

Knowledge and Practices of Breastfeeding Mothers regarding Protective Measures for their Neonates against COVID-19

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Abstract

Background: Considering the benefits of breastfeeding and the role of breastfeeding in the transmission of COVID-19, the mother can continue breastfeeding, while applying the necessary protective measures. **Aim:** to assess knowledge and practices of breastfeeding mothers regarding protective measures for their neonates from COVID-19. **Design:** A descriptive correlational design. **Subject:** A convenient sample of 104 breastfeeding mothers and a purposive sample of their hospitalized neonates. **Setting:** The NICUs at Maternity and Gynecological Hospital and Children's Hospitals affiliated to Ain Shams University Hospital and Benha Specialized Pediatric Hospital affiliated to Ministry of Health and Population. **Tools:** (1) Interviewing Questionnaire contained 3 categories: Characteristics of the studied mothers, breastfeeding history of mothers, knowledge of mothers about COVID-19 & protective measures during breastfeeding, (2) Neonatal Medical Record included characteristics of the studied neonates (3) Observational Checklists regarding hand hygiene, wearing & removing face mask, respiratory hygiene, preventing coronavirus spread practices, breastfeeding practice and milk expression. **Results:** less than three quarters of studied mothers had unsatisfactory knowledge regarding protective measures of COVID-19 and more than half of them had unsatisfactory practices regarding protecting their neonates from COVID-19. **Conclusion:** Findings of present study concluded that there was a statistical significant relation between studied mothers' total knowledge and their education, age & job. Whereas, there was a statistical significant relation between their total practice and their educational level and there was a positive correlation between mothers' total knowledge and their total practice toward protective measures for their neonates against COVID-19. **Recommendations:** designing and implementing educational programs to improve mothers' knowledge and practices about protective measures of COVID-19 during breastfeeding their neonates.

Keywords: COVID-19, Protective measures, Breastfeeding, Mothers, Knowledge, Practices, Neonates.

Introduction:

Novel coronavirus infection is an infectious disease was named Coronavirus Disease 2019 (COVID-19) by the World Health Organization (WHO). In early December 2019, a number of pneumonia cases of unknown origin emerged in Wuhan, China. Then, COVID-19 spreads rapidly throughout China and has become a global pandemic. The disease has a strong human-to-human transmission (*Ma et al., 2020*).

Exclusive breastfeeding up to six months has incredible health benefits to the newborn and mother. It reduces the risk of newborn morbidity and mortality by reducing risk of contamination from formula milk and ensures proper early

mental and motor development. It has immunological and anti-inflammatory properties that protect both mother and newborn against various infections and diseases (*Rahman et al., 2020*).

Milk expression is safely and effectively achieved by both manual and mechanical methods and can be used to maintain milk supply in the event of separation from the infant. Both latch and an effective suckling pattern are keys. Milk removal, either via direct breastfeeding or expression, is essential for continuation of milk production (*Feldman-Winter et al., 2020*).

When lactating mother is COVID-19 positive and infant is negative, breastfeeding is

encouraged with measures taken to reduce infection as: mask wearing, hand washing, disinfection of surfaces, cleaning and sterilization of feeding equipment before and after use and breast washing with soap and water. When mother is healthy and infant is COVID-19 positive, the mother is encouraged to remain in quarantine with her infant and to continue breastfeeding (*Vassilopoulou et al., 2021*).

Neonatal nurses must explain the suitable interval between breast expression. The caregiver taking care of the newborn during mother isolation should be taught how to breastfeed the newborn and the principles of personal hygiene, including regular hand washing and Personal Protective Equipment (PPE). As neonatal symptoms of infection may be nonspecific or gastrointestinal disorders, so these symptoms should be taught to caregivers and parents. Parents should be informed about national screening, vaccination and routine visits programs during the COVID-19 pandemic (*Sighaldehy & Kalan, 2020*).

Strict precautions in Neonatal Intensive Care Units (NICUs) should be maintained by using PPE with social distancing measures in the neonatal wards to minimize staff exposure. Breaks should be spread out so colleagues do not eat or drink with each other. Asymptomatic contacts of this team member should be tested and self-isolation in these cases depends on unit policy (*De Rose et al., 2020*).

Significance of Study:

The COVID-19 is an urgent and rapidly spreading global public health threat. In December 2019, the first case of pneumonia caused by COVID-19 was reported in China. Since then, the disease has spread worldwide causing a pandemic (*Dimopoulou et al., 2020*).

The WHO announced the COVID-19 as a pandemic on March 7, 2020. As of April 21, 2020, COVID-19 has reached the entire world. It is a life-threatening condition that mainly involves the respiratory system as it can cause a wide range of symptoms from a common cold to severe respiratory distress. The other infectious conditions and immune disorders might increase

the risk of severe COVID-19 and death (*Mirbeyk & Rezaei et al., 2020*).

The risk of neonatal COVID-19 infection is low, while the consequences of not breastfeeding and separation between mother and newborn are significant. Neonatal COVID-19 represents a much lower threat to survival than other infections that breastfeeding is protective against. The benefits of breastfeeding to prevent infection and promote health and development are especially important with adherence to infection control measures to prevent transmission between COVID-19 suspected or confirmed mothers and their newborns (*Pereira et al., 2020*).

Since the beginning of COVID-19, a small number of neonatal cases have been reported worldwide. Data on the epidemiological and clinical features of COVID-19 in neonates are limited. Approximately 3% of neonates born to mothers with COVID-19 reportedly tested positive for SARS-CoV-2. Neonates with pre-existing medical conditions are at higher risk for developing severe COVID-19. The greatest perinatal concern is the possibility of vertical transmission (*Kim, 2021*).

