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## Neonatal intensive care nurses' performance regarding expression and storage of breast milk

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### Abstract

Human milk has specific immunological, growth, and developmental benefits. To receive both nutritional and immunological advantages, expressing breast milk during the postnatal phase may be difficult. However, in such a case, breast milk, fresh or frozen, may still be an alternative. This study aimed to assess neonatal intensive care nurses' performance regarding expression and storage of breast milk. A descriptive research design was used in a neonatal intensive care unit at Minia University Hospital for obstetrics and pediatrics. All nurses who are working in the previous setting. A structured interview questionnaire consisted of two tools was used. Results: 55.0% of the studied nurses had average knowledge regarding breast milk storage, and 32.5% had good reported practice regarding expression and storage of breast milk. Also, 76.9% of the studied nurses who had a good level of reported practices regarding expression and storage of breast milk, their experience was less than one year with statistically significant difference. So, this study concluded that more than half of the studied nurses had an average total knowledge level, and more than two-thirds of them had poor reported total practices regarding expression and storage of breast milk. Recommendation: Health education sessions for neonatal intensive care nurses regarding express breastfeeding and storage of breast milk, especially preparation for breast milk storage, valid duration, and methods of breast milk storage.

**Keywords:** Breast milk, expression, storage, performance, nurses, neonatal intensive care

### 1. Introduction

The use of breast milk is an essential component in providing optimal health for critically ill newborns. As the professional voice of neonatal nurses, the National Association of Neonatal Nurses (NANN) encourages all neonatal nurses to provide mothers of critically ill newborns with the education, support, and encouragement needed to provide human milk for their newborn<sup>[1]</sup>.

Human breast milk prevents sickness in babies. Research shows that bottle-fed babies tend to be more vulnerable to illness than others that are breastfed. Many lysozyme, lactoferrin, complement components, and interferon-like leukocytes are present in human milk, which is crucial for child protection; they contain components such as lysozyme, lactoferrin, and lactoferrin, but the particular importance lies in immunoglobulins and interferon-like leukocytes<sup>[2]</sup>.

Human milk offers many health benefits to the newborn, both when he or she is in the hospital and after it is discharged<sup>[3, 4]</sup>. These advantages include a 72 percent reduction in respiratory tract infections, a 64 percent reduction in gastrointestinal tract infections, and a reduction in the prevalence and seriousness of hospital-acquired infections. In addition, human milk lowers the risk of necrotizing enterocolitis (NEC) by 77%, and babies that are given human milk have better visual acuity and higher ratings on neurocognitive and developmental outcomes<sup>[3]</sup>.

Expressed breast milk is advised to be given to the baby if the mother is to stay away from the neonate for a long time. Knowledge about appropriate human milk handling and storage is essential for breastfeeding success. Stored human milk maintains its unique qualities such that it continues to be the golden standard for infant feeding, superior to artificial feeding<sup>[5]</sup>. According to the California Pacific Medical center<sup>[6]</sup> states that the baby can breastfeed directly by using the mother's fresh or frozen milk to ensure optimal nutritional and immunological benefits. Initially, the mother is pumping to stimulate the hormonal response for milk production, so; the first weeks are crucial for maintaining a regular pumping schedule to optimize for milk production.

Neonatal nurses must provide evidence-based awareness of the science of human milk, lactation, and breastfeeding, as well as a commitment to promote the supply of human milk and breastfeeding by the support and evidence-based information.

It is important to ensure that neonate consume human milk whilst in the hospital and that mothers can meet their breastfeeding needs <sup>[1, 6]</sup>.

## 2. Significance of the study

The World Health Organization (WHO) recommends that all infants be breastfed for the first six months of life and that, if possible, infants continue to be breastfed until they have reached two years of age or longer <sup>[7]</sup>.

The use of maternal milk in the neonatal intensive care unit (NICU) has increased, as the advantages of human milk, compared with formula, have been well established regarding enteral tolerance, host defense, and the prevention of late-onset septicemia and necrotizing enterocolitis. However, human milk can also be a vehicle for commensal and pathogenic microorganisms derived from the mother or the environment <sup>[8]</sup>.

