

Effect of Electronic-Based Instructions Guide on Supporting Mothers of Preterm Infants Regarding Safe Breastfeeding during Covid-19 Pandemic

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Abstract

Background: Breastfeeding is the best choice for preterm infant feeding. Supporting mothers during Covid-19 requires innovative electronic methods for delivery of health education and protective measures for safe breastfeeding. **Aim of the study** to evaluate the effect of an electronic-based instruction guide for supporting mothers regarding safe breastfeeding of their preterm infants during Covid-19 pandemic based on mothers' breastfeeding perception, self-efficacy, safety measures practices, breastfeeding technique, and attitude. **Design:** A quasi-experimental research design was conducted on 100 participating mothers of preterm infants. **Settings:** The study was carried out at neonatal care unit and breastfeeding clinic in obstetric and gynecological hospital affiliated to Ain Shams University. **Tools:** Data was collected using 1) An Interview Questionnaire Format to assess mothers' demographic characteristics and their breastfeeding perception; 2) Breastfeeding Self-Efficacy Scale-Short Form; 3) Observational checklist of Safety Measures Practices of Breastfeeding, 4) The Bristol Breastfeeding Assessment Tool and 5) The Iowa Infant Feeding Attitude Scale. **The Results** highlighted most of mothers were improved their mean scores of breastfeeding perception, self-efficacy, safety measures practices, breastfeeding technique, and attitude with statistically significant differences pre, post applying electronic-based instruction guide (t-test =34.887, 17.388, 42.52, 4.172 and 17.886 respectively at P- value= <0.001). The results also revealed a positive correlation between mother's self-efficacy with their attitude post applying electronic-based instruction guide (r = 0.642 at P- value= <0.01). **Conclusion:** the electronic-based instruction guide had a significant positive change in mothers' breastfeeding perception, self-efficacy, safety measures practices, breastfeeding technique, and attitude regarding safe breastfeeding of their preterm infants during Covid-19 pandemic. **Recommendation:** Adopting electronic-based instruction as a method for supporting breastfeeding mothers of preterm infants during Covid-19.

Keywords: Electronic-Based Instructions Guide, Safe, Breastfeeding, Mothers, Preterm infants, Covid-19.

Introduction:

In the last of the year 2019, the Covid-19 was acknowledged as a global pandemic that affects the world's life (Davanzo et al., 2020; Zhu et al., 2020). The virus transmitted by respiratory and droplet infection in close contact with the infected person. The World Health Organization (WHO), (2020a) has declared protective measures to combat the spread of the virus around the world by implementation of lockdowns, and social distancing (Ceulemans et al., 2020). These measures have resulted in the separation of mothers and their preterm infants, particularly in cases of confirmed Covid-19 positive infection, preventing mother-infant attachment which negatively impact both mothers

and infants, families, community, and economic status (Caparros-Gonzalez, and Alderdice, 2020).

Breast milk is an essential and primary infant's nutrition that supplies preterm infants with required food for optimal growth, neurodevelopment, and immunity (Johnston et al., 2012). It prevents problems association with prematurity (e.g., necrotizing enterocolitis, chronic lung conditions, retinopathy, and infection) (Parker and Patel, 2017; Thai and Gregory, 2020).

During Covid-19 pandemic, increased social distancing, lockdown restrictions, limited mother's visits to Neonatal Intensive Care Units

(NICU) has interrupted mothers' lactation support, reduced skin to-skin contact and may even lead to the cessation of breastfeeding. As result, the mother is psychologically negatively affected as well as her feeding process. Disruption of breastfeeding leads to a drop in maternal milk production, refusal of the infant to breastfeed, and deprivation of protective immune factors contained in breast milk **(Brown and Shenker, 2021)**.

According to the WHO guidelines (2020a) asserted that the importance of breastfeeding even the mother is infected. The mother can wash her hands before breastfeeding or expressing human milk, wearing a face mask while breastfeeding, avoid talking or coughing during feeding and clean the breast pump after use. The surfaces of the equipment used for milk expression must be disinfected with 70% alcohol, washed, and milk expression equipment boiled for 15 minutes **(Mocelin et al., 2020)**.

Mothers with suspected covid-19 infection might have a doubt about feeding their infant breast milk, they along with their family and health care professionals, should decide whether and how to start or continue breastfeeding. Mothers with Covid-19 infection have high amounts of antibodies in their breast milk. Fresh "not frozen" milk contains active immune bodies giving the most protection **(Ceulemans et al., 2020)**. These guidelines aimed to limit contact and improving breastfeeding while keeping appropriate social distance **(Ezenwa et al., 2020)**. Neonatal nurses should balance the primary needs of infants with infection control measures **(Tscherning et al., 2020)**.

Supporting breastfeeding mothers is critical for promoting healthy child development in the face of stressors, such as those occurring during Covid-19 pandemic. Planning and supporting breastfeeding mothers within the current pandemic require two areas including the clinical characteristics of Covid-19 and practicing of skin-to-skin care **(Lubbe, et al., 2020)**. The application of health education programs greatly contributes to promoting maternal breastfeeding perception, attitude, and practice **(Seyyedi et al., 2021)**.

Breastfeeding self-efficacy is defined as the mother's confidence and own capability to breastfeed her infant and it is one of the factors

affecting the initiation and continuation of breastfeeding. Mothers of preterm infants encounter several breastfeeding challenges during Covid-19 pandemic, including maternal intention to breastfeed, knowledge deficiency, and little confidence in possessing safely breastfeeding skills **(Jasny et al., 2019)**. Physical, mental, and social conditions are among the factors that affect the self-efficacy of breastfeeding mothers, and it is also affected by other factors such as level of education, social support, mother's breastfeeding skills, the method adopted by mother to feed her infant and the level of anxiety **(Zhou et al., 2020)**.

Electronic interventions were more effective in promoting breastfeeding when compared with traditional face-to-face. These interventions may vary in forms of message prompts, multimedia files, computer programs, to online websites. In addition, mobile applications and social media have become a popular platform used to support breastfeeding **(Wang et al., 2018)**. However, the technological revolution of conducting healthcare, including the advancement and acceptance of telehealth during pandemic. Advances and availability of smartphones, and the internet have facilitated telehealth and accelerated by the Covid-19 pandemic **(Bashshur et al., 2020)**.

The innovation of technology has opened new outlook in the health field such as educating the mothers with saving time, effort and money as well as keeping social distance. Therefore, applying electronic-based instruction guide through mobile is an effective method at the time of Covid-19 **(McKay et al., 2018; Heller et al., 2021)**.