Aim of the study:

To assess knowledge and practices of breastfeeding mothers regarding protective measures for their neonates from COVID-19.

Research question:

- What is knowledge of breastfeeding mothers regarding protective measures for their neonates from COVID-19?
- What are practices of breastfeeding mothers regarding protective measures for their neonates from COVID-19?
- Is there a relation between knowledge and practices about protective measures of breastfeeding mothers and their characteristics?

Subject and Methods

I. Technical design:

The technical design included research design, setting, subject and tools for data collection.

Research Design

A descriptive correlational design was utilized to assess knowledge and practices of breastfeeding mothers regarding protective measures for their neonates against COVID-

Study Settings

This study was conducted at the NICUs at Maternity and Gynecological Hospital and Children's Hospital affiliated to Ain Shams University Hospitals and Benha Specialized Pediatric Hospital affiliated to Ministry of Health and Population. The NICU of Maternity and Gynecological Hospital consisted of 3 rooms. These rooms contained 30 incubators, 15 ventilators and 30 phototherapy devices. There was a room for breastfeeding and milk expression.

The NICU of Children's Hospital affiliated to Ain Shams University Hospitals consisted of two units, the new building was for medical cases, it contained a large room consisted of 5 partitions, these partitions contained 18 incubators, 10 ventilators and 3 CPAPs and 15 phototherapy devices. There was a room for breastfeeding and milk expression. The old building was for surgical cases, it contained two rooms, one contained 3 incubators and the other one contained 5 incubators. These rooms contained 8 phototherapy devices, 7 ventilators and 1 CPAP. There was a room for breastfeeding and milk expression.

The NICU of Benha Specialized Pediatric Hospital consisted of two buildings, the first building was for medical cases, it contained two rooms, large one contained 28 incubators, 20 ventilators and 5 CPAPs and the small one contained 5 incubators for jaundice cases and 12 phototherapy devices. There was a room for breastfeeding and milk expression. The second one was for surgical cases, it contained two rooms, one contained 7 incubators and 7 ventilators and the other one contained 5 incubators and 7 ventilators. These rooms contained 4 phototherapy devices. There was a room for breastfeeding and milk expression.

Subject

- A convenient sample of breastfeeding mothers (n=104) from the previous mentioned study settings.
- A purposive sample of breastfeeding hospitalized neonates (n=104) in the previous mentioned study settings.

Inclusion criteria

- 1) Neonates who are in a stable condition.
- 2) Neonates whose gestational age was 37 weeks or more.
- 3) Neonates whose birth was 2500 grams or more.

Exclusion criteria

- 1) Mothers with suspected or confirmed diagnosis of COVID-19.
- 2) Neonates with gestational age less than 37 weeks.
- 3) Neonates with birth weight less than 2500 grams.

Data collection tools

First tool: Pre-designed Interviewing Questionnaire Format:

It was designed by the researcher after reviewing the related literature and was reviewed by supervisors. It was consisted of closed end questions and was written in an Arabic language for gathering data in relation to the following parts:

Part 1: Socio-demographic characteristics of mothers, it included: Age, level of education, employment status, residence, family size, previous COVID-19 infection and COVID-19 vaccination, (7 questions).

Part 2: History of mother about breastfeeding, it included: pervious breastfeeding, number of pervious breastfeeding per day, sufficiency of breast milk, causes of insufficient breast milk, pervious breastfeeding problems and weaning time of previous neonate, (8 questions).

Part 3:

A. Knowledge of mothers about COVID-19, it included: Definition, incubation period, pathogenesis, mode of transmission, signs and symptoms, diagnosis, and management and source of knowledge about COVID-19, (8 questions).

B. Knowledge of mothers about protective measures during breastfeeding, it included: transmission of COVID-19 through breastfeeding, possibility of COVID-19 confirmed or suspected mothers to breastfeed their neonates, avoiding kissing neonate during breastfeeding, transmission of COVID-19 antibodies from mother to neonate through breastfeeding, risks of breastfeeding cessation and separation between mothers and their neonates are significant and increasing neonate's immunity against COVID-19 through skin to skin contact of mother and neonate during breastfeeding, (6 questions).

❖ Scoring system:

The right answer was scored as a single point and the wrong answer was scored as a zero point. These scores were summed and converted into a percent score.

It was classified into 2 categories:

- Satisfactory, if score was $\geq 80\%$
- Unsatisfactory, if score was $< 80\%$

Second Tool: Neonatal Medical Record:

Concerning the characteristics of studied neonates, it included: Chronological age, gender, gestational age, birth weight, diagnosis, newborn ranking, hospitalization period, type of feeding, frequency of breastfeeding per day, type of milk used in incubator in case of mother's absence and period of breastfeeding per time, (11 questions).

Third Tool: Observational Checklists:

Breastfeeding mothers' practices regarding protective measures for their neonates from COVID-19:

It was adapted from (*World Health Organization (WHO), 2020 & Center for Disease Control and Prevention (CDC), 2020*) and used to assess practices of breastfeeding mothers regarding protective measures for their neonates from COVID-19 (6 observational checklists), including:

- Hand hygiene (8 steps).
- Wearing & removing face mask (9 steps).
- Respiratory hygiene (Cough etiquette), (4 steps).
- Preventing coronavirus spread practices as: (Avoiding touching face, social distancing, avoiding shaking hands & hugs, early seeking of medical care and disinfecting surfaces), (5 steps).
- Breastfeeding practice, (7 steps).
- Milk expression using breast pump, (6 steps).