Neonatal nurses are responsible for educating all mothers about the importance of human milk for their children, regardless of the mothers' initial reasons for nursing, and encouraging them to pump milk for as long as possible <sup>(1)</sup>. So, this study aimed to assess neonatal intensive care unit nurses' performance regarding expression and storage of breast milk.

## 3. Aim of the study: To

Assess neonatal intensive care unit nurses' performance regarding expression and storage of breast milk.

## 4. Research questions

1. What is the level of neonatal intensive care unit nurses' knowledge regarding expression and storage of breast milk?
2. What is the level of neonatal intensive care unit nurses' reported practice regarding the expression and storage of breast milk?
3. Is there a relation between neonatal intensive care unit nurses' performance regarding expression and storage of breast milk and their selective demographic characteristics?

## 5. Subjects and method

### 5.1 Research Design

A descriptive research design was used to achieve the aim of the current study.

### 5.2 Setting

The current study was conducted in the neonatal intensive care unit on the third floor at MUHOP. It receives high-risk neonates from all over Minia governorate who complained from different diseases, and the total number of incubators in this unit is 25 incubators and provides levels of care up to the 3<sup>rd</sup> level.

### 5.3 Sample

All nurses working in the neonatal intensive care unit at Minia University Hospital for obstetrics and pediatrics (MUHOP) were included in the study; their number was 40 nurses.

### 5.4 Data Collection Tools

**A Structured interview questionnaire:** the researchers developed it after an extensive review of related literature and the consultation of the experts in pediatric nursing. The

questionnaire was in English language and composed of two tools as the following:

### Tool I: Neonatal intensive care unit nurses' knowledge regarding expression and storage of breast milk which included two parts

**Part I: Demographic data of the nurses:** it included 6 items about nurses, such as gender, age, educational level, marital status, year of experience in the neonatal intensive care unit, and attending training courses related to the high-risk neonate.

**Part II: Neonatal intensive care unit nurses' knowledge regarding expression and storage of breast milk:** It contained 19 items regarding indications of breast milk expression (5 items), different methods of milk expression (6 items), and methods of breast milk storage (5 items), and valid duration of breast milk storage (3 items).

### Scoring system

The correct answer was given one score, the incorrect or didn't know the answer was given zero scores. If the total knowledge of nurses < 60% (11.3) is considered poor knowledge, from 60% -75% (11.4 - 11.2) is considered average knowledge, and more than 75% (11.3) is considered good knowledge.

### Tool II: Neonatal intensive care unit nurses reported practices regarding expression and storage of breast milk:

it included 28 items about steps of manual breast milk expression (14 items), preparation to breast milk storage (3 items), the storage temperature of breast milk (3 items), and methods for thawing frozen breast milk (8 items). The total number of questions was 47 question.

### Scoring system

The correct answer was given one score, the incorrect or didn't know the answer was given zero scores. If the total reported practice of nurses < 75% (21) is considered poor practice, and more than 75% is considered good practice.

## 5.5 Ethical Consideration

Written approval was obtained from the Research Ethical Committee at the Faculty of Nursing, Minia University. Official permission was obtained from the director of MUHOP. Each nurse was informed about the nature and purpose of the study, as well as its benefits. Informed written consent was obtained from each nurse. The researchers emphasized that nurses' participation in the study was voluntary, and there was a possibility to withdraw at any time without repercussions and any effect on their work. Confidentiality was also assured through coding the data. Each assessment sheet was coded anonymously.

## 5.6 Validity

Three specialists associated with the Faculty of Nursing, Minia, and Cairo Universities at the Pediatric Nursing Department investigated the face validity of the data collection tool. Content coverage, clarification, importance, applicability, text, volume, style, and general appearance were analyzed in the method. The committee members had first proposed their opinions and recommendations. Afterward, to change the opinions and recommendations to be more accurate and reliable.

