Effect of Colostrum Feeding Intervention on the Clinical and Nutritional Outcomes of Very Low Birth Weight Infant

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ABSTRACT

Context: Having premature and very low birth weight infants in the Neonatal Intensive Care Unit (NICU) is disempowering for mothers as they lost autonomy over their behavior and lost autonomy over beginning to establish a close relationship with their neonates. Mothers highly value Breastfeeding/breast milk feeding as it is the 'one thing that only the mother can do to protect and improve their neonates' health.
Aim: Evaluate the effect of colostrum feeding intervention on the clinical and nutritional outcomes of very low birth weight infants.
Methods: A quasi-experimental research design was utilized to achieve the aim of this study. A convenient sample of 80 mothers of very low birth weight infants was subjected to a colostrum feeding intervention program. Their 80 very low birth weight infants (divided randomly into two groups) study and control groups to examine the effect of the colostrum feeding intervention on their clinical and nutritional outcomes versus artificial milk feeding. Three research tools used were a structured interview questionnaire, mothers' practice observation checklist, and very low birth weight clinical and Nutritional outcomes' record.
Results: the study reveals a significant improvement of mother knowledge and practices after colostrum feeding intervention at the post and follow-up compared to their pre-intervention level. The study also revealed a statistically significant difference in all clinical and nutritional outcomes between infants of the study and control groups.
Conclusion: A significant improvement in mothers' knowledge and practice regarding colostrum feeding intervention. The study group of very low birth weight infants had a rapid growth rate, better nutritional outcomes, and lesser complications than the control group. The study recommended tailored intervention programs for mothers that expecting a very low birth weight infant. Besides, policies for training midwives at maternity centers and hospitals early to initiate colostrum feeding. Further research with a larger sample size is recommended to determine if early colostrum administration can positively affect very low birth weight infants' outcomes.

Keywords: Colostrum feeding intervention - clinical nutritional outcomes - very low birth weight infant

1. Introduction

Low birth weight (LBW) is defined by the World Health Organization (WHO) as weight at birth less than 2500 g. Low birth weight continues to be a significant public health problem globally and is associated with a range of both short and long-term consequences. Overall, it is estimated that 15% to 20% of all births worldwide are LBW, representing more than 20 million births a year *(WHO, 2012)*. Low birth weight is not only a significant predictor of prenatal mortality and morbidity, but recent studies have found that very low birth weight also increases the risk for non-communicable diseases such as diabetes and cardiovascular disease later in life *(Larroque, Bertrais, Czernichow, & Leger, 2001; Risnes, Vatten, Baker, Jameson, Sovio, Kajantie, et al., 2011)*.

However, low- and middle-income countries (LMICs) account for a disproportionate burden of LBW; over 95% of the world's LBW infants are born in LMICs *(Cutland et al., 2017)*. Low birth weight is a complex syndrome that includes preterm neonates (born before 37 weeks of gestation), small for gestational age neonates at term, and the overlap between these two situations – preterm, small for gestational age neonates, who typically have the worst outcomes *(WHO, 2012)*. Nevertheless, very low birth weight (birth weight <1500 g) is also a global concern, as enteral feedings are not always possible, and oral feedings are not practical due to developmental immaturity in the immediate post-natal period (*Romano-Keeler et al., 2017)*.

Adequate nutrition is essential for the optimal growth and health of very low birth weight (VLBW) infants. Enteral nutrition is preferred to total parenteral nutrition (TPN) because the former avoids complications related to vascular catheterization, sepsis, adverse effects of TPN, and fasting. Early parenteral nutrition in these very low birth weight infants remains critical and should be used as an adjunct to enteral nutrition. The overarching goal while feeding VLBWI infants is to reach full enteral feeding in the shortest time while maintaining optimal growth, nutrition and avoiding the adverse consequences of rapid feeding advancement. Attaining this goal is more

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complicated than it sounds, and controversies abound *(Dutta et al., 2015).*

Colostrum and breastfeeding milk considered the gold standard of infant nutrition. It has been strongly encouraged for preterm newborns due to the immunological properties of colostrum and breast milk. Its role in gastrointestinal maturation and the establishment of the mother-child bond is contributing to better growth and development *(Santiagoa, Júnior, Freitas, & Rugolo 2018).* Colostrum is bright yellowish thick milk secreted from mammary glands during late pregnancy and continuing during the first few days after birth. Colostrum is rich in immunoglobulin (IgA, IgG, and IgM), enzymes, cytokines, and growth factors. Along with that, colostrum also has laxative effects that help VLBW infants excrete excess bilirubin and aid in passing the stool *(La Leche League International 2017).*

As colostrum is very wealthy in proteins, carbohydrates, vitamin A, sodium chloride, and immunoglobulin G, it fits the premature digestive system with a reduced quantity of lipids and potassium *(Joshi, Brakoti, & Lamsal, 2012).* Other studies added that colostrum could protect against hospital-acquired and other serious infections (such as necrotizing enterocolitis or septicemia) *(Woodman, 2017).* Many studies evidenced that infants who have not to feed colostrum are more likely to develop many bacterial, viral, fungal, and protozoal infections, stunting, underweight, and wasting *(Abie & Goshu, 2019). Mohammed (2019)* reported a reduced incidence of lower respiratory tract infections, hospitalization, sudden infant death syndrome, leukemia, and obesity in very-low-birth-weight infants feed by colostrum.

However, many barriers prevent colostrum feeding to the infant. Maternal barriers include poor mothers' awareness of the importance of early breastfeeding and the advantages of colostrum feeding. Some mothers dislike colostrum color. They even discard it on their own and also on the advice of in-laws. Another misconception exists that breast milk does not arrive in the first few days after delivery and is inadequate for the baby's needs. Additional barriers to colostrum feeding are also prolonged labor and surgical deliveries. Neonatal barriers include neonatal illness or inability to suck due to illness, deformities, or other reasons *(Joshi, Brakoti, & Lamsal, 2012).* Despite the colostrum's role in promoting growth and development, and fighting infection in the newborn is widely acknowledged. Many mothers are still unaware of the benefits of colostrum to their very low birth weight infants. It is argued by *Joshi, Brakoti, and Lamsal (2012),* who reported that although breastfeeding is a common practice, the importance of colostrum feeding is still poorly understood.

Very low birth weight infants are most likely to be in the NICU during the first post-natal period. There is an increased importance of human milk to protect very low birth weight infants. The environment of NICUs introduces unique challenges for the breastfeeding course of mother and newborn. Depending on breast pumps, delayed direct breastfeeding, and other NICU stresses may leave NICU mothers at an increased risk for decreasing or terminating human milk feeds before discharge *(Briere, McGrath, Cong, Brownell & Cusson, 2015).*

According to *Parker, Sullivan, Krueger, Kelechi, and Mueller (2012),* neonatal nurses care for the infant and provide the mother with evidence-based support and care to ensure that the mother establishes and maintains milk supply and collection. Nursing education about milk production through pumping is important because lactation counselors are not always readily available. Therefore, the nurse must increase mothers' awareness about the importance of colostrum and breast milk feeding and collection methods to allow the nursing staff to feed the babies with it and allow the newborn to establish all benefits of colostrum and breast milk. Intervention program with effective training plans encourages mothers to follow healthy practices in day-to-day life.

2. Significance of the study

During the last 20 years, several studies have been undertaken to determine the incidence of very low birth weight in Egypt. The results have varied but have shown that between 5% and 15% of babies are born with very low birth weight *(WHO, 2005)*. It is worth noting that these rates are high, although the data on LBW remain limited or unreliable, as many deliveries occur in homes or small health clinics and are not reported in official figures, which may result in an underestimation of the prevalence of LBW *(WHO, 2014).*

A single comprehensive strategy to address this issue does not exist. Affordable, accessible, and appropriate health care is critical for preventing and treating low birth weight. Reductions in neonatal morbidity and mortality will only be achieved if pregnancy care is fully integrated with appropriate neonatal and post-neonatal medical and nutritional care for preterm and small for gestational age infants. Evidence is growing on recommendations for nutritional support and early initiation of breastfeeding for all neonates, particularly high-risk infants. This study aimed to examine the effect of colostrum feeding intervention on the outcomes of hospitalized very low birth weight infants.

3. Aim of the study

Evaluate the effect of colostrum feeding intervention on the clinical and nutritional outcomes of very low birth weight infants. This aim will be achieved through:

- Assess the knowledge and practice of mothers of VLBW infants regarding colostrum and breast milk feeding.
- Design and implement an intervention program for mothers about colostrum and breast milk feeding collection
- Evaluate the effect of colostrum and breast milk feeding intervention on the mothers` knowledge and practice
- Evaluate the effect of colostrum and breast milk feeding intervention on the very low birth weight infants' clinical and nutritional outcomes.

3.1. Research hypotheses

- There will be a statistically significant improvement in both mothers' knowledge and practice regarding the colostrum and breast milk feeding intervention for their very low birth weight infants.
- There will be a statistically significant improvement in the study group (very low birth weight) infants' clinical and nutritional outcomes after implementing the colostrum feeding intervention program compared to their control groups.

3.2. Operational definitions

A very low birth weight infant (VLBW) is defined in this study as an infant whose birth weight is less than 1500g. It includes the VLBW preterm births, intrauterine growth restriction (IUGR), and neonates who are both preterm and growth-restricted.