❖ Scoring system:

The steps of each reported practice were distributed as **done** or **not done**. Each practice was scored as a single point for done and the wrong practice was scored as a zero point for incorrectly done or not done at all. These scores were summed and converted into a percent score.

According to practice of each subject, it was classified into 2 categories:

- Satisfactory, if score was $\geq 80\%$
- Unsatisfactory, if score was $< 80\%$

II. Operational Design:

Preparatory Phase:

The researcher reviewed the relevant and related literature using articles, journals, periodicals and textbooks for developing the data collection tools. During this phase, the researcher also visited the selected places to be acquainted with the personnel and the study settings. Development of the tools was under supervisors' guidance and experts' opinions were considered.

Content validity of the study tools:

Content validity was ascertained by three experts in pediatric Nursing Department, Faculty of Nursing, Ain Shams University to test its comprehensiveness, accuracy, clarity and relevance. New questions were added in mothers' knowledge, also some questions are removed.

Reliability of the study tools

It was conducted for the developed tool to achieve the criteria of trust-worthiness of the tool reliability. The test used for tool reliability was Cronbach alpha test and the result was:

- History (0.768) accepted reliability.
- Knowledge (0.833) good reliability.
- Practice (0.902) excellent reliability.

Pilot Study

A pilot study was carried out on 10% from the total sample (n = 10 mothers and their neonates) on a period of one week to evaluate reliability and applicability of the tools and to find the possible obstacles that might be faced during data collection. They were chosen randomly from the previously mentioned settings and excluded from the sample as some modifications occur in the form of adding new questions in mothers' knowledge and removing some questions.

Fieldwork

Data collection was started and finished at three months from the second week of July (2021) to the second week of October (2021). The researcher attended NICUs at Maternity and Gynecological Hospital and Children's Hospitals 2 days/ week (Saturday & Sunday) from 9 am to 4 pm and attended NICUs at Benha Specialized Pediatric Hospital 1day/ week (Monday), from 9 am to 4 pm. The researcher introduced herself and explained the purpose of the study to the breastfeeding mothers before starting the interview. The researcher distributed questionnaire to mothers who can read and write and read questions to illiterate mothers in order to collect the required data to assess knowledge of mothers regarding COVID-19 and protective measures during

breastfeeding. The researcher was available for any more clarifications.

The researcher assessed practices of mothers regarding protective measures of their neonates from COVID-19 during breastfeeding such as hand hygiene, wearing & removing face mask, respiratory hygiene (Cough etiquette), preventing coronavirus spread practices, breastfeeding practices and milk expression using breast pump according to scoring system. The tool was filled by the mother within 20-40 minute.

Ethical Consideration

- The research approval was obtained from the faculty Ethical Committee before starting the study.
- Verbal approval was obtained from mothers before inclusion in the study; a clear and simple explanation was given according to their level of understanding, physical and mental readiness.
- The studied mothers were secured that all the gathered data was confidential and used for research purpose only.
- The mother informed that they are allowed to choose to participate or not in the study and they have the right to withdraw from the study at any time.

III. Administrative Design

Approval was obtained through an issued letter from the Dean of Faculty of Nursing, Ain Shams University to the Director of each hospital.

IV. Statistical Analysis

Data collected from the studied sample was revised, coded and entered using Personal Computer (PC) using SPSS version. Computerized data entry and statistical analysis were fulfilled using the Statistical Package for Social Sciences (SPSS) version 22. Data were presented using descriptive statistics in the form of frequencies, percentages and Mean SD. The Chi Square statistic is commonly used for testing relationships between categorical variables. A correlation coefficient "Pearson correlation" is a numerical measure of some

type of correlation, meaning a statistical relationship between two variables.

Significance of the results:

P value >0.05 was considered insignificant.

Results:

Table (1): Shows that the age of more than half of the studied mothers (51.9%) ranged between 20 to less than 30 years old, less than half (45.2%) of them had secondary education, less than half (44.2%) of their family size was 5 individuals and less than one fifth (17.3%) of mothers had received COVID19 vaccine.

Figure (1): Regarding mothers' job, illustrates that less than two thirds (63%) of mothers were housewife, while rest of them were working.

Figure (2): illustrates that less than two thirds of mothers lived in urban areas, while rest of them lived in rural areas.

Figure (3): shows that more than two thirds (70.2%) of them were not previously infected with COVID-19, while rest of them were previously infected with COVID-19.

Table (2): Shows that nearly one third (32.7%) of the studied neonates had chorological age ranged between 7 to 14 days; the entire studied sample had gestational age ranged from 37 to 42 weeks. The entire of neonates' feeding type was breastfeeding and artificial feeding and half (50.0%) of them had twice breastfeeds /day.

Figure (4) illustrates that more than half (56.7%) of the studied neonates were females, while rest of them were males.

Figure (5) illustrated that less than three quarters (71.1%) of the studied neonates' birth weight was ranged from 2500 gr to less than 3500 grams.

Figure (6): Regarding newborns' diagnosis, illustrates that less than one third (32.7%) of neonates were diagnosed with jaundice.

Figure (7): Shows that less than three quarters (73.10%) of studied mothers had unsatisfactory knowledge regarding protective measures of COVID-19, while the rest of them had satisfactory knowledge regarding protective measures of COVID-19.