**5.7 Reliability**

Internal accuracy was calculated to identify the degree to which the objects measure the same definition. Tool reliability is to be enhanced by combining similar problems in a questionnaire. This study provided Cronbach's alpha of 0.681 and 0.692 to express breast milk and breast milk storage, respectively.

**5.8 Pilot Study**

The pilot study was conducted on 10% (4 nurses) to ensure the feasibility, objectivity, applicability, clarity, adequacy, content validity, and internal consistency of the study tool and to determine possible problems in the methodological approach or the tool. The results of the pilot study were used to test the proposed statistical and data analysis methods. The tool was completed without difficulty, adding support to the validity of the tool. The time required for completion of the interview questionnaire didn't exceed 20 minutes. Nurses involved in the pilot study were included in the study sample.

**5.9 Data Collection Procedure**

Official permissions from the directors of MUHOP and the neonatal intensive care unit (NICU). The explanation and the type of research were explained to the nurses separately. Formal written consent was obtained from each nurse to get her acceptance and gain her cooperation. The researchers for each nurse discussed clear and simple explanations about the aim and nature of the study. The interview was conducted in the nurses' break room in the previously mentioned setting. Each nurse was interviewed individually; the time taken to fill the structured interview questionnaire for each nurse was ranged from 15 to 20 minutes and at the rate of 4 to 6 nurses/ week. Data collection was conducted over three months extending from the beginning of June 2019 to the end of August 2019.

**5.10 Statistical Analysis**

The statistical software was used to document and tabulate the results (IBM SPSS 25.0). Descriptive statistics is made up of mean and standard deviation. Quantitative data presented as a number and percentages. Chi-square was

used for qualitative data to detect the relation between nurses' knowledge regarding expression and storage of breast milk and their selected demographic characteristics. Level of significance at  $p < 0.05$ , 0.001 were used as the cut of value for statistical significance. Mean percentage was calculated by the sum of all items and divided into total score then \* 100.

**6. Results**

**Table 1:** Percentage distribution of demographic characteristics among the studied nurses (n= 40).

Demographic characteristics	No.	%
Gender		
Male	3	7.5
Female	37	92.5
Age / year		
20-	21	52.5
25-	14	35.0
30- 34	5	12.5
Mean ± SD 25.5 ± 3.5 years		
Educational level		
Technical institute of nursing degree	28	70.0
Bachelor degree in nursing	12	30.0
Years of experience in NICU		
Less than one year	24	60.0
1- <5	8	20.0
5- 10	8	20.0
Mean ± SD 2.4 ± 2.8 years		
Training courses?? about what		
Yes	10	25.0
No	30	75.0
If yes, no. of training courses (n= 10)		
One training	4	10.0
2 – 4 courses	6	15.0

Table (1): showed that 92.5% of the studied nurses were female, 52.5% of them aged between 20- < 25 years, 70.0% of them had a technical nursing educational level, 60.0% of them their experience less than one year, 75.0% of them didn't attend any training courses, and 15.0% of them had previous 2- 4 training courses related to high-risk neonates.

**Table 2:** Mean percentage and standard deviation of knowledge and reported practices among the studied nurses regarding expression and storage of breast milk (n = 40)

Items	Mean % ± SD
Nurses' Knowledge	
Indications of breast milk expression	76.0 ± 17.7
Different methods of breast milk expression	70.4 ± 17.1
Methods of breast milk storage	67.5 ± 17.9
Valid duration of breast milk storage	50.0 ± 22.6
Total knowledge among the studied nurses regarding expression and storage of breast milk	70.9 ± 10.8
Nurses' Reported practices	
Steps of manual breast milk expression	84.6 ± 13.9
Preparation of breast milk storage	25.0 ± 22.3
Storage temperature of breast milk	60.8 ± 32.8
Methods for thawing frozen breast milk	67.8 ± 12.9
Total reported practices among the studied nurses regarding expression and storage of breast milk.	67.9 ± 11.1