Clinical outcomes describe the clinical findings of weight gain, length gain, head circumference gain, intake and output, length of hospital stay, and complications of the very low birth weight infants.

Nutritional outcomes are describing the weight gain rate according to the days to regain birth weight.

4. Subjects & Methods

4.1. Research Design

The quasi-experimental research design was used to achieve the aim of this study. This design was used to compare matched groups (study and control group) of infants and measure the degree of change occurring due to treatment or intervention**.** A quasi-experimental research design (pre/post-test design) was used to test changes in mothers' knowledge and practice regarding colostrum and breast milk feeding.

4.2 Research Setting

The current study was conducted at the Neonatal Intensive Care Units (NICUs) at Beni Suef University Hospital. This setting has the highest capacity of very low birth weight infants, allowing mothers to feed their hospitalized infants.

1.3. Subjects

A convenience sample of all available mothers for a very low birth weight hospitalized infants (80 mothers) who were available at the time of the study. They recruited conveniently to achieve the aim of this study. The mothers have colostrum milk, and their infant was selected as a study group. Mothers who did not have colostrum or cannot breastfeed their infants for any reason, their infants selected as a control group. The mothers` knowledge and practice were tested as one patch, and the comparison has been made based on pre/post-test design. Mothers selected based on the availability, willingness to participate in the study, medical stability, able to attend the intervention sessions, and have breast milk adequate for her infant (for study group mothers).

A purposive sample of 80 very low birth weight infants recruited to achieve the aim of this study according to the following:

Inclusion criteria

- Neonates from the first day of life.
- Born for gestational age of 26-38 weeks
- Present weight 1000-1500 gm.
- Physiologically stable and on intravenous fluids, total enteral nutrition or feeding by gavage feeding
- Apgar score >7 at 1 and 5 minutes after birth
- Free from any medical complications or disorders.
- The expected duration of hospital stays not less than 22 days.

Exclusion criteria for the studied VLBW infants

- Very low birth weight infants with severe confirmed pathological conditions as necrotizing enterocolitis, congenital abnormalities, intraventricular hemorrhage, acute respiratory distress syndrome, or pathological hyperbilirubinemia.
- Apgar score <7 at 1 and 5 minutes
- The expected duration of hospital stay less than 22 days.

1.4. Tools of data collection

1.4.1. Structured Interview Questionnaire

It was designed by the researcher to assess mothers` knowledge regarding colostrum feeding. It consisted of two parts:

The first part concerned with assessing characteristics of mothers and their very low birth weight infants, such as maternal age, educational level, employment status, parity, family structure, previous experience with colostrum feeding, and sources of mothers' knowledge. This part also included the very low birth weight infants` characteristics such as gestational age (weeks), birth weight (gm), mode of delivery, body length, frontal-occipital circumference, duration of hospital stay, and C-reactive protein test (CRP).

The second part is adopted from *the Department of Obstetrics and Gynecology (2015) to* assess mothers' knowledge regarding colostrum feeding. It included 15 open-ended questions (definition of colostrum milk (1 question), the definition of exclusive breastfeeding (1 question), ideal frequency of colostrum and breast milk expressing/day (2 questions), benefits of colostrum feeding for both mothers, and their neonates (2 questions), maternal barriers of colostrum expressing (2 questions), neonatal barriers of breastfeeding in low birth weight infants (2 questions), benefits of breast milk expression (2 questions), methods of breast milk expression (1 question), storage and using of expressed breast milk (2 questions). This part of the questionnaire was filled in by the educated mothers and the researcher for non-educated mothers. This form was collected three times, pre, post-intervention, and at follow-up.

A content analysis of the 15 open-end questions' answers has been done. Each step was assigned to three score levels, which are: correct and complete was scored (3), correct and incomplete scored (2), and incorrect scored (1). The total score was 45 marks (100%). The total

knowledge score categorized as correct knowledge at 31, 5 grades (70% or more) and incorrect knowledge considered at less than 31, 5 marks (less than 70%)

4.4.2. Mothers' Practice Observation Checklists

It was adopted from *the Ministry of Health and Population (2004)* and *Davis (2006)*. It was used to assess mothers' practice as regards five main procedures; those are hand washing (12 steps), breast care (5 steps), breast massage (6 steps), breast milk manual expression (10 steps), breast milk mechanical expression (10 steps), storage (6 steps) and transportation of colostrum breast milk to the hospital (7 steps). Time consumed for assessing each procedure took 5-10 minutes.

The scoring system was as follows: each step was assigned to two score levels, which are: done was scored (2), and not done scored (1). Each subsection scored independently as hand washing (24 marks), breast care (10 marks), breast massage (12 marks), breast milk expression (40 marks), storage and transportation of colostrum breast milk to the hospital (26 marks). The total score is categorized into either competent (from 80% of the total score and more) or incompetent (less than 80% of the total score). The total practice scores equal to 112.

4.4.3. Very Low Birth Weight Clinical Outcomes' Record

It was developed by the researchers based on relevant literature *Moyer-Mileur, (2007)* and *Goldberg et al. (2018)* to assess the clinical and nutritional outcomes of the very low birth weight infants in both study and control groups. The measured outcomes included two main parts.

The first part included growth parameters and complications occurrence. The record included daily infant weight, weekly body length, frontal occipital circumference, intake and output, and complications (abdominal distension, emesis, change in stool frequency, sepsis (CRP), and length of hospital stay). The information recorded in this tool is used to calculate weight gain, length gain, head circumference gain, intake and output, and incidence of various complications.

The second part included the nutritional outcome scale adopted from *Moyer (2007)* and *Goldberg et al. (2018).* This scale formed of two variables**:** *linear gain rate (weight and height)* and *days to regain birth weight* to evaluate the level of malnutrition for both groups of very low birth weight infants. Testing reliability of the scale items using alpha Cronbach test = 0.83.

Scoring system

Linear gain rate (weight and height) is scored on a scale of 0 (not present) to 3 (severe): 0 = good nutrition, 1 = Mild, 2 = Moderate, 3 = Severe malnutrition. A total score range of 100%, where ≥ 75% indicates good nutrition <75% mild malnutrition, 50% indicates moderate malnutrition, and 25% denotes severe malnutrition. The item scored on a scale of 1 (mild) to 3 (severe) for the days to regain birth weight. A total score range of 21 days, where 15-18 days indicates mild malnutrition, 19-21days denotes moderate malnutrition, > 21 signifies severe malnutrition.

4.5. Procedures

The study's preparatory phase started with an extensive review of relevant literature using textbooks, periodicals, and journals to search for the research problem, select the study tools, and develop the intervention program and guiding booklet. The researcher assesses the study setting; explores the availability of the study sample. Validity and reliability of the study tools tested for their content and face validity through a panel of five experts (three professors of pediatric nursing and two professors of Neonatology and Obstetrics and Gynecology Medicine). Tool reliability tested using Cronbach's alpha coefficient test. Structured interview questionnaire reliability equal to 0.996, and mothers' practice observation checklist reliability equal to 0.994.

The exploratory phase started after official approval issued from the hospital manager and head nurses supervising the setting mentioned above. A pilot study carried out on 10% of the studied sample involved eight mothers and their very low birth weight infants to test the tools' clarity, applicability, objectivity, the time required filling each tool, and feasibility of conducting the study. Simple modifications were carried out based on the pilot study results to develop the final form of the questionnaire, and the subjects included in the pilot study were excluded later from the study sample.

Development of the colostrum feeding intervention began by setting the general objective that trains the mothers of very low birth weight infants on colostrum feeding to improve their infants' clinical outcomes. Content of the intervention program encompassed definition of colostrum milk, the definition of exclusive breastfeeding, ideal frequency of colostrum and breast milk expressing/day, benefits of colostrum feeding for mother and neonate, maternal barriers of colostrum expressing, neonatal barriers for breastfeeding among low birth weight infants, benefits of breast milk expression, methods of breast milk expression, storage and using of expressed breast milk for low birth weight infants. It was designed in the Arabic language to meet mothers' actual educational needs.

The researcher selected the teaching methods and developed audiovisual materials accordingly. The teaching methods included mini-lectures, group discussion, simulation, demonstration, and re-demonstration. The audiovisual materials incorporated posters, video films, and PowerPoint presentations using the researcher's Lap Top and an Arabic booklet printed to be used as supportive teaching materials. The researcher prepared the wanted equipment that assisted mothers to apply what is learned, such as hand soap, kidney basin, warm water, sterile gauze, sterile breast pump and bottle, and small ice tank. The researcher used a mobile phone to provide the mothers with a book of simple photos and short videos for their very low birth weight to be watched immediately before and during milk expression at home to collect expressed breast milk

and store it. The hospitalized very low birth weight infants fed by the amount of expressed breast milk (study group) and another group (control group) feed by artificial milk.

The actual fieldwork was carried out from the beginning of August 2018 to the end of February 2019 for data collection and application of the intervention program. The researcher carried out an initial visit for NICUs and introduced herself to the unit's head nurse, explained the purpose of the visit, and gave her a simple explanation about the nature of the study, its expected outcomes to the mothers, and their very low birth weight infant. The researcher was available three days/week in the morning shift at the allowed time of mothers' visit. Mothers were interviewed individually or in groups that included 5-6 mothers according to their readiness. Sessions were carried out in the hospital over two weeks (6 sessions), two sessions for theory, two sessions for practice, and two sessions for pre and post-test. The researcher conducted the session in the mothers' feeding area in each neonatal unit of the previously mentioned settings.