Figure (8): Illustrates that more than half (52.9%) of studied mothers had unsatisfactory practices regarding protecting their neonates from COVID19, while the rest of them had satisfactory practices regarding protecting their neonates from COVID19.

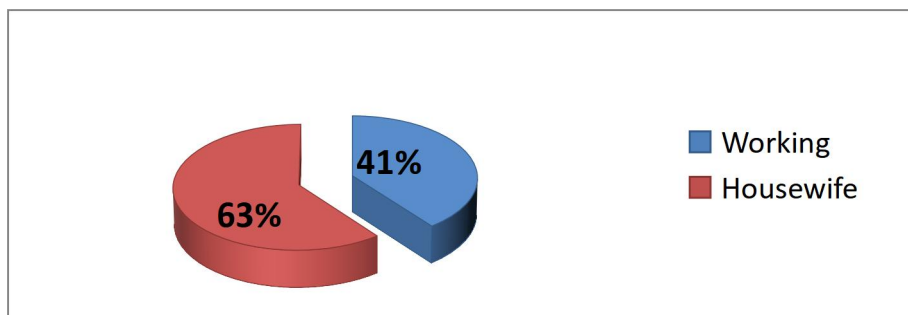
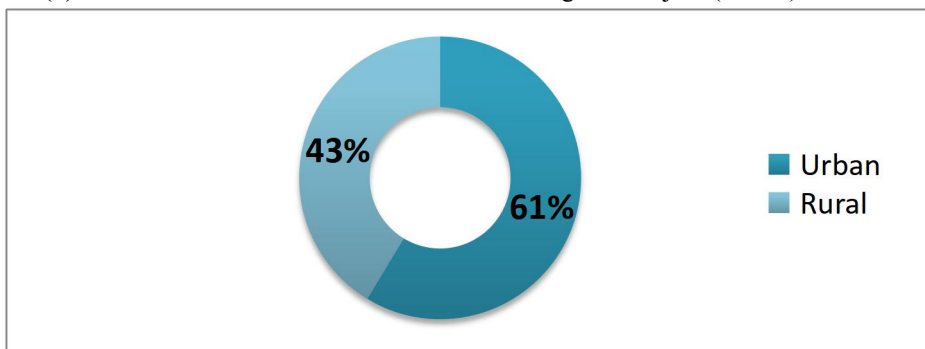
Table (3): Shows that there was high statistically significant relation between studied mothers' total knowledge and educational level at p (.001**), moreover, that there was statistically significant relation between studied mothers' total knowledge and age, the mothers' job at p (.024*, .021*) respectively.

Table (4): Presents that there was high statistically significant relation between studied mothers' total practice and educational level at p (.000**).

Table (5): Reveales a positive statistical correlation between total knowledge and total practice (r = 0,536).

Table (1): Distribution of the studied mothers according to their Socio-demographic characteristics (n= 104).

Characteristics	N	%
Age (Years)		
< 20	11	10.6
20 - < 30	54	51.9
30- < 40	30	28.8
≥ 40	9	8.7
	Mean± SD 30.14 ± 3.97	
Educational level		
Illiterate	7	6.7
Read and write	10	9.6
Basic education	15	14.4
Secondary education	47	45.2
University education	25	24.1
Family size		
3	19	18.3
4	32	30.8
5	46	44.2
≥ 6	7	6.7
COVID-19 vaccination		
Yes	18	17.3
No	86	82.7

**Figure (1):** Distribution of the studied mothers according to their job, (n=104).**Figure (2):** Distribution of the studied mothers according to the residence, (n=104).

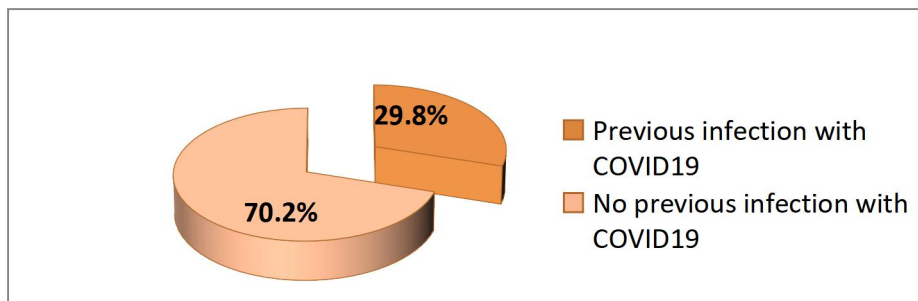


Figure (3): Distribution of the studied mothers according to their previous infection with COVID-19, (n=104).

Table (2): Distribution of the studied neonates according to their general characteristics (n= 104).

