%)
Breast milk expression is tiresome	174 (41.63)	28 (6.7)	216 (51.67)
Expressing breast milk can require a lot of time	146 (34.93)	18 (4.3)	254 (60.77)
Breast milk expression is painful	191 (45.69)	51 (12.2)	176 (42.11)
Expressing breast milk may be harmful for a mother's health	239 (57.31)	72 (17.27)	106 (57.31)
It's difficult to learn how to express breast milk	234 (56.12)	42 (10.07)	141 (33.81)
Expressing and storing breast milk is expensive	282 (6746)	29 (6.94)	107 (25.60)
Expressed and stored breast milk has less nutritional value compared to direct breast feeding	238 (57.07)	58 (13.91)	121 (29.02)
Stored breast milk is safe for infants to drink	195 (46.88)	56 (13.46)	165 (39.66)
The community may condemn a mother for expressing breast milk	222 (53.11)	67 (16.03)	129 (30.86)
It is better to give formula milk than expressed breast milk	266 (63.64)	38 (9.09)	114 (27.27)
Breast milk expression can be done at the workplace	307 (72.73)	35 (8.37)	79 (18.90)
Breast milk expression can allow mothers to achieve exclusive breastfeeding for 6 months	120 (28.71)	30 (7.18)	268 (64.11)
Mothers should be educated about expressing breast milk	49 (11.78)	15 (3.61)	352 (84.62)

Table 5: *Attitudes towards expressing breast milk.*

Practice of breast milk expressing and storage

Among the 418 employed mothers participated during the study period, 212 (51.5%, 95% CI: 46.7% - 53.4%) were expressing breast milk regularly or occasionally. For these mothers, the most common methods of expression were manual breast pump (73.11%) and hand expression (39.6%), while a smaller percentage of participants reported using electrical pumps (3.3%). Participants employed various methods for storing expressed breast milk, with refrigeration (66.5%) being the most common followed by storing at room temperature (40.6%). Baby bottles were the most commonly used storage containers (68.87%) (Table 6).

About half (50%) of the mothers claimed to have had a previous experience of breast milk expression. Of the 212 mothers expressing breast milk, 183 (86.3%) of the mothers had refrigerator at their home. However, it is only 24.5% and 13.7% of the mothers that claimed to have suitable room for expressing breast milk and access to a refrigerator at their work place, respectively (Table 6).

Indicators	Responses	n = 212 (%)
Method of breast milk expression	Hand	84 (39.62%)
	Manual pump	155 (73.11%)
	Electric pump	7 (3.3%)
Storage of breast milk	Room temperature	86 (40.57%)
	Refrigerator (4°C)	141 (66.51%)
	Freezer	7 (3.3%)
Preferred container for storing breast milk	Baby Bottle	146 (68.87%)
	Other	40 (18.87%)
Availability of refrigerator at home	No	29 (13.68%)
	Yes	183 (86.32%)
Availability of refrigerator at work	No	183 (13.68)
	Yes	29 (13.68%)
Availability of space at work place that is suitable for expressing	No Yes	151 (71.23%) 61 (28.77%)

Table 6: *Practice of breast milk expression and storage (n = 212).*

The main reason why mothers expressed breast milk was to enable them delegate feeding while they were at work (53.83%) followed by to relieve engorgement (19.86%) and when having sore nipple (7.5%). The mothers also reported reasons such as to increase milk production (2.15%), to mix with complementary meal (2.6%), and to train baby to bottle feed (2%) as reasons for expressing breast milk (Figure 3).