After the researcher obtained official permission, permission from the studied mothers got. Clear and straightforward clarification about the aim of the study was explained to all studied mothers. Mothers' participation was voluntary. The researchers ensured confidentiality of the studied mothers' data, and the head nurses informed about the nature of the study. Data related to the newborn infants (such as their gestational age, weight, head circumference, length, diagnosis) extracted from the newborn's medical file and nurses' notes.

The first intervention session was for the pretest. The second intervention (theoretical) session covered a part of the theoretical content that emphasized an overview of the definition and benefits of breastfeeding and factors that promote or hinder breast milk production. The third intervention (theoretical) session included indications and benefits of breast milk expression, methods of breast milk expression, storage, and use of expressed breast milk. The fourth intervention (practical) session covered some practical content, underlined hand washing, breast care, and breast massage.

The fifth intervention (practical) session included breast milk expression, storage, and transportation of expressed breast milk to the hospital safely, feeding for very low birth weight correctly. The sixth intervention session was for the post-test. The researcher explained all theoretical aspects of colostrum and breastfeeding and breast milk expression and revised it with mothers through group discussion at the end of each theoretical session. The researcher demonstrated all practical parts for the mothers using real objects and instructed mothers to watch the previously obtained illustrated books with simple photos and short videos for their own very low birth weight infants to be watched during breast care, massage, and milk expression at home to enhance milk production.

Mothers encouraged increasing the frequency and duration of their breast milk expressions during the 24 hours. They were taught to accurately measure the volume of expressed breast milk and storage by using graded sterile bottles until the second day for use in the feeding of the study group of very low birth weight infants. The researcher observed each mother individually during re-demonstration for all practical parts. At the end of each session, the researcher summarized the content and got feedback from the audience. For both groups, enteral feedings started when determined by the attending physician in the NICU. Infants were fed either by artificial milk (control group) or by colostrum (study group) from the time enteral feeding started until discharge. Enteral feedings were given either by the assigned nursing staff or by one of three research assistants who are staff nurses at the NICU and trained in the enteral feeding technique.

The researcher carried out a baseline assessment for all very low birth weight infants regarding gestational age, birth weight, method of delivery, length, frontal-occipital circumference, and feeding condition. Weight gain, progress, changes, devices, and treatment were used for each case to select the study subjects fulfilling the study inclusion criteria of both groups: monitoring growth parameters, clinical, nutritional outcomes, and complications. Daily weighing infants until regained average birth weight, weekly follow up for length and head circumference, amount of milk feeding, the day of infants' life reached 160 ml/kg/day, and the appearance of any complications is recorded for both group after feeding with colostrum and breast milk or artificial milk and compare between the two groups.

In the end, the program evaluated by re-observing mothers' practices immediately after the program and one week later at follow-up (before discharge). The researcher used the mothers' practice observation checklist to assess mothers' practices regarding colostrum and breastfeeding and breast milk expression. Growth parameters, nutritional outcomes, and complications were measured daily for both groups (study and control group) by the researcher to assess linear gain rate (weight and height), days to regain birth weight complications, and level of malnutrition.

4.6. Data analysis

Data collected, organized, revised, and coded, tabulated, and analyzed using the Statistical Package for Social Science (IBM SPSS) version 20. Numerical data presented as a number, percentage, mean, and standard deviations. The comparison between qualitative data pre and post-application of the nursing intervention was made using the Chi-square test, while quantitative data were compared using a Paired t-test. The confidence interval set to 95%, and the margin of error accepted was set to 5%. So, the p-value was considered significant as the following: $P>0.05$ (Non-significant), $P\leq0.05$ (Significant), and $P\leq0.01$(Highly- significant).

5. Results

Table 1 shows that nearly two-fifths (37.5%) of studied mothers' age ranged from 20 - <25 years with a mean ± SD of 28.8±5.2. Of notice that 50% of the mothers equally distributed between the age group of fewer than 20 years and over 30 years of age (25%) for each. Regarding mothers' level

of education, one-quarter (25%) had secondarily educated compared to 22.5% of them had primary or highly educated. The table also shows that 60% of the others were nulliparous, and 52.5% live within an extended family structure. Also, the majority of them (95%) had no previous colostrum feeding experience.

Figure 1 illustrates that the mothers were the primary sources of information were their families (50%), followed by friends (20%), then health care team and mass media (15%).

Table 2 displays very low birth weight infants' characteristics. It shows that near half (47.5%) of study group infants` age ranged from 34 -<38 weeks compared to 55% of the control group. Regarding very low birth weight, infants' birth length and head circumference were abnormal ranges in both groups, with a non-significant difference between both groups. The two groups matched all baseline characteristics with non-significance differences between them regarding delivery methods, birth length, head circumference, and duration of hospital stay.

As noticed from Table 3, most mothers' knowledge improved post-implementation of the colostrum and breastfeeding intervention program and at follow-up compared to pre-intervention level with a highly statistically significant difference between the three implementation phases at (p=0.001).

Figure 2 describes the studied mothers' total knowledge score. The figure illustrates that 83% of mothers have incorrect knowledge than 17% correct knowledge before program implementation. The same figure illustrates that 96%, 94% correct nurses' knowledge post-implementation and at follow-up, respectively, with a statistically significant difference between the three study phases at p=<0.001.

Table 4 clarifies that there were highly statistically significant differences between the three phases at p<0.001 in mothers' competent practices regarding all colostrum and breast milk feeding procedures.

Figure 3 describes the studied mothers' total practice score. The majority of them (85%) were incompetent before intervention program implementation, which improved for most of them (96%) perform competently immediately post-intervention program implementation. However, the same figure illustrates that the majority of studied mothers (94%) had a competent level in their total practice scores at the follow-up phase of the intervention program, with a highly statistically significant difference (P<.0001).

Table 5 reveals the clinical and nutritional outcomes of both groups. A highly statistically significant difference between study and control group infants regarding weight, length, head circumference gain, age at enteral intake of 100 ml/kg/day, age at full enteral intake, complication, and length of hospital stay. The table also reveals that 87.5% of the study group infants passed without complications than 50% of the controls.

Figure 4 reveals studied very low birth weight infants' nutritional outcomes in both groups. Concerning linear weight gain rate, significant improvement was indicated in the study group as 85% of them have no malnutrition compared to 3% of the controls. Also, 2% of the study group infants have severe malnutrition compared to 37% of the controls. A highly statistically significant difference appears between both groups.

Figure 5 reveals studied very low birth weight infants' nutritional outcomes according to days of weight gain. It reveals significant improvement in study group weight that 86% had a mild level of malnutrition compared to 30% of the controls at 15-18 days. Also, the figure shows that 60% of the controls suffer from moderate malnutrition compared to 10% of the study group infants at 18-21 days, with a statistically significant difference (P< 0. 05) between both groups.

Table (1): Frequency and percentage distribution of the studied mothers according to their characteristics (n=80).

Mothers' Characteristics	Studied Subjects	
	No.	%
Age (Years)		
15 - < 20	20	25
20 - < 25	30	37.5
25 - < 30	10	12.5
30 +	20	25
Mean±SD	28.8±5.2	
Level of education		
Cannot read and write	10	12.5
Read and write	14	17.5
Primary education	18	22.5
Secondary education	20	25.0
High education	18	22.5
Mothers' Parity		
Nulliparous	48	60.0
Multiparous	32	40.0
Family structure		
Nuclear	38	47.5
Extended	42	52.5
Previous Maternal Colostrum feeding Experience		
Yes	4	5.0
No	76	95.0

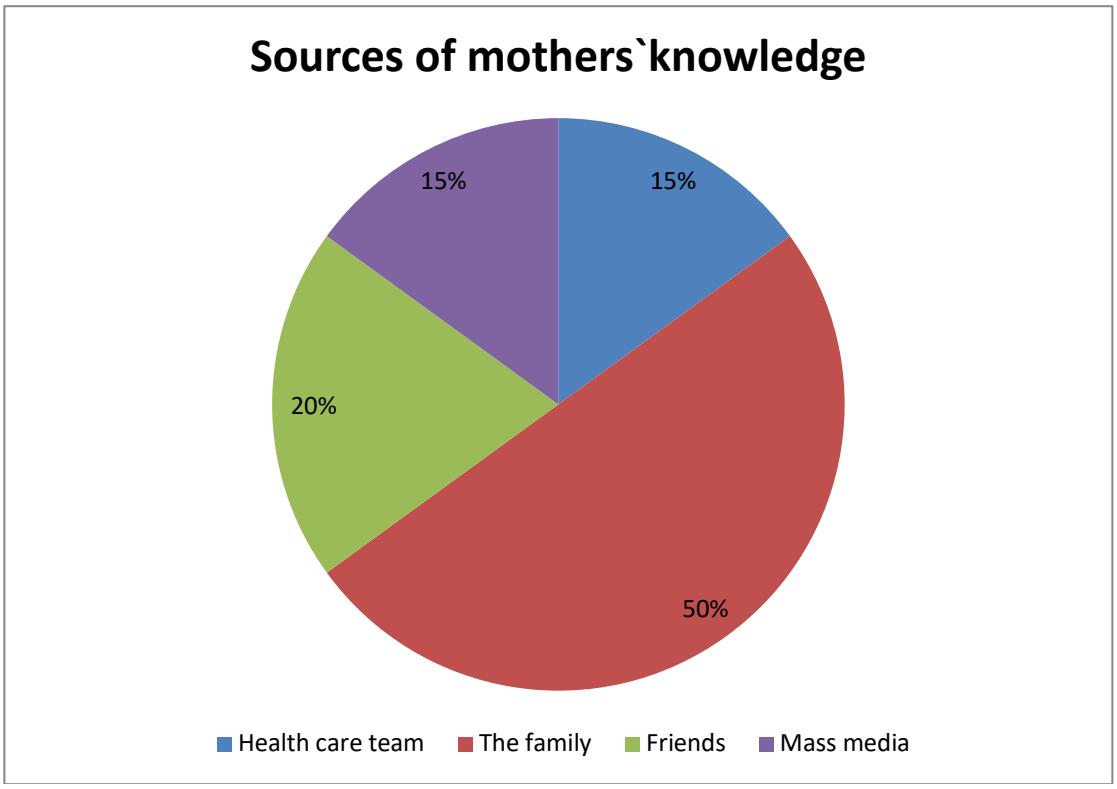

Fig (1): Percentage distribution of mothers regarding the source of knowledge about colostrum feeding and its collection (n=80).