Items	N	%
Chorological age		
Less than 7 days	13	12.5
7 – 14 days	34	32.7
15-21 days	29	27.9
22-28 days	28	26.9
Gestational age		
37 – 42 weeks	104	100
More than 42 weeks	0	0
Newborn ranking		
First	19	18.3
Second	32	30.8
Three or more	53	50.9
Period of hospital stay		
1:5 days	69	66.3
6: 10 days	25	24.1
More than 10 days	10	9.6
Type of feeding		
Exclusive breastfeeding	0	0
Breastfeeding and artificial feeding	104	100
Frequency of breastfeeding / day		
1	35	33.7
2	52	50.0
≥ 3	17	16.3
Type of milk used when mother isn't attended		
Expressed breast milk	13	12.5
Bottle milk	91	87.5
Period of breastfeeding/ time		
5: 30 min	83	79.8
31: 60 min	21	20.2

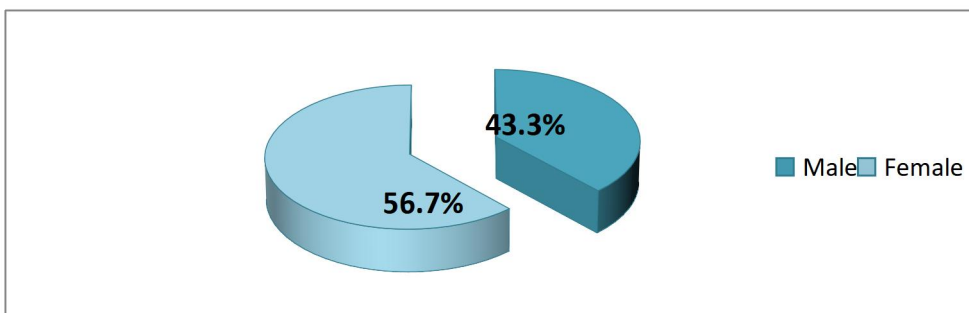


Figure (4): Distribution of the studied neonates according to their gender, (n=104).

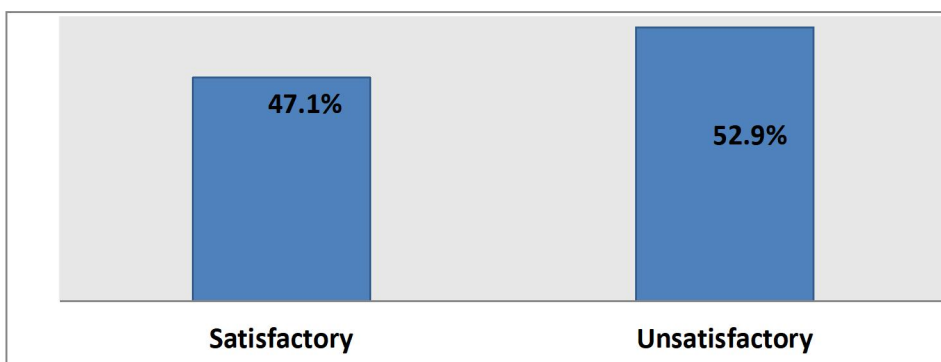


Figure (5): Distribution of the studied neonates according to their birth weight, (n=104)

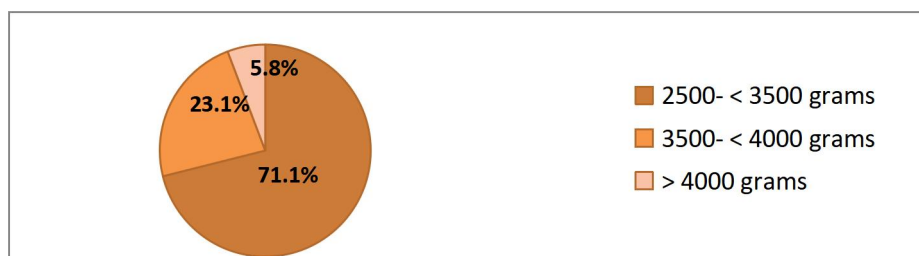


Figure (6): Distribution of the studied neonates according to their diagnosis, (n=104).

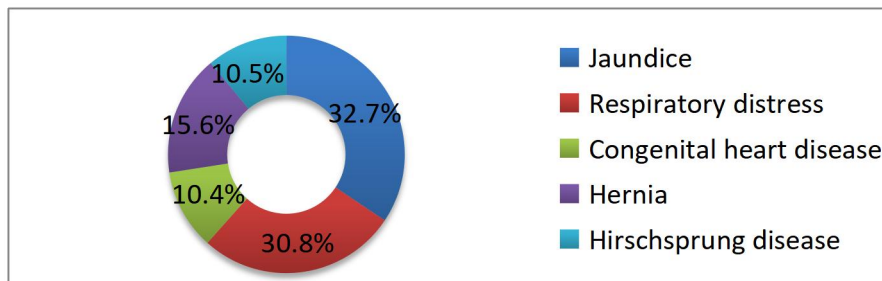


Figure (7): Distribution of the studied mothers according to their total knowledge regarding protective measures of COVID-19 during breastfeeding (n=104)

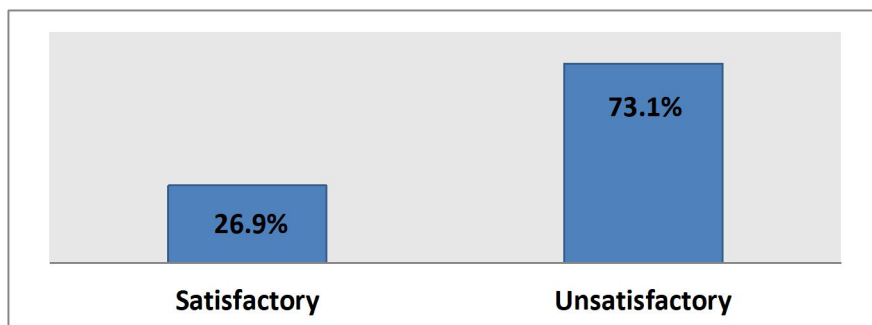


Figure (8): Distribution of the studied mothers according to their total practices regarding protective measures of COVID19 (n=104)

Table (3): Relationship between demographic characteristics of studied mothers and their total knowledge about COVID-19 (n=104).

