Effect of Topical Application of Mother Milk on Umbilical Cord Stump Separation Time Compared To Ethanol in Healthy Newborn

Fatma Ahmed Ahmed Elsobky[1], Afaf Mohamed Mohamed Emam[2],
Somaya Ouda Abd Elmenim[3], Marwa Ahmed Shahin[4]

[1] Lecturer of Pediatric Health Nursing, Benha University, Egypt
[2,3] Lecturer of Obstetric & Women's Health Nursing, Benha University, Egypt
[4] Lecturer in Maternal and Neonatal Health Nursing Department, Faculty of Nursing, Menoufia University, Egypt

Abstract: **Aim of this study was to evaluate the effect of topical application of mother milk on umbilical cord stump separation time compared to ethanol in healthy newborn. Design: A quasi-experimental design was used for the study. Setting: The study was carried out in postpartum unite of obstetrics department at Benha University Hospital Sample: A purposive sample of 100 neonates randomly assigned into two groups (50) in mother milk group, and (50) in ethanol group. Tools: Data were collected through two main tools: Structured interview schedule and follow up observational checklist for monitoring signs of cord healing, cord separation time and signs of cord infection. Results: There was highly statistically significant difference in umbilical cord stump separation time, sign of cord infection, bleeding continuation and mucoid secretion in mother milk group as compared with ethanol group. Conclusion and recommendation: Topical application of mother milk on umbilical cord stump care leads to quick cord separation time, reduce the umbilical cord stump infection and it can be used as an easy, cheap and non invasive way for cord care. Therefore, it is recommended that study can be replicated on large sample size with longer duration in different setting so that the findings can be generalized to large population.**

Keywords: **topical mother milk the umbilical cord stump, ethanol, health newborn.**

1. INTRODUCTION

The most important time for the mother and newborn is during birth and in the hours and days immediately after childbirth. Around 75 percent of neonatal deaths occur during the first week of life, with the majority in the first 48 hours due to infectious causes. **(Blencowe, et al., 2011).**

The umbilical cord stump infections are most common cause of newborn morbidity and mortality in many developing countries, due to poor of hygienic care. According to a recent World Health Organization (WHO) predicted that 4 million neonates die annually during the neonatal period *(Mahrous et al., 2012). Oestergaard, et al. (2011)*, reported that more than 30 percent are caused by infections. Some of the infections are started by the umbilical cord infection. The umbilical cord is very nice for growing some benefit and harmful microorganisms (dangerous: clostridium tetani). Cord infection may be localized to the umbilical cord (omphalitis) or, after entry into the bloodstream, become systemic (e.g., neonatal sepsis) *Lawn et al. (2005), and Mullany et al. (2009)*. Data on the incidence of omphalitis in low-income countries is generally scarce; the available data estimate the risk to range between 2 and 77 per1000 live births in hospital settings, with fatality rates of between 1% and 15% depending on the definition of omphalitis used. *(Mir, et al., 2011)*.

Tetanus neonatorum one of the infections commonly occurs during the neonatal period and causing high mortality rate. This infection caused by clostridium tetani which go through the wound of umbilical cord stump. This is may be due to the poor of care, such as, cutting the umbilical cord using unsterile scissors or putting some spices on, or after cutting the umbilical cord using some ashes, soil, oil and some leaves. *(Sofiana, 2011).*

Many efforts prevent the umbilical cord stump infection. From the methods are used, for example using antiseptic such as alcohol 70 %, povidone iodine (betadine) 10 %, for a traditional method by using honey, ghee oil (India), or colostrum *(Sofiana, 2011).* In some countries are treated umbilical cord stump infection cases by using an septically technique. Other countries concerned to protect the umbilical cord stump from infection by applying topical breast milk. Some reports showed applying topical breast milk shortening umbilical cord stump separation time compared to antiseptic or nonantiseptic treatment. The treatment costs vary according to the method used. Hence, it is important to find cheap alternative care; for example breastfeeding/milk especially for low- income countries *(Mahrous et al., 2012).*

Factors that delay the process of cord stump separation are the application of antiseptics to the stump. Delayed cord separation with antiseptics may be due to a destruction of the normal flora around the umbilicus and a subsequent decrease in the number of leucocytes attracted to the cord. *(Whaly & Wong, 2003).* A meta-analysis of the of twenty-one study involving 8.959 participants to assess the effects of topical in preventing the umbilical cord infection, the researchers found that there was no benefit in using of antibiotics or antiseptic, it's just applying breast milk on the umbilical cord. They said that using of antiseptic actually prolong the time of the umbilical cord separation. *(Allam, 2015).*