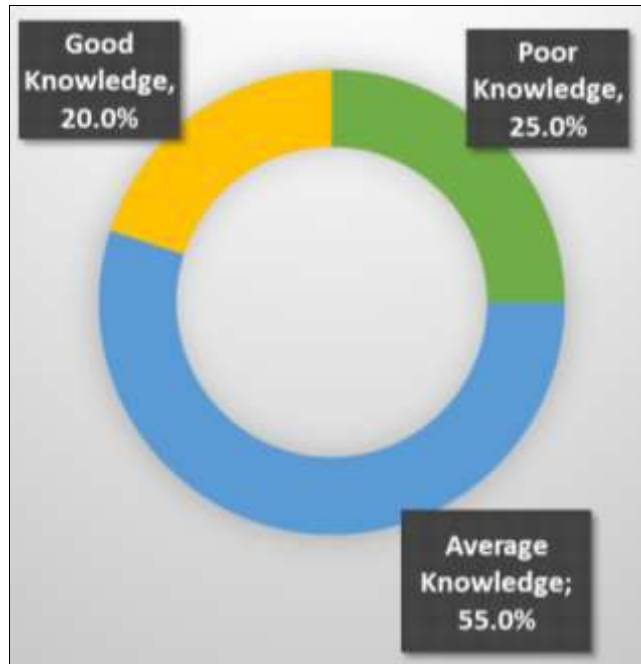
Table (2) presented the mean percentage and standard deviation of knowledge and reported practices among the studied nurses regarding expression and storage of breast milk. Generally, it was observed that nurses have average knowledge regarding expression and storage of breast milk;

their total mean score ±SD was (70.9 ± 10.8). As well as they had good knowledge level related items; indications of breast milk expression with mean score ± SD (76.0 ± 17.7), they had average knowledge level related items of different methods of breast milk expression and methods of breast

milk storage with a mean score  $\pm$ SD ( $70.4 \pm 17.1$  and  $67.5 \pm 17.9$ ) respectively. In contrast, defects of nurses' knowledge were observed related to the valid duration of breast milk storage; their mean score  $\pm$ SD was ( $50.0 \pm 22.6$ ) is considered poor knowledge level.

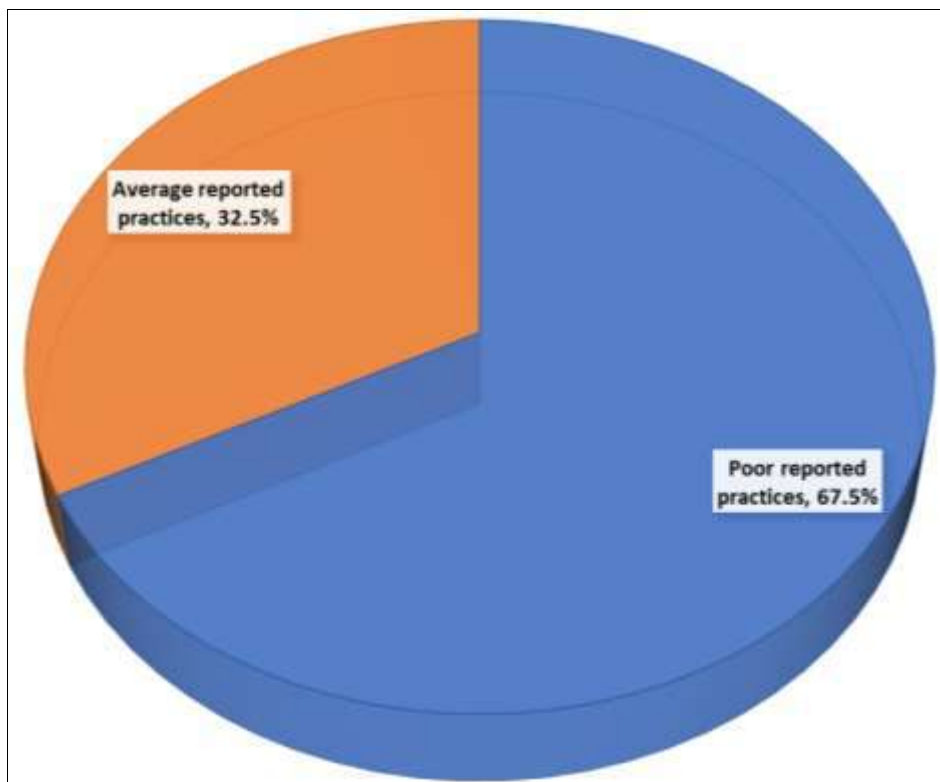
Regarding nurses' reported practices regarding expression and storage of breast milk, the table showed that they had a poor score in reported practices related to three items listed