Table (2): Frequency and percentage distribution of the studied very low birth weight infants according to their characteristics.

Neonates' Characteristics	Study group (no=40)		Control group (no=40)		Test of significance	P-value
	No	%	No	%		
Gestational age (Weeks)						
26 - < 30	3	7.5	2	5.0	$x^2 = 1.09$	>0.05
30 - < 34	18	45.0	16	40.0		
34 - ≤ 38	19	47.5	22	55.0		
Mean±SD	31.08±2.53		32.37±2.62			
Birth weight (Grams)						
1000 - < 1250	16	40.0	17	42.5	$X^2= 2.72$	>0.05
1250 - ≤1500	24	60.0	23	58.5		
Mean±SD	1291.8±105.3		1290.3±177.4			
Mode of delivery						
Normal vaginal delivery	16	40.0	18	45.0	$X^2 =2.41$	>0.05
Cesarean section	24	60.0	22	55.0		
Birth length (Mean±SD)	45.8±0.4		47.1±0.2		T= 0.455	>0.05
Birth head circumference (Mean±SD)	30.8±0.2		29.9 ±0.6		T=0.055	>0.05
Duration of hospital stay (days)						
20 - < 30	12	30.0	5	12.5	$X^2 =1.96$	>0.05
30 - < 40	16	40.0	10	25.0		
40 - < 50	10	25.0	15	37.5		
50 - ≤ 60	2	5.0	10	25.5		

Table (3): Distribution of mothers' correct knowledge regarding colostrum and breast milk feeding pre/post-intervention program and follow-up (n=80).

Mothers` knowledge	Mothers' correct knowledge No=80			Test of significance		P-value
	Pre	Post	Follow up	$X^2$1*	X^2 2	
Definition of colostrum milk	20.0	98.0	95.0	0.392	24.44	<0.001
Definition of Exclusive breastfeeding.	22.0	96.0	94.0	2.50	10.00	<0.001
The ideal frequency of colostrum and breast milk expressing /day.	15.0	97.0	96.0	6.40	19.60	<0.001
Benefits of colostrum feeding for mother.	15.0	95.0	93.0	2.50	28.90	<0.001
Benefits of colostrum feeding for neonate	17.0	97.0	94.0	6.40	22.50	<0.001
Maternal barriers of colostrum expressing	10.0	97.0	95.0	14.40	16.90	<0.001
Neonatal barriers of breastfeeding	15.0	96.0	95.0	14.40	25.60	<0.001
Benefits of breast milk expression	20.0	95.0	93.0	2.5	10.00	<0.001
Methods of breast milk expression, storage, and using expressed breast milk	25.0	98.0	95.0	14.40	25.60	<0.001

** $X^2$1 = the difference between Pre and post-test, $X^2$2 = the difference between Post and follow-up tests.*

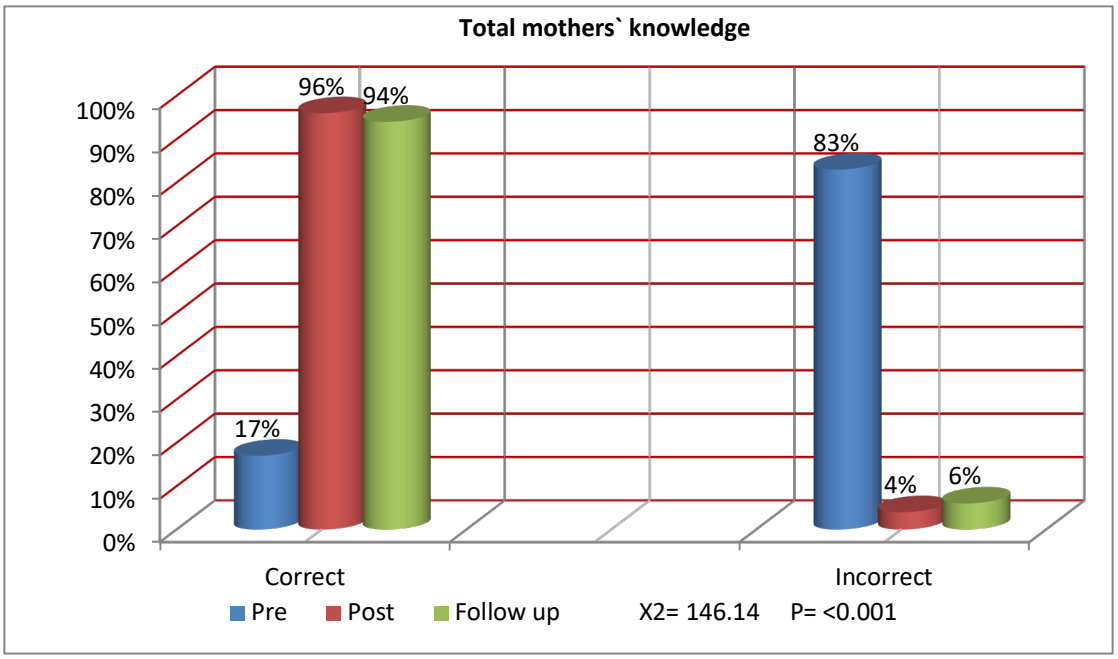

Figure (2): Distribution of total mothers' knowledge regarding colostrum and breast milk feeding pre/post-intervention program and follow-up (n=80).

Table (4): Distribution of mothers' competent practice regarding colostrum and breast milk feeding pre / post-intervention program and at follow up (n=80)

Mothers` practice	Mothers' competent practice			Test of significance		P-value
	Pre	Post	Follow up	$X^2$1*	X^2 2	
Hand washing	20.0	98.0	96.0	14.40	28.90	<0.001
Breast care	18.0	94.0	92.0	6.40	22.50	<0.001
Breast massage	15.0	92.0	92.0	14.40	16.90	<0.001
Expression procedure of milk	20.0	98.0	96.0	14.40	28.90	<0.001
Storage of colostrum and breast milk	24.0	97.0	95.0	14.40	25.60	<0.001
Transportation of expressed milk to the hospital	25.0	95.0	94.0	22.50	10.00	<0.001

**X^2 1= the difference between Pre and post-test, $X^2$2 = the difference between Post and follow-up tests.*

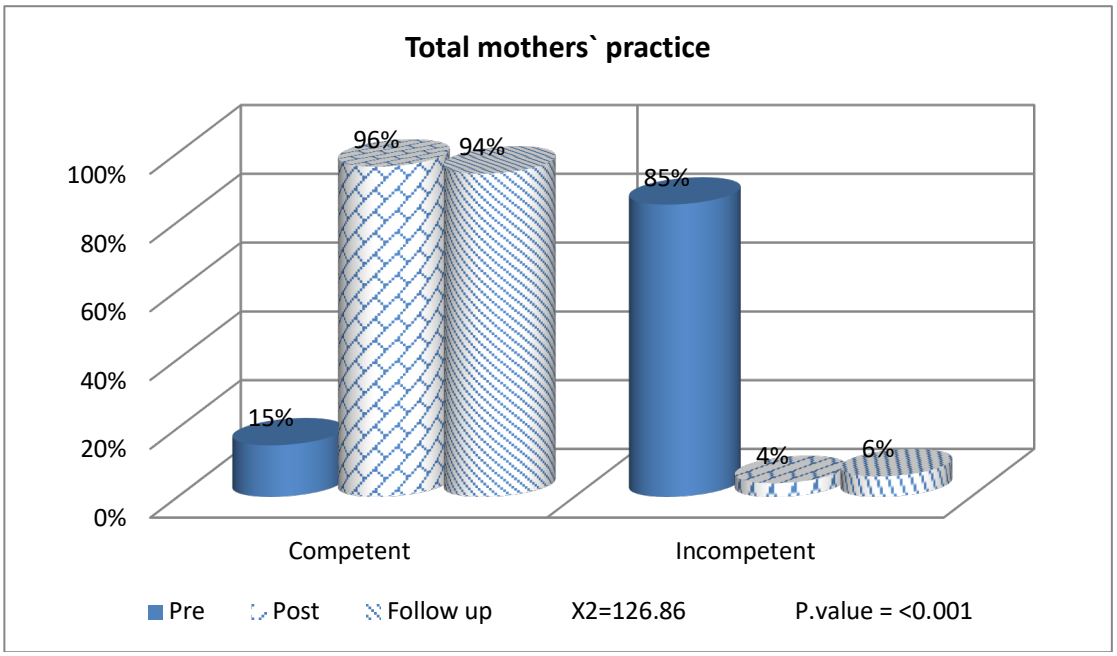

Figure (3): Percentage distribution of total mothers' competent practice regarding colostrum and breast milk feeding procedures pre / post-intervention program and follow-up (n=80).