Significance of the study:

According to the Lancet Series breastfeeding support contributes to a 11.6% reduction in Infant Mortality Rate (IMR), and it reduces the risk of dying from diarrheal diseases and pneumonia. There is an inverse relationship between exclusive breastfeeding and IMR in developing countries **(Azaine et al., 2015)**. Based on the recommendations of WHO, (2021b), the importance of continuing breastfeeding even if the mother is infected or suspected. Recent studies have shown that the expressed breast milk of mothers with Covid-19 is safe for their infants **(Pandey et al., 2021)**.

The development of online groups has strengthened communication for delivery of health-related information between nurses and mothers of preterm infants which are innovations that should be continued after the pandemic ends. Covid-19 pandemic can increase the awareness of healthcare specialists about the importance of active engagement of mothers in the primary care of their hospitalized preterm infants especially the development in the health care services to digitalization process (Cena et al., 2021). Therefore, application of electronic-based instructions guide via mobile applications has been used in this study to support mothers of preterm infants regarding safe breastfeeding during Covid-19 pandemic, because it improves mothers breastfeeding perception, self-efficacy, practice, and attitude.

Aim of the study:

The aim of this study is to evaluate the effect of an electronic-based instruction guide for supporting mothers regarding safe breastfeeding for their preterm infants during Covid-19 pandemic based on breastfeeding perception, self-efficacy, safety measures practices, breastfeeding technique, and attitude.

The study objectives:

1. Assessing mothers' perception, self-efficacy, safety measures practices, breastfeeding technique, and attitude regarding safe breastfeeding for their preterm infants during covid-19 pandemic.

2. Developing and implementing an electronic-based instructions guide according to actual needs assessment of mothers.

3. Evaluate the beneficial effect of an electronic-based instructions guide on mothers' perception, self-efficacy, safety measures practices, breastfeeding technique, and attitude regarding safe breastfeeding for their preterm infants during covid-19 pandemic.

Research Hypothesis:

Implementation of the electronic based instruction guide would improve mothers' breastfeeding perception, self-efficacy, safety measures practices during breastfeeding, breastfeeding practice, and positive attitude regarding safe breastfeeding of their preterm infants during covid-19 pandemic.

Operational Definitions:

- **Safe breastfeeding:** is the application of Covid-19 safety measures during breastfeeding that approved from WHO (2020b).

Study Tools:

- **Perception:** is the recognition and explanation of experience to understand the information.

- **Self-efficacy:** is the ability and confidence to perform a desired task.

Subject & Methods

Research Design:

A quasi-experiment research design was conducted (One group of pre-post) to evaluate the effect of independent variable which is an electronic-based instructions guide on the dependent variables, including mothers' perception, self-efficacy, safety measures practices, breastfeeding technique, and attitude regarding safe breastfeeding for their preterm infants during covid-19 pandemic.

Settings:

The study was conducted at NICU and breastfeeding clinic at obstetric and gynecological hospital affiliated to Ain Shams University, which was considered one of the well-equipped university hospitals with high rate of preterm infants' admission in Cairo.

- The NICU includes 3 main rooms for admission of high risk and preterm neonates and two isolation rooms for those with a serious infection and one area for breastfeeding.

- The breastfeeding clinic is located on the second floor of the gynecological outpatient clinic building and receives mothers from 10.00 am to 1.00 pm. It provides breastfeeding counselling and advice for mothers by breastfeeding counsellors specialist.

Research subjects

A purposive sample composed of 100 mothers of preterm infants were selected based on specific inclusion criteria: mothers of stable preterm infants, were have smart phones with installed WhatsApp, able to use the application and Internet. Mothers who met the selection criteria were randomly selected by the computer from a list of admitted preterm infants according to the total number of preterm infants who admitted in the past three months from August to October 2020 were 107 infants. Estimation of sample size was done by the following equation.

$$n = \frac{N * [Z^2 * p * (1-p)/e^2]}{[N - 1 + (Z^2 * p * (1-p)/e^2)]}$$

N= population size.

e = margin of error at 5% (standard value of 0.05).

z = z score (confidence level at 95% (standard value of 1.96).

p = estimated prevalence of preterm infants.

Data was collected by using the following four tools and they were translated into simplified Arabic language by a language expert:

Tool (I): An Interview Questionnaire Format (pre/post):

It was developed by researchers in the light of relevant literature Costantini et al., (2021). It included three parts:

- Part (1): concerned with demographic characteristics of studied mothers as regards their age, level of education, employment status, parity, birth order, residence, previous history of covid-19 infection, and total hours of mobile phone used per day.

- Part (2): included data regarding received breastfeeding support during Covid-19 in the form of closed ended questions as regarded received information about safety precautions of breastfeeding and main sources of breastfeeding information during Covid-19 pandemic.

- Part (3): comprised of mothers' perception regarding safe breastfeeding adopted from WHO (2020a). It included 11 questions regarding "breastfeeding protection, skin-to-skin contact, immune system support, breastfeeding continuation, hand hygiene, respiratory hygiene, cleaning & disinfection for surfaces, human milk expression, and relactation after recovery". The researchers excluded two items: "wet nursing, and breastmilk donors" (because they weren't applicable). All items are rated on a 3-point Likert scale, ranging from 1 (disagree), 2 (unsure) to 3 (agree). The overall total scores range from 9 - 27, with higher scores reflecting a high level of breastfeeding perception.

Scoring system:

0- 9 = Low breastfeeding perception.

10-18 = Moderate breastfeeding perception.

19- 27 = High breastfeeding perception.

Tool (II): Breastfeeding Self-Efficacy Scale-Short Form (BSES-SF) (pre/post):

It was adopted from Brandão et al., (2018). It included 14 self-reported questions to assess mothers breastfeeding self-efficacy (see table 5). By using a 5-point Likert scale "1= not at all confident, 2= not confident, 3= unsure, 4= confident and 5=always confident". The total

overall scores ranged from 14-70 with higher scores indicating a high level of self-efficacy.

Scoring system:

0- 14 = Low breastfeeding self-efficacy.

15-42 = Moderate breastfeeding self-efficacy.

43-70 = High breastfeeding self-efficacy.

Tool (III): Observational checklist of Safety Measures Practices of Breastfeeding (pre/post):

It was adapted from WHO (2020b), to assess mothers' practice regarding applying of safety measures during breastfeeding as regards hand hygiene, washing breast, wearing, and removing of face mask, respiratory etiquette, surface cleaning & disinfection, and handling & disinfection of milk expression equipment.