out of four as preparation to breast milk storage, the storage temperature of breast milk storage, and methods for thawing frozen breast milk with mean score  $\pm$  SD ( $25.0 \pm 22.3$ ,  $60.8 \pm 32.8$  and  $67.8 \pm 12.9$ ) respectively. But they had a good score in reported practices related to items of steps of manual breast milk expression only with a mean score  $\pm$  SD ( $84.6 \pm 13.9$ ). Their total reported practices mean score  $\pm$  SD was ( $67.9 \pm 11.1$ ) is considered poor practices.



**Fig 1:** Percentage distribution total knowledge levels of the studied nurses regarding expression and storage of breast milk

Figure (1): illustrated that 25.0% of the studied nurses had poor knowledge, 55.0% had average knowledge, and 20.0% had good knowledge regarding breast milk storage.



**Fig 2:** Percentage distribution total reported practice levels of the studied nurses regarding expression and storage of breast milk

Figure (2): illustrated that 67.5% of the studied nurses had poor reported practice, and 32.5% of them had good

reported practice regarding expression and storage of breast milk.

**Table 3:** Relation between selective demographic characteristics of the studied nurses and their total knowledge and reported practice levels regarding expression and storage of breast milk (n= 40).

Demographic characteristics	Total knowledge levels						Total reported practice levels.				
	Poor (n= 10)		Average (n= 22)		Good (n= 8)		Poor (n= 27)		Good (n= 13)		
	No.	%	No.	%	No.	%	No.	%	No.	%	
Age / year											
20-	21	6	60.0	10	45.5	5	62.5	14	51.9	7	53.8
25-	14	2	20.0	10	45.5	2	25.0	9	33.3	5	38.5
30- 34	5	2	20.0	2	9.1	1	12.5	4	14.8	1	7.7
<i>X<sup>2</sup> / fisher (P-value)</i>	2.681 (.613)						.429 (.807)				
Educational level											
Technical	28	5	50.0	18	81.8	5	62.5	18	66.7	10	76.9
BSc	12	5	50.0	4	18.2	3	37.5	9	33.3	3	23.1
<i>X<sup>2</sup> / fisher (P-value)</i>	3.582 (.167)						.440 (.507)				
Years of experience in NICU											
Less than one year	24	5	50.0	14	63.6	5	62.5	14	51.9	10	76.9
1-< 5	8	3	30.0	2	9.1	3	37.5	6	22.2	2	15.4
5- 10	8	2	20.0	6	27.3	0	.0	7	25.9	1	7.7
<i>X<sup>2</sup> / fisher (P-value)</i>	4.439 (.245)						7.583 (.04)*				
Training courses											
Yes	10	3	30.0	4	18.2	3	37.5	7	25.9	3	23.1
No	30	7	70.0	18	81.8	5	62.5	20	74.1	10	76.9
<i>X<sup>2</sup> / fisher (P-value)</i>	1.345 (.510)						.038 (.845)				

Table (3): clarified that 76.9% of the studied nurses who had a good level of reported practices regarding expression and storage of breast milk, their experience was less than one year with statistically significant difference which P-value ≤ 0.04; In comparison, 63.6% of them with average knowledge level experience was less than one year with no statistically significant difference. No statistically significant differences were found between nurses' age, educational level & attended training courses, and their level of knowledge and reported practice-related either breast milk expression or breast milk storage. At the same time, the table illustrated that 62.5% of nurses with good knowledge level and 53.8% of those with good reported practices are younger than others, their age ranged between 20-<25 years old; 81.8% of nurses with average knowledge level and 76.9% of them with good reported practices had technical nursing education and didn't attend an educational program about high-risk neonate.