Items	Total knowledge				X ²	P-Value	
	Satisfactory (n= 28)		Unsatisfactory (n=76)				
	N	%	N	%			
Age	< 20	0	0	11	14.5	18.83	.024*
	20 - < 30	3	10.7	51	67.1		
	30- < 40	20	71.4	10	13.1		
	≥ 40	5	17.9	4	5.3		
	Illiterate	0	0	7	9.2		
Educational level	Read and write	0	0	10	13.2	21.73	.001**
	Basic education	0	0	15	19.7		
	Secondary education	7	25.0	40	52.6		
	University education	21	75.0	4	4.3		
The mother's job	Working	23	81.1	18	23.7	19.39	.021*
	Housewife	5	17.9	58	76.3		
Residence	Urban	16	57.1	45	59.2	6.241	.131
	Rural	12	42.9	31	40.8		
Family number	3	7	25.0	12	15.8	5.339	.122
	4	13	46.4	19	25.0		
	5	6	21.5	40	52.6		
	≥ 6	2	7.1	5	6.6		
Previous infection with COVID-19	Yes	26	92.9	5	6.6	24.89	.000**
	No	2	7.1	71	93.4		
COVID 19 vaccination	Yes	15	53.6	3	3.9	8.904	0.02*
	No	13	46.4	73	96.1		

*Significant at p <0.05. **Highly significant at p <0.01. Not significant at p>0.05

Table (4): Relationship between demographic characteristics of studied mothers and their total practice regarding protective measures of COVID19 (n=104).

Items	Total Practice				X ²	P-Value	
	Satisfactory (n=44)		Unsatisfactory (n=60)				
	N	%	N	%			
Age	< 20	2	4.5	9	15.0	7.992	0.023*
	20 - < 30	4	9.1	50	83.3		
	30- < 40	30	68.2	0	0		
	≥ 40	8	18.2	1	1.7		
	Illiterate	0	0	7	11.6		
Educational level	Read and write	0	0	10	16.7	22.98	.000**
	Basic education	2	4.5	13	21.7		
	Secondary education	17	38.6	30	50.0		
	University education	25	56.9	0	0		
The mother's job	Working	16	36.4	25	41.7	5.952	.128
	Housewife	28	63.6	35	58.3		
Residence	Urban	36	81.8	25	41.7	8.430	0.023*
	Rural	8	18.2	35	58.3		
Family size	3	1	2.3	18	30.0	21.36	.001**
	4	4	9.1	28	46.7		
	5	32	72.7	14	23.3		
	≥ 6	7	15.9	0	0		
Infected with COVID-19 previously	Yes	30	68.2	1	1.7	23.44	.000**
	No	14	31.8	59	98.3		
COVID-19 vaccination	Yes	15	34.1	3	5.0	9.170	0.012*
	No	29	65.9	57	95.0		

*Significant at $p < 0.05$. **Highly significant at $p < 0.01$. Not significant at $p > 0.05$

Table (5): Correlation between total knowledge and total practice of mother (n= 104)

Items	Total Practice
Total knowledge	r. 0.536 P. .000**

(**) Statistically significant at $p < 0.01$. r Pearson correlation

Discussion:

Concerning Socio-demographic characteristics of the studied mothers, the current study revealed that more than half of the studied mothers are in the age group from 20 to less than 30 years, (table 1). This result was not in agreement with the **Brown & Shenker, (2021)** who studied "Experiences of breastfeeding during COVID-19: Lessons for future practical and emotional support" and reported that, more than third of the mothers was aged between 30 and 34 years. In addition, this result was disagreed with (**Jayasudha et al., 2021**).

Who studied "Effectiveness of Self Instructional Module on Knowledge Regarding Breastfeeding Safety During COVID-19 Among Postnatal Mothers in a Selected Tertiary Care Hospital, Coimbatore" and cleared that, more than half of the mothers' age was ranged from 24 to 29 years.

In relation to mothers' education, the current study showed that less than half of their education was secondary. This finding was agreed with **Latorre et al., (2021)**, who studied "Impact of COVID-19 pandemic lockdown on exclusive breastfeeding in non-infected mothers" and found

that, more than half of the mothers' education was secondary. Moreover, this finding was incongruent with **Kahn et al., (2021)**, who studied "Infant sleep during COVID-19: Longitudinal analysis of infants of US mothers in home confinement versus working as usual" and found that, nearly half of the mothers' education was college degree.

According to the family size, the current study revealed that less than half of the studied mothers had five family members. This result was contradicting with **Dessu et al., (2020)** who studied "The Kaplan Meier estimates of mortality and its predictors among newborns admitted with low birth weight at public hospitals in Ethiopia" and found that, less than half of mothers had less than four family members.

Concerning receiving COVID-19 vaccination, the current study revealed that less than one fifth of the studied mothers had received COVID-19 vaccine. This result was in agreement with **Sutton et al., (2021)** who studied "COVID-19 vaccine acceptance among pregnant, breastfeeding, and non-pregnant reproductive-aged women" and reported that, less than fifth of the studied mothers were already vaccinated against COVID-19. The researcher point of view that could be due to the fear of breastfeeding mothers regarding myths of COVID-19 vaccine during breastfeeding. In addition, the COVID-19 vaccine had not been obligatory in the Egyptian community yet.