Checklist	steps/ score
Hand hygiene	8
Washing breast	4
Wearing and removing of face mask	9
Respiratory etiquette	4
Surface cleaning & disinfection	5
Handling & disinfection of milk expression equipment	5
Total overall score	35

Scoring system:

Each step of practice was scored one if it was done correctly and zero if not done or done incorrectly. The total scores of steps are summed and converted to percentages and presented two categories:

Satisfactory = if total score < 60%

Unsatisfactory = if total score > 60%

Tool (IV): The Bristol Breastfeeding Assessment Tool (BBAT) (pre/post):

It was adopted by Ingram et al., (2015) to assess mothers' breastfeeding technique. It is a 2-point Likert scale composed of 5 items of "positioning," "Grasping/ Attachment," "Sucking" "Swallowing" and "Comfort". Each item scored as "0 = poor, 1= moderate, and 2 = good". The total score is 8. A lower score indicates unsuccessful breastfeeding practice, and the higher scores signify successful breastfeeding.

Items	Description	Poor 0	Moderate 1	Good 2
1. "Positioning"	"The infant is well supported, resting on or adjacent to the mother's body; The baby is lying on its side/the head is not bent; The nose is facing the nipple; The mother knows how to hold/grasp the infant"	"None or very few of the criteria have been met"	"Some of the criteria have been met"	"All of the criteria have been met"
2. "Grasping /Attachment"	"There is a searching reflex; The mouth is open wide; The baby has successfully latched onto an adequate amount of the breast tissue; the baby is well attached throughout the feeding."	"The baby is unable to attach to the breast or the attachment is inadequate None or very few of the criteria have been met"	"Some of the criteria have been met"	"All of the criteria have been met"
3. "Sucking"	"An effective cycle of sucking is achieved on both breasts (initially rapid sucking followed by slow sucking with pauses); The infant ends the feeding"	"There is no effective sucking; no sucking cycle"	"There is some effective sucking; no satisfying sucking; the baby is on and off the breast"	"An effective sucking cycle is achieved"
4. "Swallowing"	"There is audible, regular soft swallowing. No clicking sounds"	"No sound of swallowing/gulping. No sound of clicking"	"Intermittent sounds of swallowing/ gulping. Some swallowing/ gulping is noisy or accompanied by clicks"	"There is regularly audible, quiet swallowing/ gulping"
5. "Comfort"	"Mother reports breasts and nipples comfortable; no visible damage. This combination of mother report with visible inspection of the nipples"	"Mother reported severe discomfort and there was moderate or severe nipple damage visible."	"Mother reported some discomfort and there was some damage or soreness to the nipple visible."	"Mothers reported complete comfort with no obvious damage."

Scoring system:

0- 5 = Successful breastfeeding practice.

6-10 = Unsuccessful breastfeeding practice.

Tool (IV): The Iowa Infant Feeding Attitude Scale (IIFAS) (pre/post):

It was adopted De la Mora and Russell, (1999). It included 17 questions to assess mothers breastfeeding Attitude (see table 6). By using a 5-point Likert scale "1= strongly disagree, 2= not agree, 3= unsure, 4= agree and 5=strongly agree". The items 1, 2, 4, 6, 8, 10, 11, 14, 17 were reverse scored. The total score was 5-85 with higher scores indicating a more positive breastfeeding attitude.

Scoring system:

0- 40 = Positive breastfeeding attitude.

41-85 = Negative breastfeeding attitude.

Validity & Reliability

Content validity was done by a jury committee of three experts professors of pediatric nursing and medicine from Ain Shams University to audit the study tools. The committee expressed their opinion of only adding The Bristol Breastfeeding Assessment Tool to assess mother's breastfeeding technique. Cronbach's alpha test was used to test the reliability of the tools.

Tool	Cronbach's alpha test score
1. A Structured Questionnaire Format	0.87
2. Breastfeeding Self-Efficacy Scale-Short Form (BSES-SF)	0.84
3. The Bristol Breastfeeding Assessment Tool (BBAT)	0.82
4. Observational checklist of Safety Measures Practices of Breastfeeding	0.92
5. The Iowa Infant Feeding Attitude Scale (IIFAS) (BSES-SF)	0.86

Ethical Considerations:

Ethical approval was granted from the Ethical Committee of the Faculty of Nursing, Modern/ University for Technology, and Information (MTI), Egypt with a formal approval code (FAN/7/2020). An agreement letter was obtained from the director of the obstetric and

gynecological hospital to conduct the study. The purpose and method of the study were explained for participated mothers to obtain their written consent. They were insured the right to continue or withdraw from the study without penalty. Also, mothers were assured that all data are kept confidential and anonymous (e.g., interviewing

data, voice records, and recorded WhatsApp chats) were archived securely and protected with suitable precautions with password and will be destroyed permanently after 5 years from the final publication.

Pilot study:

A pilot study was done on 10% of the total sample size (10 mothers) to check the feasibility of the research process, accuracy, relevance, clarity, and appropriateness of the study tools as well as the required time to fulfill each study tool. Brief modifications were required as rephrasing of some statements. The pilot study mothers were included in the study sample.

Field work:

The current study was carried out through the following phases:

Assessment and planning phase:

The actual field work was conducted from August to November 2020 (the time between the end of the first wave of Covid-19 and before the peak of the second wave in Egypt) and due to the actual situation of the pandemic and application of safety measures in hospital, the researchers conducted semi structured, open-ended interviews by telephone to collect mothers' personal data. Each interview lasted between 5 and 10 min. The researchers selected studied participants according to the previously mentioned eligibility criteria to be recruited. The researchers have explained the purpose and method of the study to the participating mothers and arranged the time for WhatsApp chat and assured them that all recorded data and chats are kept confidential and used for the research purpose only. Each mother was interviewed individually and obtained written consent. The first session was held face-to-face in NICU for each mother to assess their breastfeeding perception (tool I), self-efficacy (tool II) and attitude (tool IV). While the researchers were observed the mothers safe practicing breast feeding of their preterm infants to fill out the Bristol Breastfeeding Assessment Tool (Tool IV). The first session lasted between around 30-45 minutes.

Then, the website link was given for each participating mother after installing the application on their mobile phone and joined WhatsApp group and received the electronic

based instruction guide and audiovisual materials.