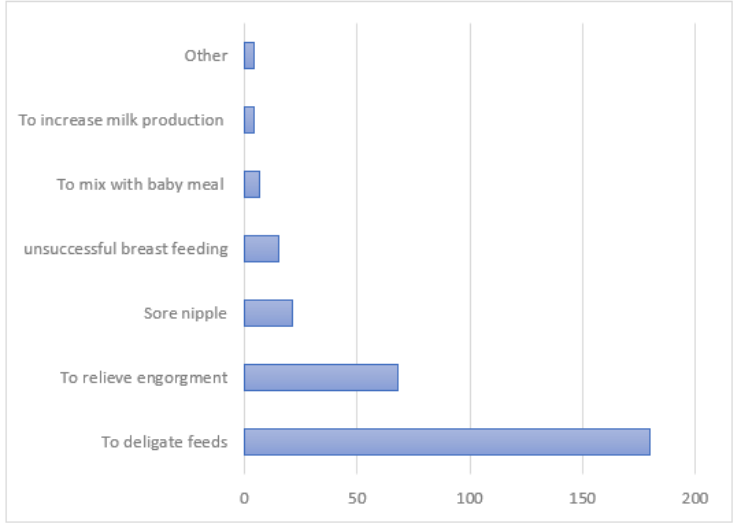

Figure 3: *Reasons for expressing breast milk.*

Factors associated with practice of expressing breast milk

Based on the multi-variable analysis, the odds of practicing breast milk expressing among mothers who attained tertiary level education is 2.39 times than that of mothers who only attained primary level education (95% CI: 1.30 - 4.37). Similarly, having satisfactory knowledge and previous experience with expressing breast milk were significantly associated with the practice of expressing breast milk among working mothers (Table 7).

Variables		COR	95%CI	p-value	AOR	95%CI	p-value
Age of mother		1.03	0.98-1.08	0.200	-	-	-
Level of education	Primary	1					
	Secondary	1.62	0.89-2.91	0.108	-	-	-
	Tertiary	2.87	1.68-4.92	0.000	2.39	1.30-4.37	0.005
Income		1.0	1.00-1.00	0.025	1.0	0.99-1.00	0.291
Mode of delivery	Vaginal	1					
	C/S	1.02	0.68-1.51	0.94	-	-	-
Parity	Primiparous	1					
	Multiparous	1.73	1.10-2.71	0.017	0.78	0.42-1.43	0.421
Availability of fridge at home	No	1					
	Yes	2.19	1.32-3.62	0.002	1.36	0.76-2.47	0.303
Availability of fridge at work	No	1					
	Yes	1.2	0.67-2.16	0.531	-	-	-
Availability of suitable space at work	No	1					
	Yes	1.7	1.07-2.70	0.024	1.67	0.99-2.81	0.050
Previous experience in breast feeding	No	1					
	Yes	1.54	1.00-2.37	0.049	-	-	-
Previous experience in expressing	No	1					
	Yes	3.2	2.14-4.80	0.000	3.48	2.02-6.02	0.000
Knowledge	Unsatisfactory	1					
	Satisfactory	2.33	1.53-3.55	0.000	1.75	1.09-2.79	0.020
Attitude	Unfavorable	1					
	Favorable	1.39	0.95-2.07	0.091	1.46	0.93-2.32	0.103

Table 7: *Factors associated with practice of expressing breast milk.*

Discussion

In this cross sectional study, the practice and associated factors of expressing breast milk were studied. Among the studied 418 participants, 212 (51.5%, 95% CI = 46.7% - 53.4%) had a practice of expressing breast milk either occasionally or regularly. Mothers who

attained higher level of education are 2.39 times more likely to practice expressing breast milk compared to those with primary education. Additionally, the odds of having the practice is 76% higher among mothers who had sufficient knowledge as compared to those with insufficient knowledge. Furthermore, mothers who had previous experience with expressing breast milk were 3.47 times more likely to express breast milk as compared to mothers who had no previous experience.

Potential sources of bias in this study may include recall bias as mother who are far gone up to 2 years after delivering their child are included in this study. Additionally, mothers might have over reported their practices due to social desirability, particularly if they perceived expressing milk as a practice recommended by health professionals. To address these potential biases the questions were designed to be more specific and clear to help participants recall information more accurately. Furthermore, data collectors were emphasizing the confidentiality of responses and used non-judgmental and neutral wording to reduce the pressure to respond in a socially desirable way, further ensuring the validity of the results.

The observed association of higher level of education with practice of expressing breast milk can be explained by the better understanding and access to information about the benefits and techniques of breast milk expression among more educated women. Good knowledge and previous experience in expressing milk also directly influences mothers' ability to effectively express and store breast milk as well as builds motivation and confidence, making mothers more likely to continue the practice. These three factors are quite interrelated, indicating that education can enhance both experience and knowledge, and experience can influence knowledge, which in turn enhances the practice.