Concerning mothers' job, the current study showed that less than two thirds of the studied mothers were housewife, (**figure 1**). This result was contradicting with **Piankusol et al., (2021)**, who studied "Factors Affecting Breastfeeding Practices under Lockdown during the COVID-19 Pandemic in Thailand: A Cross-Sectional Survey" and highlighted that, more than two thirds of the mothers were employed. Moreover, this result was disagreed with **Zanardo et al., (2021)**, who studied "Infant feeding initiation practices in the context of COVID-19 lockdown" and found that, more than three fourths of the mothers were working. This could be due to the culture of the mothers in the Egyptian community which prefers

the mothers to stay at home to care for their children.

Regarding mothers' residence, the current study showed that less than two thirds of the studied mothers were lived in urban areas, (**figure 2**). This result was consistent with **Mose, (2021)**, who studied "Willingness to Receive COVID-19 Vaccine and Its Determinant Factors among Lactating Mothers in Ethiopia: A Cross-Sectional Study" and reported that, more than half of the studied mothers were lived in urban areas. In addition, the current finding was matched with **Mustefa, (2020)**, who studied "Prevalence of neonatal sepsis and associated factors amongst neonates admitted in arbaminch general hospital, arbaminch, southern Ethiopia, 2019" and reported that, more than half of the studied mothers were lived in urban areas.

Concerning mothers' previous infection with COVID-19, the current study revealed that more than two thirds of the studied mothers were not previously infected with COVID-19, (**figure 3**). This result was matched with **Beheshti et al., (2021)**, who studied "Predictors of breastfeeding self-efficacy during the covid-19 pandemic" and found that, more than two thirds of the studied mothers were not previously infected with COVID-19. On the opposite side, this result was inconsistent with **Bertrand, et al., (2021)**, who studied "Maternal and Child Outcomes Reported by Breastfeeding Women Following Messenger RNA COVID-19 Vaccination" and reported that, less than fifth of the studied mothers were not previously infected with COVID-19.

Concerning the characteristics of the studied neonates, the current study revealed that, nearly one third of the studied neonates' chorological age was ranged from 7 to 14 days, (**table 2**). This result was in contrast with the result of **Mohagheghi et al., (2021)**, who studied "Epidemiological Features of Neonates With COVID-19 Infection in Iran" and cleared that more than half of the studied neonates had age was ranged from 1 to 6 days. Moreover, This result was in contrast with the result of **Dessu et al., (2018)**, who studied "Survival Status and Predictors of Neonatal Mortality among Neonates Who were Admitted in Neonatal Intensive Care

Unit at Arba Minch General Hospital, Southern Ethiopia which” and found that more than two thirds of the studied neonates age was less or equal to 1 day.

Regarding the gestational age of the studied neonates, the current study showed that, the entire studied neonates had gestational age was ranged from 37 to 42 weeks. This result was agreed with the result of **Salvatore et al., (2020)**, who studied “Neonatal management and outcomes during the COVID-19 pandemic: an observation cohort study” and reported that more than three fourths of the studied neonates had gestational age ranged from 37 to 42 weeks. In addition, this result was matched with the result of **Kaushal et al., (2021)**, who studied “Rooming in and Breast Feeding Practices and Rate of Horizontal Transmission of SARS-CoV-2 Virus in 5 UAE Hospitals—An Observational Study” and reported that about fourth of the studied neonates had gestational age was 37 weeks or more.

Concerning type of feeding, the current study revealed that the entire neonates were received breastfeeding and artificial feeding. This result was inconsistent with **Sánchez-Luna et al., (2021)**, who studied “Neonates Born to Mothers With COVID-19: Data From the Spanish Society of Neonatology Registry” and reported that, more than half of neonates were received breastfeeding. Moreover, this result was inconsistent with **Oncel et al., (2021)**, who studied “A multicenter study on epidemiological and clinical characteristics of 125 newborns born to women infected with COVID-19 by Turkish Neonatal Society” and cleared that, more than half of neonates were received formula feeding. The researcher point of view that could be due to insufficiency of mothers’ expressed milk, reduced breastfeeding times/day and far distance between their residence and hospital.

Concerning neonates’ frequency of breastfeeding/ day, the current study revealed that half of them had twice breastfeeds /day. This result was disagreed with **Tahiru et al., (2020)**, who studied “Exclusive Breastfeeding and Associated Factors among Mothers with Twins in the Tamale Metropolis” and reported that, more than half of them had 8-12 breastfeeds /day. This

could be due to far distance between mothers’ residence and hospital.

As regards neonates’ gender, the current study revealed that more than half of the studied neonates were females, (**figure 4**). This result was agreed with **Angelidou et al., (2021)**, who studied “Association of Maternal Perinatal SARS-CoV-2 Infection With Neonatal Outcomes During the COVID-19 Pandemic in Massachusetts” and reported that, more than half of the neonates were females. On the other hand, this result was disagreed with **Tigka et al., (2022)**, who studied “Frequency and Determinants of Breastfeeding in Greece: A Prospective Cohort Study during the COVID-19 Pandemic” and reported that, more than half of the neonates were males.

Concerning neonates’ birth weight, the current study revealed that more than two thirds of them had birth weight ranged from 2500 to 3500 grams, (**figure 5**). This result was consistent with **Robinson et al., (2021)**, who studied Thrombosis in infants in the neonatal intensive care unit: Analysis of a large national database and reported that, more than third of them had birth weight ranged from 2500 to 3499 grams. On the other side, this result was inconsistent with **Tigka et al., (2022)**, who studied “Frequency and Determinants of Breastfeeding in Greece: A Prospective Cohort Study during the COVID-19 Pandemic” and reported that, more than three quarters of them had birth weight less than 2500 grams.