The researchers have stated the general objective of the electronic-based instructions guide to improve participating mothers' perception, self-efficacy, practice, and attitude regarding safe breastfeeding for their preterm infants during covid-19 pandemic and the following specific objectives:

1. Discuss benefits of breastfeeding for both mother and infants.
2. Discuss the recent nine World Health Organization recommendations for safe breastfeeding during covid-19 pandemic.
 - Breastfeeding protection.
 - Skin-to-skin contact.
 - Immune system support.
 - Breastfeeding continuation.
 - Hand hygiene.
 - Respiratory hygiene.
 - Cleaning and disinfection of surfaces.
 - Human milk expression.
 - Relactation after recovery.
3. Practice safety measures during breastfeeding.
 - Hand hygiene
 - Washing breast
 - Wearing and removing of face mask
 - Respiratory etiquette
 - Cleaning & disinfection of surfaces
 - Handling & disinfection of expressed milk equipment.
4. Practice breastfeeding technique for preterm infants for successful breastfeeding
 - Positioning
 - Grasping/Attachment
 - Sucking
 - Swallowing
 - Comfort

Implementing phase:

An electronic-based instructions guide was conducted in a period of four months through 10 sessions, 30 minutes for each session (2 hours for theory & 3 hours for practical part). The audiovisual materials of an electronic-based instruction guide were distributed to all participating mothers through WhatsApp, and practical part was given through individualized direct face-to-face sessions for each mother (session 1, 4, 6 and 10). The online sessions (2,3,5,7,8, and 9) aimed at applying the

regulations of social distance and safety measures of covid-19 pandemic (two sessions for theory and four sessions for practice of safe breastfeeding in the form of videos, and audiovisual training), in addition to two real face-to-face sessions (4 & 6) held in NICU for practicing safe breastfeeding and last sessions for evaluation are held in the breastfeeding clinic one week after discharge. Where, commitment of infection control regulations for prevention of

covid-19 by World Health Organization (2020), were taken including; ensure that each mother must be free from any signs or symptoms of covid 19 infection, measuring body temperature before entrance to hospital and wearing of face mask, hand washing before enter to the unit and before touch the baby, washing the breast, wearing mask and gown, follow regulation of surface disinfection and respiratory hygienic measures.

Summary of sessions contents of the electronic-based instruction guide

Session number	contents
Session (1) Face-to-face at NICU	- Introduction and aim. - Assessment of participating mothers using the previously mentioned tools.
Session (2) Online	- Discussing the importance of breast milk for both mother and infant. - Explain the safety measures of covid-19 during breastfeeding.
Session (3) Online	- Revision the content of previous session. - Explain signs of adequate of breastfeeding, time, and frequency. - Practice safe breastfeeding using audiovisual materials (hand hygiene, washing the breast, wearing, and removing of face mask, respiratory etiquette, surface disinfection, handling, and disinfection of milk expression equipment).
Session (4) Face-to-face at NICU	- Discussing proper positioning during breastfeeding. - Determine signs of good latching on.
Session (5) Online	- Discussing breastfeeding safety practice recommendations during covid-19 pandemic. <ul style="list-style-type: none"> ○ Breastfeeding protection. ○ Skin-to-skin contact. ○ Immune system support. ○ Breastfeeding continuation. ○ Hand hygiene. ○ Respiratory hygiene. ○ Cleaning and disinfection of surfaces. ○ Human milk expression. ○ Relactation after recovery.
Session (6) Face-to-face at NICU	- Revision on the content of session 2 to session 5. - Practice safe breastfeeding (hand washing and personal hygiene, surfaces disinfection and respiratory hygiene).
Session (7-8-9) Online	- Revision on previous content. - Encourage mothers to express their feelings, needs, and desires. - Discuss infant's condition. - Discuss mothers' perception, and self-efficacy regarding safe breastfeeding.
Session (10) Face-to-face at breastfeeding clinic	- Summary - Evaluation of participating mothers using the previously mentioned tools. - Closure.

Various teaching methods were used for implementing the electronic-based instruction guide including modified lectures, group discussion in WhatsApp chat, and real situation for practice. Proper audiovisual materials were used to help mothers for appropriate understanding of the contents and follow the social distance regulations of covid-19 pandemic.

Evaluation phase:

Each mother was evaluated individually at breast feeding clinic one week after discharge from NICU to evaluate the effect of an electronic-based instructions guide on participating mothers' breastfeeding perception (tool I), self-efficacy (tool II) safety measures practices (tool III),

breastfeeding technique (tool IV) and attitude (tool V).

Data analysis

The collected data were revised, coded, entered, analyzed, and presented by Statistical Package for Social Sciences (IBM SPSS V26). Qualitative variables were presented in the form of frequencies, arithmetic mean, and standard deviations (SD). A paired t-test was used to compare means of the participated mothers' pre and post the intervention. Data were analyzed to determine the statistically significant differences as follows:

- P-value ≤ 0.05 = was assumed that significant statistical differences.
- P-value > 0.05 = was assumed that insignificant statistical differences.

The normality of data was assessed by using Kolmogorov-Smirnov test. Paired t-test was applied to compare the values of mean and standard deviation pre and post application of the study intervention.

Results:

Table (1) illustrates demographic characteristics of the studied mothers included in this study. The mean age of them was 29.38 ± 4.45 years. Most of mothers (88%) were housewives. Moreover, 56% of them are multipara.

Figure 1 illustrates that 56% of studied mothers had secondary educational level, 24% of them have university education and only 20% of them are read and write. **Figure 2** clarifies that 68% of studied mothers reported that they were come from urban areas while 32% of them from rural areas. **Figure 3** shows that only 12% of studied mothers had reported positive history of confirmed infection with covid-19 during pregnancy.

Table (2) & figure (3) summarizes that only 24% of studied mothers are informed with safety precautions of breastfeeding, while almost all of them did not receive any breastfeeding support from nursing staff. Moreover, 52% and 48 % were following social media stands (e.g., Facebook and WhatsApp) and mass media to gain information from respectively.

Concerning mothers' responses of breastfeeding perception was clarified in **Table (3)**, it was noticed that highest levels of agreement post implementation of electronic-based lactation guide with a statistically significant increase in the total mean scores of studied mothers breastfeeding perception for their preterm infants during covid -19 pandemic post implementation of an electronic based instruction guide compared to the mean scores of pre implementation phase (from 11.72 ± 2.95 to 26.66 ± 0.65 respectively (t-test = 34.887 at P value of < 0.001). Where, the majority (88.0%) of the mothers disagreed breastfeeding continuation during covid-19 and only (14%) agreed that breastmilk protects their infants from covid-19 infection in pre implementation phase. After implementation of the electronic based instruction guide, it was observed marked improvement of mothers' breastfeeding perception regarding breastfeeding continuation agreed by (80%) of them and (98%) agreed the breastmilk protection during covid-19 respectively.