Table (5): Clinical and nutritional outcomes of study and control groups after colostrum and breast milk feeding intervention (n=80).

Variables	Study group	Control group	Test of significance	P-value
Weight gain (gm /kg/day)	16.8±5.5	13.8±4.7	t=18.73	<0.001
Length gain (cm)	0.76±0.2	0.58±0.19	t=12.63	<0.001
Head circumference gain (cm)	0.59±0.16	0.49±0.11	t=50.641	<0.001
Age at enteral intake of 100 (ml/kg/day)	8.24±3.5	10.24±4.9	t=46.14	<0.001
Age at full enteral intake (160 ml/kg)	11.12±3.59	14.44±7	t=16.22	<0.001
Complications				
Abdominal distension	3 (7.5%)	6 (15%)	X^2=14.40	<0.001
Emesis	4 (10%)	5 (12.5%)		
Change in stools frequency	6 (15%)	4 (10%)		
Sepsis	2 (5%)	5 (12.5%)		
No complications	35 (87.5%)	20 (50%)		
Length of hospital stay (days)	22.76±8.8	28.52±7.9	t=18.63	<0.001

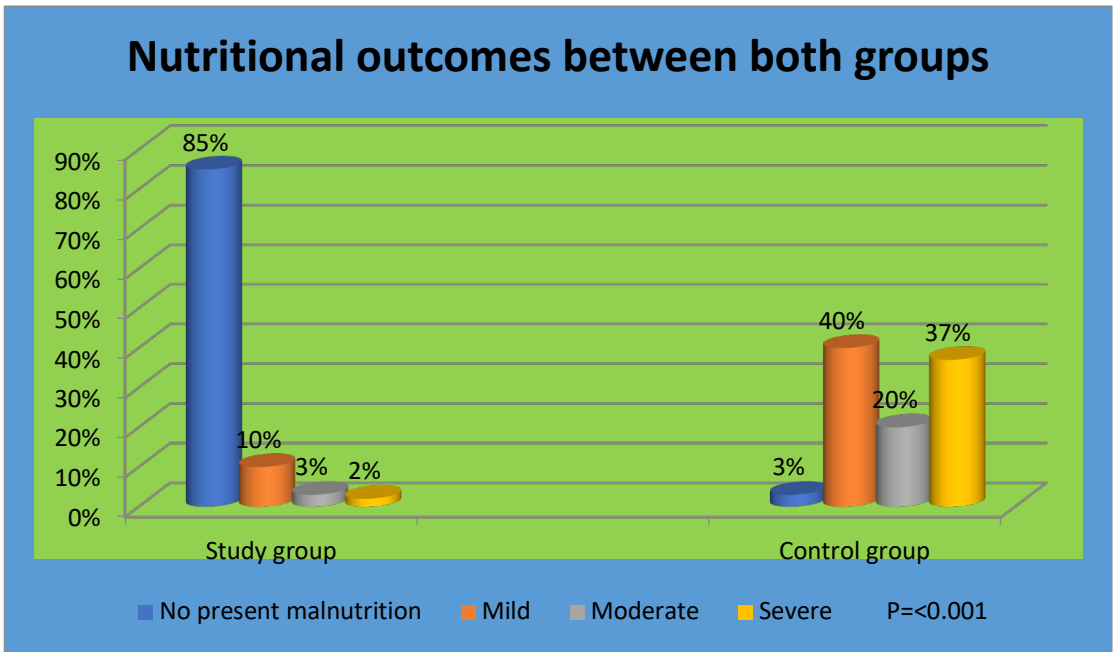

Figure (4): Frequency distribution of nutritional outcomes for both studied groups according to linear weight gain rate after colostrum and breast milk feeding intervention (n=80).

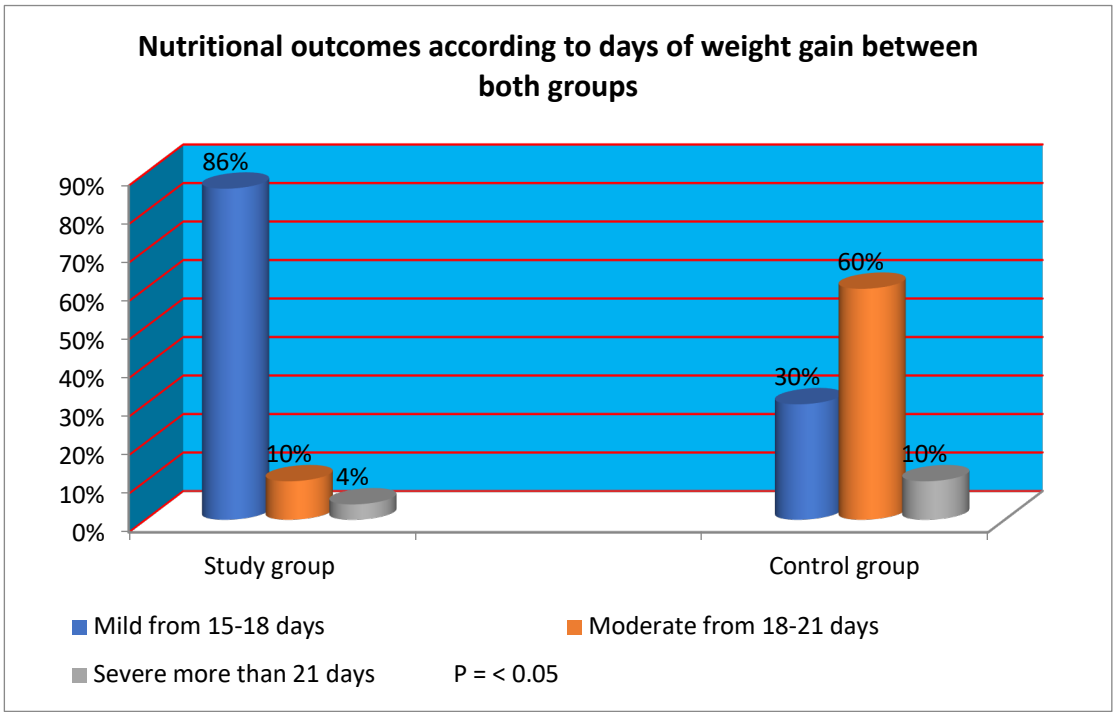

Figure (5): Distribution of nutritional level between both studied groups according to days of weight gain after colostrum and breast milk feeding intervention (n=80).

6. Discussion

American Academy of Pediatrics recommends colostrum and breast milk for all preterm and very low birth weight infants because of its proven short and long-term benefits. Nutrition is a significant element of care for those infants. Breast milk feeding on the preterm and very low birth weight infant's mother is the preferred enteral feeding *(El Sakka, El Shimi, Salama & Fayez, (2016).*

Intervention program has a crucial role in improving mothers` knowledge and practices about colostrum collection and the effect of colostrum feeding on hospitalized very low birth weight infants. This study aims to evaluate the effect of colostrum feeding intervention on the clinical and nutritional outcomes of very low birth weight infants.

The current study revealed that the higher percentage of mothers' age ranged from 20-<25 years, with a mean±SD of 28.8±5.2. Similar findings were reported by *Mohammed (2019),* who mentioned that the mean age of mothers was 28.6±6.2 years. This result contradicted *Jihye and Kyung (2012)*, who reported in a similar study that the mean age of the studied mothers was 32.65±3.24 and 32.41±3.02 years in the experimental and control group respectively. One of the notable findings in the current study was that half of the sample was equally distributed between 15 - 20 and over thirty years of age.

This finding may reflect the risk of extreme maternal age on the delivery of low-birth-weight infants. The researchers' opinion about the increased prevalence of very low birth weight and prematurity of infants was due to the early marriage of younger mothers and ignorance of antenatal care and follow-up. This finding documented in the earlier researches done in the United States by *Fraser, Brockert, and Ward (1995); Weng et al. (2014)*, who evidenced that the younger mothers (13 to 17 years) of age had a significantly higher risk at ($p<0.001$), and older teenage mothers (18 or 19 years) of age also had a significant increase in delivering of low birth weight, premature, or small for gestational age infant. Similar findings were also reported by a recent population study conducted in Brazil and UK by *Restrepo-Mendz, et al. (2014),* who observed an association between low birth weight infants and younger mothers' age (< 20 years). This risk remained high or increased for older mothers (≥ 35 years).

Regarding mothers' level of education, around one-quarter of the studied mothers had primary, secondary, and high education levels. Also, the majority of them had no previous colostrum feeding experience. This finding might indicate that the mothers' educational level could not be a factor in delivering a low birth weight infant. This finding is supported by *Hidayat, Ajiz, Achadiyani, and Weng Krisnadi (2016)*; *Mohammed (2019)*, who proved that there was no significant correlation of educational level with preterm birth. Also, there is no significant relationship between a mother's education and preterm birth or experience of high-risk pregnancy and delivery.