Breast milk known as liquid gold is a deep yellow serous fluid containing a lot of antibodies IgA, IgG, IgM. It seems to have an effect of preventing of skin infection. Also have effect as antibacterial, antiviral, supporting body immune, promote recovery and musculoskeletal growth as well. Breast milk is easily available and easy to use as a non-invasive method for umbilical cord care. Application of breast milk had shorter umbilical cord separation time compared antiseptic solutions. Breast milk has been used as a home remedy for minor ailments, such as conjunctivitis, insect bites and stings, contact dermatitis, and infected wounds, burns, and abrasions. *(Park, 2006; Abd El Hamid, et al.,2011)*

According to the WHO, topical application of human breast milk to the umbilical cord stump can be beneficial due to its antibacterial factors, in addition to immunologic and anti-infective agents. Colostrum contains significant quantities of complement components that act as natural antimicrobial agents, in addition to protective factors that provide specific and non-specific passive immunity.*(Golshan, & Hossein, 2013).*

Umbilical cord care is part of the routine work of the nurse after baby bath every day in the hospital. Before mother discharge, the nurses should be educated about umbilical cord care at home. Nurses routinely provide umbilical cord care for babies and mothers care skills and find new parents often complain about problems such as delay in umbilical cord separation, blood/serous secretions, odor, and umbilical cord infection when they access clinic visits or call telephone help lines. This indicates the need and the request from new mothers and nurses to improve the umbilical cord care according to evidence-based practice. *(Huang, 2013).*

The Significance of the study: Umbilical cord infections contribute to the increased morbidity and mortality of newborns in developing countries. *(Dhanawade, 2014).* Annually about 3.3 million neonatal deaths occur around the world, More than 30% are caused by infections. Some of these infections start as umbilical cord infection. *Oestergaard, et al (2011)* Umbilical cord care is very important since infections of the cord can be so fatal that it may even lead to the death of the neonate. Despite the importance of umbilical cord care, both traditionally and medically, there have been few randomized trials, investigating the impact of different cord care regimen on umbilical cord separation time, particularly in developing countries. Several agents have been used for umbilical cord care. The most widely used agents include alcohol, triple dye, chlorhexidine 0.5%, silver sulfadiazine & bacitracin *(Karumbi, 2013)*. As the human milk doesn't cost anything, sterile, available and it can be used as an easy, and noninvasive way for the cord care, it is important to explore the possibility of using human milk topically to protect infants from umbilical cord infections in developing countries. A search of the literature found no study that compared human milk with ethanol 70% in benha university hospital. So, the researcher decided to compare the effect of topical application of mother milk on umbilical cord separation time compared to ethanol 70% in a healthy newborn.

ISSN 2394-7330

International Journal of Novel Research in Healthcare and Nursing
Vol. 4, Issue 1, pp: (1-11), Month: January - April 2017, Available at: www.noveltyjournals.com

Aim of the Study:

The study aimed to evaluate the effect of topical application of mother milk on umbilical cord stump separation time compared to ethanol 70% in a healthy newborn.

Hypothesis:

H1: There will be a significant difference in the timing of umbilical cord separation among mother milk group and Ethanol 70% group.

H2: There will be a significant difference in signs of umbilical cord infection, bleeding continuation and mucoid secretion among mother milk group and ethanol 70% group.

2. SUBJECT AND METHODS

Research design: A quasi-experimental design was be utilized for the study.

Setting: The study was conducted in postpartum unit of obstetrics and gynecology department at Benha University Hospital.

Sample: Sample type: Purposive sampling

Sample size: A total of 100 healthy newborn - mother pairs were recruited in the study and fulfills the inclusion criteria.

Inclusion criteria:

1. Mothers delivered by caesarean section

2. Mothers willing to co-operate for intervention and apply their breast milk to their babies' umbilical cord.

3. Healthy term (37-42 weeks) neonate.

4. Apgar score >7 at 1 and 5 minutes.

5. Normal birth weight from 2.5 to 3.5 kg.

6. Free from any medical complication or disorder.

7. Rooming in with the mother.

8. Mother with normal breastfeeding

9. Newborns from the first day of life.

Exclusion criteria:-

1. Newborns those are sick, unstable, and critically ill.

2. Newborns admitted to a neonatal intensive care unit (NICU).

3. Newborns that are having congenital anomalies.

4. Premature, preterm, low birth weight babies.

5. Newborns receiving antibiotics.

6. Gestational age more than 42 weeks.

7. Apgar score less than 7 degrees.

8. Mother with contraindicated of normal breastfeeding.

Sample technique: The sample was randomly assigned into two main groups (50) in mother milk group, and 50 in ethanol 70% group. The researcher recruited the odd numbers in mother milk group and the even numbers in ethanol group.