Table (4) reveals a statistically significant change in total mean score of studied mothers breastfeeding self-efficacy for their preterm newborns during covid -19 pandemic post implementation of an electronic-based instruction guide compared to the pre implementation phase (from 35.86 ± 7.17 to 56.56 ± 4.39 respectively with a P value < 0.001).

As regard applying of safety measures practices during breast feeding, **table (5)** clarifies marked changes in total mean scores of studied mothers' practices regarding hand hygiene, washing the breast, wearing, and removing of face mask, respiratory etiquette, surface disinfection, handling, and disinfection of milk expression equipment with a statistically significant difference (paired t test = -42.52 at P-Value < 0.000).

As noticed from **table (6)**, there was significant improvement in the overall mean scores of all items of breastfeeding assessment tool regarding positioning, grasping/ attachment, sucking, swallowing, comfort for study group compared by control group. Where, the total mean scores pre implementation of electronic-based instruction guide is 1.75 compared to 6.34 post implementation phase (p-value < 0.001).

The mothers' attitude in post implementation phase was enhanced by about 57.89 ± 4.35 compared to 42.90 ± 4.06 pre implementation of an electronic- based instruction guide. The change significantly differed between the pre, and post implementation phase ($p < 0.001$) as seen in **table (7)**.

Table (8) presented strong positive correlation associated with breastfeeding self-efficacy, breastfeeding attitude among studied mothers post implementation of an electronic-based instruction guide ($r = .642$ with a P value of 0.01).

Table (1): Distribution of demographic characteristics of studied mothers (n= 100)

Items	No.	%
Age (years)		
- < 20	8	80.0
- 20 -< 30	44	44.0
- 30 -< 40	42	42.0
- ≥ 40	6	6.0
$\bar{X} \pm SD$	29.22\pm6.36	
Employment state		
- Employed	12	12.0
- Housewives	88	88.0
Parity		
- Primipara	44	44.0
- Multipara	56	56.0
Baby birth order		
- First	44	44.0
- Subsequent	56	56.0

Figure (1): Percentage distribution of studied mothers according to their levels of education (n= 100)

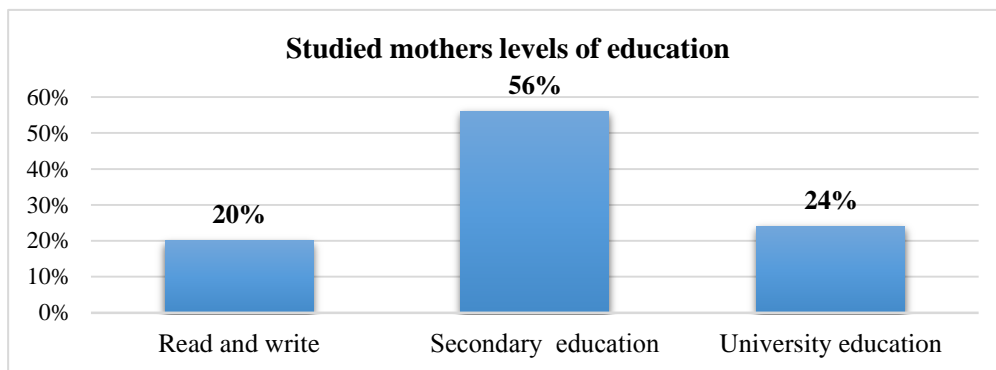


Figure (2): Percentage distribution of studied mothers according to their residence (n= 100)

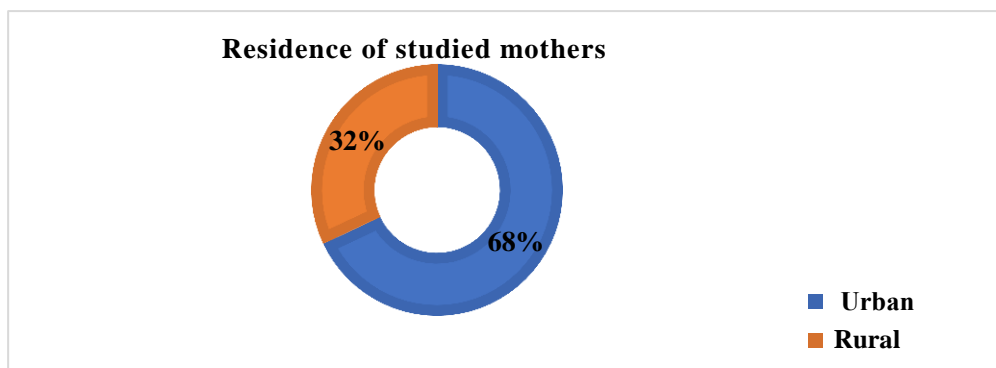


Figure (3): Percentage distribution of studied mothers according to their previous history of covid-19 infection during pregnancy (n= 100)

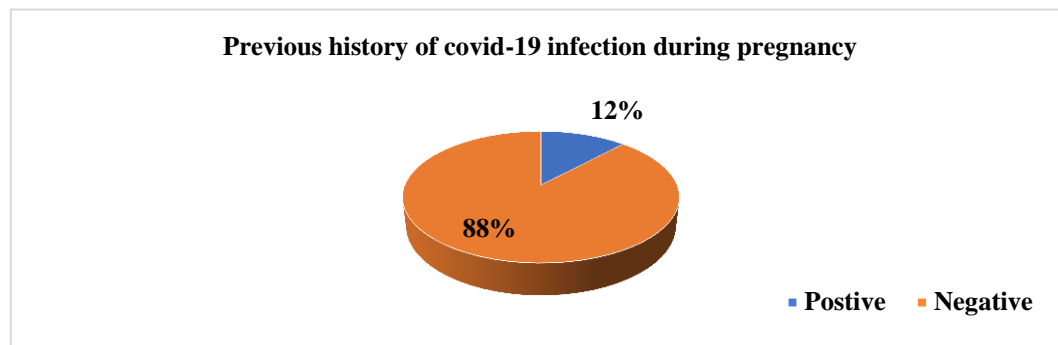


Figure (4): Percentage distribution of studied mothers according to total hours of mobile phone used per day (n= 100)