Thus, education is not perceived as a risk factor. However, this finding was not supported by *Muthayya (2009),* who mentioned in a similar study that maternal illiteracy and low socio-economic standard were significant risk factors for intrauterine growth retardation in the developing world, lacking proper health systems and resources, and the level of maternal education may be of prime importance in the determination of health outcomes of mothers and their infants and children. A meta-analysis report published in *2013 by Silvestrin* and colleagues stated that despite high maternal education showed 33% protective effect against low birth weight, medium degree of education showed no significant protection when compared to low maternal education; the overall conclusion was not confirming a relationship between maternal education and low birth weight *(Silvestrin et al., 2013).*

The researchers' opinion about risk factors of prematurity and very low birth weight between infants is illiteracy, low socio-economic standard ignorance of antenatal care, and follow-up.

About the parity and family structure of the studied mothers, results of the current study indicated that more than half of mothers were nulliparous mothers who live in an extended family structure. These findings supported *Mohammed (2019)*, who reported that more than half of mothers were nulliparous mothers living within an extended family structure. This result was inconsistent with *Bai, Felix, Wong, Bauman, and Mohsin (2002),* who reported in their study that most of the studied mothers were multiparous. In the same context, *Başer et al. (2013)*; *Mohammed (2019)* found in their study that, neonatal complications including low birth weight, low Apgar scores, and NICU admissions were higher in nulliparous women. *Hinkle et al. (2015)* report one explanation for this phenomenon, which hypothesized that the first pregnancy primes the body, and with each subsequent pregnancy, the body is more efficient. Hinkle and colleagues also documented a non-linear association as birthweight continued to increase up to parity four and appeared to stabilize between parity 4 and 7. A similar explanation, also stated by *(Khong, Adema, & Erwich, 2003; Prefumo, Ganapathy, Thilaganathan, & Sebire, 2006).*

The current study displayed no significant differences between the two groups (study and control) regarding baseline characteristics as gestational age, birth weight, type of delivery, birth length, birth head circumference, and duration of hospital stay. This finding sustains matching between the two studied groups at the beginning of the study. Concerning gestational age (GA) of studied very low birth weight infants, results of the current study displayed that the mean gestational age was 32.37±2.62 and 31.08±2.53 weeks for study and control groups, respectively.

These findings supported *Santiagoa et al. (2018)*; *Mohammed (2019)* demonstrated in a parallel study that the X ± SD gestational age was 34 weeks and 32.5±2.35 weeks, respectively. Furthermore, this result was incompatible with *Héon, Goulet, Garofalo, Nuyt, and Levy (2014),* who mentioned in a similar study that the mean±SD GA of the studied neonates was 27.5±1.7 weeks. This difference between the current study and cited references may be due to the difference in study settings, sample size, and research methodology. Regarding the source of mothers' information about colostrum feeding and collection, the current study illustrates half of the mothers` information from their family and one-fifth of them from their friends. This finding may be explaining the misconceptions that might spread among mothers regarding colostrum feeding, particularly among nulliparous. This finding signifies the importance of the current study manual in filling that knowledge gap.

Moreover, the current study showed that more than two-thirds of the studied mothers' knowledge about colostrum and breast milk collection was incorrect before

the program implementation. This knowledge level was significantly improved for most of them after program implementation and maintained at the follow-up evaluation with high statistical significance difference that reflected the positive effect of the nursing intervention, as regards the definition of colostrum milk, the definition of exclusive breastfeeding, ideal frequency of colostrum and breast milk expressing /day, benefits of colostrum feeding for mother, benefits of colostrum feeding for neonate, obstacles of colostrum expressing for mother, obstacles of breastfeeding for low birth weight infants, benefits of breast milk expression, methods of breast milk expression, storage and using of expressed breast milk.

This preprogram finding may be because the settings or closed communities or some mothers` belief about colostrum is a harmful substance that should be discarded. The studied mothers did not follow any guidelines or even allow attending programs regarding colostrum and breast milk feeding collection or application, which negatively affected their awareness and performance. Alternatively, this may be because more than half of the studied mothers were nulliparous. The sudden arrival of the very low birth weight infants deprives the mothers of prenatal health teaching and preparation regarding breastfeeding.

These results were steady with findings of *Sohail and Khaliq (2017),* who stated in their study that more than a quarter of mothers were discarding colostrum believing that colostrum is non-milk and more than four-fifths of them thinking that it is non-nutritious and more than a tenth of them thinking that it is causing diarrhea. The finding of the current study post and follow-up improvement of mothers` knowledge due to the positive effect of the nursing intervention by explaining them misunderstandings. In this context, *Joshi et al. (2012); La Leche League International (LLLI) (2017)* found that colostrum is bright yellowish thick milk secreted from mammary glands during late pregnancy and continuing during the first few days after birth. Colostrum is rich in immunoglobulin (IgA, IgG, and IgM), enzymes, cytokines, and growth factors. Along with that, colostrum also has laxative effects that help the newborn excrete excess bilirubin and aid in passing the stool.

Similar misunderstandings reported by a qualitative study conducted in Aceh province in Malaysia investigated why mothers did not initiate early breastfeeding for their low birth weight infants. The study reported that they did not know that the neonates should be breastfed within an hour and because it was not in the culture or a widespread custom in their community. Other mothers said they did not give early breastfeeding because the condition of the neonates or their mothers prohibit for gave breastfed early because of culture and customs. All mothers who gave early breastfeeding within an hour after birth did so because it was suggested by the midwife and was not because of their initiative *(Satrinawati, 2014)*.

This finding is supporting the first research hypothesis. In this context, *Joshi, Barakoti, and Lamsal (2012); Mohammed (2019)* reported similar findings who evidenced a significant improvement in the majority of the total mothers' correct knowledge post nursing intervention compared to their pre-intervention level with the highly statistically significant difference that reflected the positive effect of the nursing intervention. These findings were discordant with *Roshan, Sajjad, and Tanvir (2018),* who reported in a similar study that all mothers in their study knew about the importance of breastfeeding. This difference may be due to cultural differences and different characteristics of the study subjects.

The mothers' improved knowledge also echoed on their improved practice. The present study demonstrates that the studied total mothers' practices improved throughout the intervention program implementation phases. Although most of the mothers had no previous training in colostrum expression, collection, and storage, besides about two-thirds of them are nulliparous; they do well in performing relevant procedures such as hand washing, breast care, breast massage, breast milk expression and storage, and transportation to the hospital. This improved practice was sustained at their follow-up evaluation. This finding may be due to the recurrent demonstration and re-demonstration with different teaching methods and instructional media besides the presence of the Arabic booklet within mothers' hands.

This finding also agreed with *Mohammed (2019)*, who reported an improvement in the majority of total mothers' competent practices post nursing intervention compared to their pre-intervention level with a high statistical significance difference. *Hoddinott, Tappin, and Wright (2008)* reported three Cochrane reviews of randomized controlled trials of interventions to promote and support breastfeeding. They reported that the tailored interventions to a particular cultural or socio-economic group and multifaceted intervention prove to be most effective *(Dyson, McCormick, & Renfrew, 2005; Renfrew et al., 2005; Britton, McCormick, Renfrew, Wade, & King, 2007; Gagnon, 2007)*. *Hanafi, Shalaby, Falatah, and El-Ammari, (2014); Mohammed (2019)* also reported similar findings that the training program of colostrum and breast milk feeding collection is essential and the percentage of mothers, who initiated early breastfeeding, gave colostrum, practiced feeding on demand and intended to continue breastfeeding should still be improved. This finding is supporting the first research hypothesis.

Concerning clinical and nutritional outcomes, the current study reveals statistically significant differences between the study and control group of the low birth weight infants regarding their weight gain, length gain, head circumference gain. The study also exhibited younger age for the enteral intake of 100ml/kg/day, full enteral intake of 160 ml/kg, fewer complications, and less length of stay among the study group infants, with a highly statistically significant difference between both groups. This result reflects the benefits gained by the study group infants due to early initiation of colostrum feeding and the supported training the mothers have been given.

El Sakka et al. (2016) also declared this result, who reported better growth with an increase in weight 16.8 and 13.78 g/kg/day (P=0.0430), length 0.76 and 0.58 cm/week

(P=0.0027), and head circumference of 0.59 and 0.5 cm/week (P=0.0217) in cases compared to controls respectively. Also, the duration of hospital stay was less in cases (22.76 *versus* 28.52 days) in controls. *El Sakka et al.* also reported a younger age at full intake than controls (160 cc/kg/day) with a statistically significant difference (P=0.04).

These results were also emphasized by *Barakat and Sutan (2014),* who report that early initiation of breastfeeding had an effect on neonatal mortality and ill health for low birth weight neonates who accept breast milk within the first hour after birth. These benefits are explained by *Thapa (2005)*, who refer these benefits to both the presence of immune factors and growth factors. Colostrum also contains vitamins, minerals, and amino acids needed by the neonates. *United Nations Children Fund (n, d)* added that colostrum provides protective antibodies and indispensable nutrients, essentially acting as the first immunization for newborns, strengthening their immune system and reducing the chances of death in the neonatal period. This justification was evidenced by the current study results that revealed fewer sepsis cases and more stool frequency among study group infants than controls.