**7. Discussion**

Concerning nurses' knowledge about the temperature of storage milk, 60.8% ± 32.8 of the studied nurses had practices regarding storage temperature of breast milk storage. This result may be due to the neonatal intensive care nurses dependent on the head nurse to the accurate freezing temperature, not the staff nurses. This result due to the many numbers of nurses' dependent on the head nurse to regulate the refrigerator's temperature. This result differs with özçelik & Aktaş [9] who studied "The Evaluation of Nurses' Knowledge and Practice about the Temperature of Milk Fed to Infants: A Descriptive Study" and reported that the nurses had insufficient knowledge regarding the proper temperature of the breast milk.

The studied nurses reported practices regarding the thawing frozen breast milk process; the current study presented that 67.8% ± 12.9 of the studied nurses had practice. This may be due to the Minia university hospital involved in a "baby-friendly hospital" that positively impacts breast milk

concerns and the knowledge about the issue. This result comes contradicted with Gharaibeh, Al-Sheyab, & Malkawi [10] mentioned that nurses' knowledge inadequate in relation to the thawing process of frozen milk.

Regarding the total knowledge levels of the studied nurses regarding expression and storage of breast milk, the present study illustrated that more than half of the studied nurses had average knowledge and one-quarters of them had good and poor knowledge, respectively. These results might be due to one-quarter of the studied nurses had previous training courses regarding this topic. This result in the same line with Renuka [11] who studied "an explorative study to assess the knowledge and attitude regarding the storage of breast milk for the infants among staff nurses at selected hospitals of Gwalior city to developing an information booklet" and reported that the majority of the staff nurses were found to have an average level of knowledge and the minority of the staff nurses had excellent knowledge.

Also, this finding is consistent with the results of the study conducted by Mary [12] who worked upon a quasi-experimental study to assess the level of knowledge in collection and storage of expressed breast milk among mothers of infants at selected children's hospital in Chennai and mentioned that 15 (15%) of the studied mothers were adequate knowledge 35(35%) were in moderate knowledge, 50 (50%) were inadequate knowledge.

Regarding the total reported practice levels of the studied nurses regarding expression and storage of breast milk, two-third of them had average practices. This result might be due to half of the studied nurses aged less than 25 years, and the young age nurses have more chances for acquiring new skills in nursing care. This result consistent with Gharaibeh, Al-Sheyab, & Malkawi [8], who studied "Breast Milk Collection and Storage in the Neonatal Intensive Care Unit: Nurses' Knowledge, Practice, and Perceived Barriers" and reported that nurses' practice of breast milk collection and storage was adequate in general.

Regarding the relation between selective demographic

characteristics of the studied nurses and their total knowledge levels regarding expression and storage of breastfeeding, the present study clarified that more than three-quarters of the studied nurses their years of experience between 1-< 5 years had a good level of reported practice regarding expression and storage of breast milk with statistically significant difference which  $P$ -value  $\leq 0.04$ . This may be due to nurses' experience in the neonatal intensive care unit lead to acquiring more information and new skills regarding the nature of the work. This result comes in line with Karthika *et al.* [13] who reported that there is a significant association between practice score and their experience.

## 8. Conclusion

The current study concluded that more than half of the studied nurses had an average total knowledge level, and more than two-thirds of them had poor reported total practices regarding expression and storage of breast milk. They had good knowledge level related item of indications of breast milk expression, poor knowledge level related item of the valid duration of breast milk storage as well as they had good reported practices level related item of steps of manual breast milk expression, poor reported practices related items of preparation to breast milk storage, the storage temperature of breast milk and methods for thawing frozen breast milk.

## 9. Recommendations

**In the light of the findings of the current study, the following was recommended**

- Health education sessions for neonatal intensive care nurses regarding express breastfeeding and storage breast milk, especially preparation for breast milk storage, valid duration, and methods of breast milk storage.
- Continuous follow-up nurses' practices in preparation and storage of breast milk.
- Future research studies should evaluate nurses' practice during the thawing process and feed high-risk neonates with expressed milk.

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