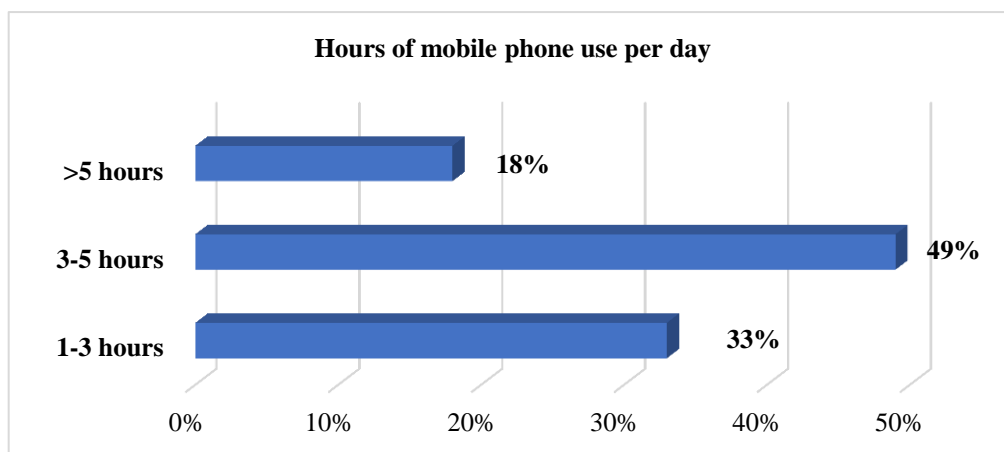


Table (2): Mothers' knowledge regarding received breast feeding information during covid-19 pandemic (n=100)

Items	No.	%
Received safety precautions during breastfeeding		
– Yes	24	24.0
– No	76	76.0
Main sources of breastfeeding information during covid-19 pandemic*		
– Social media stands (e.g., Facebook & WhatsApp)	52	52.0
– Health care settings	20	20.0
– Mass media	52	48.0
– Friends and family	18	18.0
– Previous experience	26	26.0

*Number is not exclusive

Table (3): Comparison between mothers' breastfeeding perception pre, and post application of an electronic-based instruction guide (n=100)

Items	pre (n=100)						post (n =100)					
	Disagree		Unsure		Agree		Disagree		Unsure		Agree	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
1. Breastfeeding protection.	64	64.0	22	22.0	14	14.0	6	6.0	14	14.0	80	80.0
2. Skin-to-skin contact.	84	84.0	12	12.0	4	4.0	4	4.0	12	12.0	84	84.0
3. Immune system support.	76	76.0	14	14.0	10	10.0	6	6.0	8	8.0	86	86.0
4. Breastfeeding continuation.	88	88.0	8	8.0	4	4.0	0	0.0	2	2.0	98	98.0
5. Hand hygiene.	68	68.0	24	24.0	8	8.0	6	6.0	8	8.0	86	86.0
6. Respiratory hygiene.	86	86.0	14	14.0	0	0.0	0	0.0	4	4.0	96	96.0
7. Cleaning and disinfection for surfaces.	82	82.0	14	14.0	4	4.0	4	4.0	10	10.0	86	86.0
8. Human milk expression.	84	84.0	12	12.0	4	4.0	4	4.0	14	14.0	82	82.0
9. Relactation after recovery.	44	44.0	52	52.0	4	4.0	8	8.0	14	14.0	78	78.0
Total Mean ± Std. Deviation	11.72±2.95						26.66±0.65					
Paired t-test	-34.887						P-Value <0.001					

P-Value <0.001= was considered significant statistical differences

Table (4): Comparison between studied mothers' breastfeeding self-efficacy pre, and post application of an electronic-based instruction guide (n=100)

Items	Pre (n=100)								Post (n =100)							
	Not at all confident		Not confident		Unsure		confident		Not confident		Unsure		confident		Always confident	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
- "Determine that my baby is getting enough milk."	18	18.0	52	52.0	22	22.0	8	8.0	0	0.0	14	14.0	56	56.0	30	30.0
- "Successfully cope with breastfeeding like I have with other challenging tasks."	12	12.0	30	30.0	34	34.0	22	22.0	0	0.0	6	6.0	52	52.0	42	42.0
- "Breastfeed my baby without using formula as a supplement."	10	10.0	30	30.0	46	46.0	12	12.0	4	4.0	10	10.0	56	56.0	30	30.0
- "Ensure that my baby is properly latched on for the whole feeding."	26	26.0	28	28.0	42	42.0	4	4.0	0	0.0	18	18.0	50	50.0	32	32.0
- "Manage the breastfeeding situation to my satisfaction."	24	24.0	46	46.0	22	22.0	8	8.0	2	2.0	10	10.0	56	56.0	32	32.0
- "Manage to breastfeed even if my baby is crying."	20	20.0	38	38.0	36	36.0	6	6.0	0	0.0	20	20.0	66	66.0	14	14.0
- "Keep wanting to breastfeed."	6	6.0	48	48.0	46	46.0	0	0.0	0	0.0	18	18.0	70	70.0	12	12.0
- "Comfortably breastfeed with my family members present."	0	0.0	18	18.0	56	56.0	26	26.0	0	0.0	16	16.0	54	54.0	30	30.0
- "Be satisfied with my breastfeeding experience."	0	0.0	30	30.0	70	70.0	0	0.0	0	0.0	28	28.0	54	54.0	18	18.0
- "Deal with the fact that breastfeeding can be time-consuming."	24	24.0	36	36.0	40	40.0	0	0.0	0	0.0	8	8.0	48	48.0	44	44.0
- "Finish feeding my baby on one breast before switching to the other breast."	10	10.0	30	30.0	46	46.0	14	14.0	0	0.0	34	34.0	60	60.0	6	6.0
- "Continue to breastfeed my baby for every feeding."	8	8.0	24	24.0	54	54.0	14	14.0	0	0.0	14	14.0	64	64.0	22	22.0
- "Manage to keep up with my baby's breastfeeding demands."	2	2.0	24	24.0	46	46.0	28	28.0	0	0.0	28	28.0	64	64.0	8	8.0
- "Tell when my baby is finished breastfeeding."	0	0.0	16	16.0	50	50.0	34	34.0	0	0.0	34	34.0	54	54.0	12	12.0
Total Mean ± Std. Deviation					35.86±7.17								56.56±4.39			
Paired t-test					-17.388								P-Value <0.001			

P-Value <0.001= was considered significant statistical difference

Table (5): Comparison between mothers' mean scores of applying safety measures practices during breastfeeding pre, and post application of an electronic-based instruction guide (n=100)

Items	Pre (n=100)		Post (n =100)	
	Mean	Std. Deviation	Mean	Std. Deviation
– Hand hygiene	4.2	1.2	7.2	0.7
– Washing the breast	2.0	0.6	3.8	0.3
– Wearing and removing of face mask	3.2	0.8	7.9	0.7
– Respiratory etiquette	2.2	0.5	4.3	0.5
– Surface disinfection	1.6	0.5	4.1	0.7
– Handling and disinfection of milk expression equipment.	1.3	0.6	4.3	0.6
Total Mean ± Std. Deviation	14.8±2.2		31.8±2.1	
Paired t-test			-42.52	
P- Value			<0.001	