This finding also agreed with *Joshi, Barakoti, and Lamsal (2012); La Leche League International (2017),* who indicated that colostrum is rich with immunoglobulin (IgA, IgG, and IgM), enzymes, cytokines, and growth factors. Along with that, colostrum also has laxative effects that help the newborn excrete excess bilirubin and aid in passing the stool. *El Sakka et al.* (2016) support this, and *Snyder et al. (2017)* reported similar findings and emphasized that the experimental application of colostrum and breast milk feeding resulting in a significant growth increase without significant complications. Widespread application in NICUs might lead to the shorter hospitalized duration of NICU admission, thus decreasing the cost and complications associated with a prolonged NICU stay.

The gross benefit of colostrum administration is evidenced by the current study findings that examine the linear weight gain rate and days of weight gain in very low birth weight neonates. It revealed a significant difference between both studied groups as most of the study group infants showed no malnutrition compared to three percent of the controls. Also, only two percent of the study group infants suffer from severe malnutrition compared to more than one-third of the controls.

Besides, according to their days of weight gain, the current study displayed that most of the study group had mild malnutrition at 15-18 days compared to thirty percent of the controls, and 60% of the controls suffer from moderate malnutrition compared to 10% of the study group infants at 18-21 days with a statistically significant difference between both groups. This finding might be referred to as the early initiation of colostrum feeding with its known multiple benefits. This study agrees with the *Seigel et al. (2013)* study findings that provide evidence of improved weight and nutritional status of extremely low birth weight neonates after early initiation of colostrum feeding. This finding is also similar to an earlier study conducted in India by *Singh and Srivastava (1992); Weldesamuel et al. (2018)* showed that neonatal and post-natal deaths were around 5-6 times lower in infants fed colostrum than among those not feed colostrum. Breastfeeding would reduce stunting if it provided inadequate quantity *Black et al. (2008)*. These findings support the second research hypothesis.

7. Conclusion

In conclusion, the current study evidenced statistically significant improvement in both mothers' knowledge and practice regarding the colostrum and breast milk feeding intervention for their very low birth weight infants, supporting the first and second hypothesis. Besides, a clinical and nutritional improvement was evident for the study group infants compared to their controls with a statistically significant difference between the two groups regarding their weight, length, and head circumference gain, age at enteral feeding intake of 100ml/kg/day, age of full enteral intake of 160 ml/kg. The study group also experienced fewer complications and shorter hospital stay than controls, with a statistically significant difference between both groups. The nutritional status revealed better nutritional levels among the study group infants than controls, with a statistically significant difference between both groups that support the third research hypothesis.

8. Recommendations

- Mothers who are expected to have very low birth weight infants should receive tailored intervention program regarding the importance of colostrum and human milk and how to express, store and transport breast milk and how is established during their infants' hospitalization.
- Emphasize the importance of policies for training the staff of maternity centers and hospitals to encourage early initiation of breastfeeding and exclusive breastfeeding, particularly for very low birth weight infants.
- Midwives can support community-based efforts to support colostrum administration to very low birth weight infants and exclusive breastfeeding. Breastfeeding plays an essential role in reducing neonatal mortality and should be strongly emphasized by programs attempting to reduce neonatal mortality.
- Further research is needed to determine if early colostrum administration can reduce neonatal morbidity and mortality.

9. References

Abie, B. M., & Goshu, Y. A. (2019). Early initiation of breastfeeding and colostrum feeding among mothers of children aged less than 24 months in Debre Tabor, Northwest Ethiopia: a cross-sectional study. *BMC Res Notes, 12*, 65 https://doi.org/10.1186/s13104-019-4094-6.

Bai, J., Felix, S., Wong, D., Bauman, A., & Mohsin M. (2002). Parity and pregnancy outcomes. Liverpool and Sydney, *Australia. American journal of obstetrics and*

gynecology, *186*(2), 274-8. https://doi.org/10.1067/mob.2002.119639.

Barakat, S., & Sutan, R. (2014). The effect of early initiation of breastfeeding on neonatal mortality among low birth weight in Aceh Province, Indonesia: An Unmatched case-control study. *Advances in Epidemiology.* http://doi.org/10.1155/2014/358692

Başer, E., Seçkin, K., Erkılınç, S., Fatih, M., Karsl, M., Yeral, I., Kaymak, O., Çağlar, T., & Nuri, D. (2013). The impact of parity on perinatal outcomes in pregnancies complicated by advanced maternal age. Department of Obstetrics and Gynecology, Zekai Tahir Burak Women" s Health Education and Research Hospital, Ankara, *Turkey, J Turkish-German Gynecol Assoc*, *14*(4), 205-9. http://doi.org/10.5152/jtgga.2013.62347

Black, R., Allen, L. H., Bhutta, Z. A., Caulfield, L. E., de Onis, M., Ezzati, M., Mathers, C., Rivera, J., Maternal & Child Undernutrition Study Group. (2008). Maternal and Child Undernutrition 1: global and regional exposures and health consequences. *The Lancet*, *371*(9608), 243-260. https://doi.org/10.1016/S0140-6736(07)61690-0

Baser, C., McGrath, J., Cong, X., Brownell, E. & Cusson, R. (2015). Direct-Breastfeeding Premature Infants in the Neonatal Intensive Care Unit. *Journal of Human Lactation,* sagepub.com/journals Permissions.nav. http://doi.org/10.1177/0890 334415581798 jhl.sagepub.com p 2-3.

Britton, C., McCormick, F. M., Renfrew, M. J., Wade, A., & King, S. E. (2007). Support for breastfeeding mothers. Cochrane Database Syst Rev, (1), CD001141. http://doi.org/10.1002/14651858.CD001141.pub3. [PubMed] [Google Scholar]

Cutland, C. L., Lackritz, E. M., Mallett-Moore, T., Bardaji, A., Chandrasekaran, R., Lahariya, C., Nisar, M. I., Tapia, M. D., Pathirana, J., Kochhar, S., Munoz, F. M., & the Brighton Collaboration Low Birth Weight Working Group (2017). Low birth weight: Case definition & guidelines for data collection, analysis, and presentation of maternal immunization and safety date. *Vaccine*, *35*(48 part A), 6492-6500. Vaccine. http://doi.org/10.1016/j.vaccine.2017.01.049

Davis, M. (2006). The premature infant located at www.premature infant health.asp.org. http://doi.org/10.3390/nu7010663.

Department of Obstetrics & Gynecology (2015). Increasing Breast Milk Supply, Von Voigtl, and er Women's Hospital, Michigan Medicine.

Dutta, S. Singh, B., Chessell, L., Wilson, J., Janes, M., McDonald, K., Shahid, S., Gardner, V. A., Hjartarson, A., Purcha, M., Watson, J., de Boer, C., Gaal, B., & Fusch, C. (2017). Guidelines for feeding very low birth weight infants. *Nutrients*, *7*(1), 423-442. http://doi.org/10.3390/nu7010423.

Dyson, L., McCormick, F., & Renfrew, M. J. (2005). Interventions for promoting the initiation of breastfeeding. Cochrane Database Syst Rev, 18;(2):CD001688. http://doi.org/10.1002/14651858.CD001688.pub2.. [PubMed] [Google Scholar].

El Sakka, A., El Shimi, S., Salama, K., & Fayez, H. (2016). Post-discharge formula fortification of maternal human milk of very low birth weight preterm infants: An introduction of a feeding protocol in a University Hospital Faculty of Medicine. Ain Shams University, Cairo, Egypt; Pediatric Reports 2016, *8*(3), 6632. http://doi.org/10.4081/pr.2016.6632

Fraser, A. M., Brockert, J. E. &Ward, R. H. (1995). Association of young maternal age with adverse reproductive outcomes. *N Engl J Med. 332*(17), 1113-1118. http://doi.org/10.1056/NEJM199504273321701

Gagnon, A. J. (2007). Individual or group antenatal education for childbirth/parenthood, or both. Cochrane Database Syst Rev; (3), CD002869. http://doi.org/10.1002/14651858.CD002869.pub2. [PubMed] [Google Scholar]

Goldberg, D. L., Becker, P. J., & Brigham, K., Carlson, S., Fleck, L., Gollins, L., Sandrock, M., Fullmer, M., & Poots, H. A. V. (2018). Identifying malnutrition in preterm and neonatal populations: Recommended Indicators. *J Acad Nutr Diet*. *118*(9), 1571-1582 https://doi.org/10.1016/j.jand.2017.10.006

Hanafi, M. I., Shalaby, S. A. H., Falatah, N., & El-Ammari, H., (2014). Impact of health education on knowledge of, attitude to, and practice of breastfeeding among women attending primary health care centers in Almadinah Almunawwarah, Kingdom of Saudi Arabia: Controlled pre-post study Taibah University. *Journal of Taibah University Medical Sciences***.** https://doi.org/10.1016/j.jtumed.2013.11.011

Héon, M., Goulet, C., Garofalo, C., Nuyt, A. & Levy, E. (2014). An intervention to promote breast milk production in mothers of preterm infant. *Western Journal of Nursing Research,* http://doi.org/10.1177/0193945914557501

Hidayat, Z., Ajiz, E., Achadiyani, A., & Krisnadi, S. (2016). Risk factors associated with preterm birth at Hasan Sadikin general hospital in 2015. Department of Obstetrics and Gynecology, Faculty of Medicine, Universitas Padjadjaran/Hasan Sadikin General Hospital, Bandung, Indonesia.P.7. *Open Journal of Obstetrics and Gynecology*, *6*(13), 798-806. http://doi.org/10.4236/ojog.2016.613098

Hinkle, S. N., Albert, P. S., Mendola, P., Sjaarda, L. A., Yeung, E., Boghossian, N. S., & Laughon, S. K. (2015). The association between parity and birth weight in a longitudinal consecutive pregnancy cohort. *Paediatr Perinat Epidemiol*, *28*(2), 105-115. http://doi.org/10.1111/ppe.12099

Hoddinott, P., Tappin, D., & Wright, C. (2008). Breastfeeding. *BMJ*, *336(7649),* 881-887. http://doi.org/10.1136/bmj.39521.566296.BE

Jihye, L. & Kyung, B. (2012). The effects of kangaroo care on maternal self-esteem and premature infants" physiological stability, College of Nursing, Seoul National University. The Research Institute of Nursing Science, Seoul National University.