As regard neonates’ diagnosis, the current study revealed that less than one third of the studied neonates were diagnosed with jaundice, (**figure 6**). This result was consistent with **Malik et al., (2021)**, who studied “Clinical Characteristics, Management, and Short-Term Outcome of Neonates Born to Mothers with COVID-19 in a Tertiary Care Hospital in India” and reported that, less than one third of the neonates were diagnosed as hyperbilirubinemia. On the other hand, this result was inconsistent with **Gunes et al., (2021)**, who studied “Effects of COVID-19 pandemic on breastfeeding rates in a neonatal intensive care unit” and found that, less than one third of the studied neonates were diagnosed with congenital pneumonia.

Concerning the total knowledge of the studied mothers regarding protective measures of COVID-19, the current study showed that, less than three quarters of studied mothers had unsatisfactory knowledge regarding protective measures of COVID-19, (**figure 7**). This finding was matched with **Shahin et al., (2019)**, who studied “Effect of structured postpartum nursing intervention involving COVID-19 precautions on mother's knowledge, practice, fear level and neonatal care” and found that, the majority of mothers had unsatisfactory knowledge in pre intervention regarding COVID-19 precautions. On the other side, this finding was not supported by **Khaton, (2021)** who studied “Awareness and Practices of Rural Mothers Regarding COVID-19 Prevention and their Role in protecting their Families” and reported that, more than half of studied mothers had good knowledge regarding protective measures of COVID-19.

The researcher point of view that this deficit may be due to that mothers were not aware of scientific nature of COVID-19 as it was a newly pandemic disease and the majority of them were housewives.

Regarding the total practices of the studied mothers regarding protective measures of COVID-19, the current study showed that, more than half of studied mothers had unsatisfactory practices regarding protecting their neonates from COVID19, (**figure 8**).The current finding was supported by **El-Ghany et al., (2022)**, who studied “Effect of Precaution Guidelines on Breast Feeding Women during COVID -19 Pandemic in Beni Suef City” and found that, more than half of studied mothers had pre-intervention unsatisfactory practices regarding protective measures of COVID-19. On the opposite side this finding was disagreed with **Khaton, (2021)** who reported that, more than half of the studied mothers had satisfactory practices regarding COVID-19 prevention.

Concerning the relation between the studied mothers' total knowledge about COVID-19 and their age, the findings of the present study shows that there was a statistically significant relation between studied mothers' total knowledge and their age, (**table 3**). This finding was

supported by **Tawfique et al., (2021)**, who found that there was a statistical significant relation between studied mothers' total knowledge and their age.

The current study showed that there was high statistically significant relation between studied mothers' total knowledge and their educational level. Moreover, there was statistically significant relation between studied mothers' total knowledge and their job. These findings were supported by **Abusaad & Algilany, (2022)** who studied “Predictors of Breastfed Mother's knowledge, Attitude and Practice during COVID-19 Pandemic” and mentioned that there are significant positive relations between mothers' COVID-19 knowledge and their education and job.

It is possible that secondary educated and housewife mothers had low opportunities to stay informed with the updated information about COVID-19 prevention and control via various medium channels and workplace.

Concerning the relation between age of studied mothers and their total practice about COVID-19, the present study showed that there was a high statistically significant relation between studied mothers' total practice and educational level, (**table 4**). This finding was supported by **Mohammed Khalil & Mohamed, (2020)**, who studied “Knowledge, Attitude, and Practices of Mothers towards Children Immunization during COVID-19 Pandemic” and mentioned that there was a statistical significant relation between studied mothers' total practice and their education.

Concerning the correlation between studied mothers' total knowledge and their total practice, the current study showed that there was a positive statistical correlation between the mothers' total knowledge and total practice, (**table 5**). The current finding was supported by **Shahin et al., (2019)**, who studied “Effect of structured postpartum nursing intervention involving COVID-19 precautions on mother's knowledge, practice, fear level and neonatal care” and reported that, there was a positive statistical correlation between mother's

knowledge of COVID-19 precautions and practice at post intervention.

This may be due to positive correlation between mothers' total knowledge and their total practice, where decreased knowledge lead to decreased level of practice about COVID-19, its associated serious consequences so their level of practice regarding preventive measures of COVID-19 was decreased.

Conclusion:

Based on the results of the present study, it can be concluded that, less than three quarters thirds of studied mothers had unsatisfactory knowledge regarding protective measures of COVID-19. Also, more than half of studied mothers had unsatisfactory practices regarding protecting their neonates from COVID19. Meanwhile, there was a high statistically significant relation between studied mothers' total knowledge and their educational level and a statistically significant relation between studied mothers' total knowledge and their age & job. In addition, there was a high statistically significant relation between studied mothers' total practice and their educational level. There was a positive statistical correlation between mothers' total knowledge and their total practices.

Recommendations:

Based on the findings of the present study, the following recommendations made:

- Designing and implementing educational programs to improve mothers' knowledge and practices about protective measures of COVID19 during breastfeeding their neonates.
- Conducting the study in different settings such as outpatient clinics.
- Conducting similar studies on mothers of children with various ages.
- Brochures and posters must be available in NICUs about precautions and protective measures to prevent spread of Coronavirus in neonates.
- Conducting the study on a large number of mothers and caregivers.
- Conducting future research to assess the awareness of neonatology nurses about

protective measures of COVID19 during breastfeeding neonates.

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