These results can also be explained by the Health Belief Model, which posits that individuals are more likely to engage in health-promoting behaviors if they perceive a benefit, have adequate knowledge and feel confident in their abilities [42]. Higher education and previous experience increase perceived self-efficacy and knowledge, which are important components of the model. Additionally, Social Cognitive Theory suggests that observational learning and personal experience play significant roles in shaping behaviors [42]. Similarly, mothers who have previously expressed breast milk or have seen others do so successfully are more likely to engage in the practice themselves.

Comparing the findings from this study with similar studies, it is noted that the prevalence of 51.5% is somewhat lower than reports in studies from high-income countries as the United States, in which the prevalence is 85% [20]. This discrepancy could result from differences in maternity leave policies, workplace support, and resource availability [20]. In contrast, the prevalence is more consistent with, or per se, slightly higher than findings from studies conducted in lower-middle-income countries, such as a 2016 study in Kenya and a 2018 study in Nigeria, which showed prevalences of 41% and 35% respectively [22,29]. These differences could be attributed to increasing awareness and knowledge over the years regarding breast milk expression. Additionally, the discrepancy could be due to differences in study populations; the Kenyan study focused on infants aged 6 months and younger, while this study included children up to 2 years old.

Similarly, the finding of a significant association between higher educational levels and expressing breast milk aligns with a 2021 Kenyan study, which reported that mothers with tertiary level education were 3.66 times more likely to express breast milk compared to those with only primary level education [23]. However, a study conducted in Hong Kong did not find a significant relationship between educational level and exclusive expressed breast milk feeding [42]. This discrepancy may be due to that the study included all mothers regardless of employment status, with many non-working mothers potentially having lower levels of education, eliminating the possible association between education and the practice.

On the other hand, a study among working lactating mothers in Kenya identified a lack of knowledge about the importance of and how to express milk as major factors for not expressing (12.9% and 20.0%, respectively) [29]. This contrasts with the 2018 Nigerian study, which found no significant association between knowledge and the practice of expressing milk [22]. The discrepancy could be due to

differences in the levels of knowledge identified; the Nigerian study reported only 13% satisfactory knowledge, while our study found 66% satisfactory knowledge. Furthermore, lack of breast feeding experience was also identified to be associated to expressing breast milk in a US and Hong Kong studies [20,42].

There are some strengths and limitations that can be mentioned regarding the study. The strengths include that the study addresses a relatively new and under explored topic in the study area, and its focus on a specific population of urban working mothers providing valuable insight into the unique circumstances of these mothers. Additionally, the inclusion of quite reasonable amount of variables in multivariable analysis to control for confounders and the aforementioned efforts made to minimize biases such as recall bias and social desirability biases, contribute to the robustness and reliability of the study findings.

However, the study has the following limitations. As the study is conducted in public health centers, the collected data may not represent mother who attain services from private clinics and hospitals. Furthermore, as the study employed a cross sectional design, capturing a snapshot of the participants' experiences and practices at a single point in time, it has limited strength in inferring relationship between the identified factors and the practice of expressing breast milk.

Conclusion

This study found that the prevalence of expressing breast milk among working mother having children under two years old is 51%, highlighting its significant association with mother's satisfactory knowledge about breast milk expression, higher levels of education, and previous experience with the practice. These findings underscore the importance of educational and experiential factors in promoting the practice of expressing breast milk.

Recommendations

According to the findings in this study the following recommendations shall be noted.

- **Increasing awareness:** Health professionals shall incorporate education for women about the benefits and techniques of breast milk expression during prenatal and postnatal periods to improve knowledge and confidence about the practice.
- **Promoting education for women:** The government should continue promoting higher education for women as it can have positive impact on breastfeeding practices.
- **Future research:** Future researches should aim to assess the practice in a larger set of population using longitudinal designs. These approaches can provide more reliable and generalizable results, ultimately determining whether promoting the practice of expressing breast milk is an effective strategy for achieving improved breastfeeding targets.

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