Joshi, S., Barakoti, B., &Lamsal, S. (2012). Colostrum feeding: Knowledge, attitude, and practice in pregnant women in a teaching hospital in Nepal. Web med Central:

International Journal of Medicine and Molecular Medicine, *3*(8). http://doi.org/10.9754/journal.wmc.2012.003601

Khong, T. Y., Adema, E. D., & Erwich, J. J. (2003). On an anatomical basis for the increase in birth weight in second and subsequent born children. *Placenta*, *24*(4), 348–353. http://doi.org/10.1053/plac.2002.0922

La Leche League International (2017). What is colostrum? How does it benefit baby? 2016 [Cited on: March 04, 2017]. Available from: http://www. llli.org/ faq/colostrum.html.

Larroque, B., Bertrais, S., Czernichow, P., & Leger, J. (2001). School difficulties in 20-years old who were born small for gestational age at term in a regional cohort study. *Pediatrics*, *108*(1), 111–15. http://doi.org/10.1542/peds.108.1.111.

Ministry of Health and Population (2004). Basic essential obstetric care: Protocol for physicians, Arab Republic of Egypt, Chap. 12.

Mohammed, M. A. K. (2019). Early maternal practices for maintenance of breast milk flow during hospitalization of their high-risk neonates: An intervention nursing study". *IOSR Journal of Nursing and Health Science*, *8*(1), 26-37.

Moyer-Mileur, L., J. (2007). Anthropometric and laboratory assessment of very low birth weight infants: the most helpful measurements and why. *Semin Perinatol, 31*(2), 96-103. http://doi.org/10.1053/j.semperi.2007.02.006.

Muthayya, S. (2009). Maternal nutrition & low birth weight - what is really important? Division of Nutrition, St. John "s Medical College & Research Institute, St. John "s National Academy of Health Sciences, Bangalore, India. *Indian J Med Res*, 130, 600-608.

Parker, L. A., Sullivan, S., Krueger, C., Kelechi, T., & Mueller, M. (2012). Effect of early breast milk expression on milk volume and timing of lactogenesis stage II among mothers of very low birth weight infants: A pilot study. *Journal of Perinatology*, *32*(3), 205–209. http://doi.org/10.1038/jp.2011.78.

Prefumo, F., Ganapathy, R., Thilaganathan, B., & Sebire, N. J. (2006). Influence of parity on first-trimester endovascular trophoblast invasion. *Fertility Sterility*, 5, 1032–1036.
https://doi.org/10.1016/j.fertnstert.2005.09.055.

Renfrew, M. J., Wallace, L. M., D'Souza, L., McCormick, F., Spiby, H., & Dyson L. (2005). The effectiveness of public health interventions to promote the duration of breastfeeding: systematic reviews of the evidence. London: National Institute for Health and Clinical Excellence, 2005

Restrepo-Mendez, M. C., Lawlor, D. A., Horta, B. L., Matijasevich, A., Santos, I. S., Menezes, A. M. B., Barros, F. C., & Victora, C. G. (2015). The association of maternal age with birth weight and gestational age: A cross-cohort comparison. *Pediatr Perinat Epidemiol*, *29*(1), 31-40. http://doi.org/10.1111/ppe.12162

Risnes, K. R., Vatten, L. J., Baker J. L., Jameson K., Sovio U., Kajantie, E., Osler, M., Morley, R., Jokela, M., Painter, R. C., Sundh, V., Jacobsen, G. W., Eriksson, J. G., Sorensen, T. I. A., & Bracken, M. B. (2011). Birth weight and mortality in adulthood: a systematic review and meta-analysis. *Int J Epidemiol*, *40*(3), 647–61. http://doi.org/10.1093/ije/dyq267. 5.

Romano-Keeler, J., Azcarate-Peril, M. A., Weitkamp, J. H., Slaughter, J. C. & McDonald, W. H., Meng, S., Latuga, M. S., & Wynn, J. L.. (2017). Oral colostrum priming shortens hospitalization without changing the immune microbial milieu. *J Perinatol*, *37*(1), 36-41. http://doi.org/10.1038/jp.2016.161.

Roshan, R., Sajjad, S., &Tanvir, S. (2018). Impact of maternal education and source of knowledge on breastfeeding practices in Rawalpindi city. Armed Forces Postgraduate Medical Institute, Pakistan. *MOJ Current Research & Reviews*, *1*(5), 5. http://doi.org/10.15406/mojcrr.2018.01.00035

Santiagoa, L. T. C., Júnior, J. D. M., Freitas, N. A. & Rugolo C. S. (2018). Colostrum fat and energy content: Effect of gestational age and fetal growth. Universidade Estadual Paulista, Botucatu, SP, Brazil.

Satrinawati, (2014). Determinant factor of neonatal mortality among low-birth-weight neonates in Aceh Province, Indonesia, Medicine Faculty, National University of Malaysia, Kuala Lumpur, Malaysia.

Seigel, J. K., Smith, P. B., Ashley, P. L., Cotton, C. M., Herbert, C. C., King, B. A., Maynor, A. R., Neill, S., Wynn, J., & Bidegain, M. (2013). Early administration of oropharyngeal colostrum to extremely low birth weight infants. *Breastfeeding Medicine*, *8*(6). https://doi.org/10.1089/bfm.2013.0025

Silvestrin S., Silva C. H., Hirakata V. N., Goldani A. A., Silveira P. P., & Goldani M. Z. (2013). Maternal education level and low birth weight: a meta-analysis. *J Pediatr*, *89*(4), 339-45. http://doi.org/10.1016/j.jped.2013.01.003.

Singh, K. & Srivastava, P. (1992). The effect of colostrum on infant mortality: Urban-rural differentials. *Health and Population*, *15*(3&4), 94-100.

Snyder, R., Herdt, A., Mejias-Cepeda, N., Ladino J., Crowley, K. & Levy, P. (2017). Early provision of oropharyngeal colostrum leads to sustained breast milk feedings in preterm infants, *Pediatrics and Neonatology*, *58*(6), 534-540. http://doi.org/10.1016/j.pedneo.2017.04.003.

Sohail, J., & Khaliq, A. (2017). Knowledge, attitude, and practice of mothers regarding colostrum feeding to newborns in rural Pakistan: a cross-sectional study. *Khyber Med Univ., 9*(4), 192-196.

Thapa, B. R. (2005). Health factors in colostrum. *Indian Journal of Pediatrics*, *22*(7), 579-581. http://doi.org/10.1007/BF02724182.

United Nations Children's Fund, Child Info (n, d). Monitoring the situation of children and women; Statistic by Area/Child Nutrition, http://www.childinfo.org/breastfeeding.html.

Weldesamuel, G. T., Atalay, H.T., Zemichael, T. M., Gebre, H. G., Abraha, D. G., Amare, A. K., Gidey, E. B., & Alemayoh, T. T. (2018). Colostrum avoidance and associated factors among mothers having children less than two years of age in Aksum town, Tigray, Ethiopia: a cross-

sectional study. *BMC Res Notes*, 11, 601 https://doi.org/10.1186/s13104-018-3712-z.

Weng, Y. H., Yang, C. Y., Chiu, Y. W. (2014). Risk assessment of adverse birth outcomes in relation to maternal age. *PLoS ONE*, *9*(12), e114843. http://doi.org/10.1371/journal.pone, 0114843

Woodman, K. (2017). Providing the best medicine: summary of the evidence in support of breast (milk) feeding in neonatal units. Providing the best medicine: summary of the evidence in support of breast (milk) feeding in neonatal units. Edinburgh: NHS Health, Scotland, P.5.

World Health Organization. (2005). Report on the regional consultation towards the development of a strategy for optimizing fetal growth and development. Cairo, Egypt 5-7 December 2005. Regional office for the eastern Mediterranean.

World Health Organization (2012). The Partnership for maternal, newborn & child health, save the children, WHO. Born too soon: the global action report on preterm birth. Geneva: (http://whqlibdoc. who.int/publications/2012/9789241503433_eng.pdf, March of Dimes, accessed October 13, 2014).

World Health Organization (2014). Preterm birth. Retrieved from http://www.who.int/mediacentre/factsheets/fs363/en/