P-Value <0.001= was considered significant statistical difference

Table (6): Comparison between mothers' mean scores of breastfeeding practice pre, and post application of an electronic-based instruction guide (n=100)

Items	Pre (n=100)		Post (n =100)	
	Mean	Std. Deviation	Mean	Std. Deviation
– Positioning	1.26	0.52	1.75	0.54
– Grasping/Attachment	1	0.40	1.26	0.52
– Sucking	1.12	0.38	1.42	0.53
– Swallowing	1.18	0.43	1.20	0.45
– Comfort	1.78	0.41	1.84	0.37
Total Mean ± Std. Deviation	1.75±0.54		6.34±1.08	
Paired t-test			-4.172	
P- Value			<0.05	

P-Value <0.05= was considered significant statistical difference

Table (7): Comparison between mothers' breastfeeding attitude pre, and post application of an electronic-based instruction guide (n=100)

Items	Pre (n=100)										Post (n =100)									
	Strongly disagree		Disagree		Unsure		Agree		Strongly Agree		Strongly disagree		Disagree		Unsure		Agree		Strongly Agree	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
- "The benefits of breastfeeding last only as long as the baby is breast-fed."	6	6.0	4	4.0	12	12.0	36	36.0	42	42.0	74	74.0	20	20.0	6	6.0	0	0.0	0	0.0
- "Formula feeding is more convenient than breastfeeding."	6	6.0	8	8.0	32	32.0	30	30.0	24	24.0	76	76.0	14	14.0	10	10.0	0	0.0	0	0.0
- "Breastfeeding increases mother infant bonding."	2	2.0	2	2.0	18	18.0	58	58.0	20	20.0	0	0.0	4	4.0	10	10.0	56	56.0	30	30.0
- "Breast milk is lacking in iron."	10	10.0	22	22.0	68	68.0	0	0.0	0	0.0	74	74.0	16	16.0	6	6.0	4	4.0	0	0.0
- "Formula fed babies are more likely to be overfed than breastfed babies."	0	0.0	6	6.0	40	40.0	46	46.0	8	8.0	0	0.0	0	0.0	18	18.0	50	50.0	32	32.0
- "Formula feeding is the better choice if the mother plans to go back to work."	0	0.0	4	4.0	26	26.0	50	50.0	20	20.0	70	70.0	18	18.0	10	10.0	2	2.0	0	0.0
- "Mothers who formula feed misses one of the great joys of motherhood."	2	2.0	18	18.0	48	48.0	32	32.0	0	0.0	0	0.0	0	0.0	20	20.0	66	66.0	14	14.0
- "Women should not breastfeed in public places."	0	0.0	0	0.0	12	12.0	52	52.0	36	36.0	68	68.0	18	10.0	10	10.0	4	4.0	0	0.0
- "Breastfed babies are healthier than formula fed babies."	6	6.0	6	6.0	32	32.0	38	38.0	18	18.0	0	0.0	0	0.0	26	26.0	56	56.0	18	18.0
- "Breastfed babies are more likely to be overfed than formula fed babies."	4	4.0	14	14.0	38	38.0	40	40.0	4	4.0	72	72.0	18	18.0	6	6.0	4	4.0	0	0.0
- "Fathers feel left out if a mother breast-feeds."	0	0.0	0	0.0	18	18.0	44	44.0	38	38.0	72	72.0	20	20.0	8	8.0	0	0.0	0	0.0
- "Breast milk is the ideal food for babies."	2	2.0	14	14.0	16	16.0	54	54.0	14	14.0	0	0.0	0	0.0	14	14.0	64	64.0	22	22.0
- "Breast milk is more easily digested than formula."	4	4.0	22	22.0	52	52.0	22	22.0	0	0.0	0	0.0	0	0.0	28	28.0	64	64.0	8	8.0
- "Formula is as healthy for an infant as breast milk."	0	0.0	0	0.0	18	18.0	46	46.0	36	36.0	66	66.0	30	30.0	4	4.0	0	0.0	0	0.0
- "Breastfeeding is more convenient than formula."	0	0.0	26	26.0	52	52.0	18	18.0	4	4.0	0	0.0	4	4.0	28	28.0	52	52.0	16	16.0
- "Breast milk is cheaper than formula."	0	0.0	0	0.0	0	0.0	66	66.0	34	34.0	0	0.0	0	0.0	18	18.0	70	70.0	12	12.0
Total Mean ± Std. Deviation					42.90±4.06								57.89±4.35							
Paired t-test					17.886								P-Value <0.001							

P-Value <0.001= was considered significant statistical difference

Table (8): Spearman correlation analysis between studied mothers' breastfeeding perception, self-efficacy, and attitude, breastfeeding practice (n=100)

Items	Self-efficacy Post		Self-efficacy Pre	
	r	P value	r	P value
Perception	.131	.366	-.009	.953
Attitude	.642**	.000	-.063	.662
Practice	.197	.171	.475**	.000

Correlation is significant at the 0.01 level (2-tailed).

Discussion:

Mothers of premature infants usually suffering from a high level of stress and deficit of knowledge about caring for their infants. Therefore, they need to be supported by educational interventions and materials. However, breastfeeding support become limited by traditional bedside education because of the circumstances and challenges imposed by the pandemic as well as depriving the preterm infant from receiving adequate breastfeeding and attachment (Jiang et al., 2019). Therefore, the researchers implemented a new model of an electronic-based instruction guide regarding safe breastfeeding during covid-19 pandemic to overcome the situation of social restriction with commitment with the regulations of prevention of Covid-19. The researchers used WhatsApp application as an electronic method, non-expensive, easily installed on the smart phones and easy use to deliver the electronic educational instruction and materials to participating mothers of preterm infants regarding safe breastfeeding during the Covid-19 as well as to deliver timely and comprehensive instructions in the time of discharge. This may help to support breastfeeding mothers at the time of infant's discharge from the NICU during covid-19 pandemic.

The researchers suggested that mothers' breastfeeding perception, self-efficacy and attitude is crucial for supporting them regarding safe breastfeeding of their preterm infants for maintaining sufficient human milk for their preterm infants as well, reducing the risk of covid-19 infection. Using of the electronic-based instruction guide based on a WhatsApp application could improve mothers' breastfeeding perception, self-efficacy, and attitude regarding safe breastfeeding during covid-19 pandemic.

Concerning demographic characteristics of participating mothers, the current summarized that, the mothers mean age was 29.38 ± 4.45 years,

most of them were housewives, one fifth them had university education and nearly half of the used mobile phone 3-5 hours per day. These findings came in the same line with the results of Wang et al., (2018) about "A Breastfeed-Promoting Mobile App Intervention: Usability and Usefulness Study" showed that, the average age of the participated mothers was 32.67 years, 38% of them were housewives, 48% of them had bachelor's degree and 43% of them used mobile phone for at least 3-5 hours daily.

As regard the source of breastfeeding information during covid-19 pandemic, it was noticed from the results that social media stands were common source used for obtaining information regarding covid-19 pandemic by more than half of studied mothers. The researchers viewed that social media stands such as WhatsApp and Facebook were used by huge number of individuals, especially among young adults for sharing information and current events. For this reason, these means of communication can be used by health care professionals to raise awareness among mothers about safe breastfeeding during the covid-19 pandemic, due to its ease use Widespread among young adults. These findings came in agreement with the findings of the study conducted by Ju Ng et al., (2020), who studied "the perception and feelings of antenatal women during covid-19 pandemic", it was mentioned that the most common sources used by more than half (55%) of women were used social media planforms including Facebook and WhatsApp message forwards for gaining information regarding the Covid-19.

The current study resulted in a greater improvement among studied mothers' breastfeeding perception, self-efficacy, and attitude during covid-19 pandemic. This could be explained by the dedication of using WhatsApp application in educating mothers, including tenth

sessions starting before their preterm discharge from NICU and continued breastfeeding clinic within two weeks after discharge from NICU.

As regards studied mothers' breastfeeding perception, the results of current study demonstrated larger improvement of overall scores of studied mothers' breastfeeding perception for their preterm infants regarding safe breastfeeding during covid-19 pandemic post implementation of an electronic-based lactation guide compared to the mean scores of pre implementation phase. These findings came in the same line with Costantini et al., (2021) entitled "Breastfeeding Experiences During the COVID-19 Lockdown in the United Kingdom: An Exploratory Study into Maternal Opinions and Emotional States" stated that the highest levels of agreement among the studied mothers were breastfeeding protection, immune system support and breastfeeding continuation if she became ill with covid-19. The researchers suggested that mother's involvement in decision-making regarding initiation and continuation of breastfeeding if suspected Covid-19 infection might influence breastfeeding process of their preterm infants, in addition the WHO (2020c) recommended the importance of assisting mothers for relactation after recovery from Covid-19 infection.

The researchers viewed that focusing on the importance of applying electronic-based instruction for supporting breastfeeding mothers to overcome the challenges of social distance and limitation of face-to-face communication with health care professionals leading to disruption of breastfeeding process or even cessation of breastfeeding.

Concerning breastfeeding self-efficacy, the current findings revealed statistically significant improvement in total mean of studied mothers breastfeeding self-efficacy for their preterm newborns during covid-19 pandemic post implementation of an electronic-based safe lactation guide. These findings were in accordance with the study conducted by Fitriah and Aprilia (2017), who studied "the effect of educational programs regarding breastfeeding". It was stated that the education class of breastfeeding by the Indonesian Breastfeeding Mothers Association greatly affect mothers' self-efficacy of exclusive breastfeeding. Also, these results were come in the

line with research conducted by Angio et al., (2019) who studied "the effect of peer education on self-efficacy and motivation in breastfeeding mothers" showed that success of breastfeeding education improving mothers' self-efficacy. From the researcher point of view using of social media during the covid-19 pandemic is an adjunct alternative substitute to face to face mother education. Using of widespread social media for application of an electronic-based safe lactation guide to overcome the current situation of covid-19 pandemic and commitment to social distance regulations.

Concerning mothers' practices regarding applying safety measures during breastfeeding, it was noticed that there was marked improvement in overall mean scores post application of electronic-based instruction guide with a statistically significant difference. This result was supported by Khaton, (2021) entitled "Awareness and Practices of Rural Mothers Regarding COVID-19 Prevention and their Role in Protecting their Families" and stated that most of mothers had satisfactory practice regarding Covid-19 safety measures.

According to the results of mothers' breastfeeding attitude from the current study findings, it was observed that, there were significant improvement of mothers overall scores breastfeeding attitude and practice regarding safe breastfeeding of their preterm infants during covid-19 pandemic post implementation of an electronic-based instruction guide compared to the mean scores of pre implementation phase. In a similar study, Seyyedi et al., (2021) studied improving of breastfeeding using smart-phone education showed that mothers' attitude and practice were significantly higher in the intervention group ($p < 0.001$) in comparison to their controls.

The researchers viewed that, it might be due to the widespread of social media applications may facilitates delivery of health information and communication between neonatal nurse and mother especially in the time of discharge from hospital settings. Also, WhatsApp group helps mothers in sharing the experience.

Concerning the results of the current study regarding spearman correlations between the studied variables, it was noticed that there was a strong positive correlation associated with

breastfeeding self-efficacy, perception, attitude, and practice among studied mothers post implementation of an electronic-based instruction guide. This result aligns with previous research by Aly (2021) entitled “Breastfeeding during the Covid-19 pandemic: suggestions on behalf of woman study group” who found a significant positive correlation between breastfeeding self-efficacy and attitude scores.

Overall, it seems that developing such an electronic instruction guide by using WhatsApp application can be quite important and useful in supporting mothers’ breastfeeding perception, self-efficacy, and attitude regarding safe breastfeeding. This new method could help mothers in providing safe breastfeeding for their preterm infants during covid-19 pandemic as well reduce social contact and the risk of transmission of Covid-19 virus.

Conclusion:

In the light of the study findings, the electronic based instruction guide had a significant positive change in mothers’ breastfeeding perception, self-efficacy, practice, and attitude regarding safe breastfeeding of their preterm infants during Covid-19 pandemic.

Recommendations:

Based on the findings of the current study, the following recommendations can be suggested:

- Adopting electronic-based instruction as a method for supporting breastfeeding mothers of preterm infants during Covid-19.
- Developing and disseminating online brochures and posters regarding safety measures practices of breastfeeding during Covid-19 pandemic.
- Standardization of the online educational classes and webinar regarding safe breastfeeding for mothers of preterm infants during covid-19 pandemic.
- Further studies are recommended regarding implementation of electronic educational materials for mothers of preterm infants regarding safe breastfeeding by using various social media applications.

Research limitations:

During implementation of the intervention, the researchers faced a limitation related to the level of mothers’ literacy to use mobile applications and WhatsApp. Some participants had difficulty in installation and use of WhatsApp group. The researchers overcame this limitation by helping mother in the first face-to-face session to install the WhatsApp application and gave the mothers full explanation about its uses.

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