ISSN 2394-7330

International Journal of Novel Research in Healthcare and Nursing
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Tools of data collection: - Two tools were utilized for collecting data.

1- Structured Interview Schedule: It was developed by the research team after reviewing the related literature and was conducted to collect data related to the mothers and newborn. This tool included three parts: the first part includes data related to the mother's as age and educational level and residence; the second part includes data related to the neonate as gestational age, gender and birth weight. The third part includes mother's culture, beliefs, and habits about cord care.

 2- Follow up an observational checklist for monitoring signs of cord healing, cord separation time and signs of cord infection.

This checklist developed by the researchers and filled by them and was based on the objectives of the study. This included two parts: the first was checklist to follow up the compliance of mothers to type of cord care, the second one to monitoring cord separation time, check the presence or absent the signs of cord infection as (redness, swelling, secretion of blood or pus, odor or tenderness) till cord separation occur**.**

Validity and Reliability:

Data collection tools were submitted to three experts in the field of neonatology, obstetrics and pediatric health nursing to test the content validity. Modifications for the tools were done according to the experts' judgment on clarity of sentences, appropriateness of content and sequence of items. The experts were agreed on the intervention, but recommended minor language skills changes that would make the information clearer and more précis.

Ethical Considerations:

All mothers were informed about the aim of the study, its benefits, in order to obtain their acceptance to participate. The researchers informed them that the participation in the study is voluntary; they have the right to withdraw from the study at any time, without giving any reason and their responses would be held confidentially. Privacy and confidentiality of all the data will be assured. Informed consent (written or verbal) will be obtained from those who welcome to participate in the study.

A pilot Study:

A pilot study was carried out on 10% of the total sample (10) newborn to test the clarity and applicability of the study tools as well as estimation of the time needed to fill the questionnaire. According to the pilot study results, the necessary modifications were done in the form of added or omission of some questions. All mothers and their neonates participated in the pilot study were excluded from the study.

Field work:

After obtaining an official permission from the director of Benha university hospital and agreement of the chairman of obstetric and neonatology department, data were collected through a period of nearly 6 months from the beginning of May 2015 to the end of November 2015.

The researcher started the study by visiting the sitting of the study three days/week (Saturday, Monday and Wednesday) from 9.00 am to 2.00 pm. The researcher introduced herself and explained the purpose of the study to all mothers who met the criteria for inclusion in the sample.

All recruited mothers were informed that participation is voluntary and have the right of accepting or refusing participation in the study. Each mother was randomly assigned to the line of treatment. The researcher recruited the odd numbers in mother milk group and the even numbers in ethanol group.

The data collected from recruited mothers through interviewing questionnaire and follow-up an observational checklist for monitoring signs of cord healing, cord separation time and signs of cord infection.

The first method of data collection was interviewing. The researcher introduced herself to the participant mothers and obtained her approval to participate in the study. The researcher collected socio-demographic data related to the mother's age, educational level, residence, and parity. And data related to the neonate as gestational age, gender and birth weight. Data related to mother culture, beliefs and habits about cord care. The researcher asked questions in a simple Arabic language and recorded the answers in the structure interview tool. Interview consumed about 10 -15 minutes for each.

ISSN 2394-7330

International Journal of Novel Research in Healthcare and Nursing
Vol. 4, Issue 1, pp: (1-11), Month: January - April 2017, Available at: www.noveltyjournals.com

Each mother was interviewed to determine her perception about cord care best practice. The explanation for the mothers in both groups was done. The mothers were randomly assigned to two groups. Group (A) Mother milk group about a new method of topical application of breast milk on umbilical cord stump, the researchers recommended all mothers to wash their hands with water and soap prior to implementation of the umbilical cord stump care to ensure safety and prevention of infection. Mothers instructed after washing their hands with water and soap to scrub their breast milk (before lactation) on the remaining part of the cord about (4-6 drops) and its cut edge and let the milk get completely dry on the cord and should to beginning 3 hours after birth once every 8 hours (three times a day) for 2 days after the cord separation. Researcher instructed the mothers that nothing is applied to the cord stump, including a topical agent with breast milk, and keep diaper folded under the umbilical stump area to enhance dryness, healing and prevent contamination. Researchers gave each mother instructions about way of cleaning the umbilical cord stump and the surrounding skin area 3 times per day and as needed during diaper care.

Group (B) ethanol group: The umbilical cord of all the newborns was cut under a sterile condition in the delivery room and no antiseptic agent was used on the cord stump. Mothers were asked to clean the cord stump with 70% ethanol by sterile gauze or swab starting three hours after birth and continued every 12 hours till two days after umbilical cord separation. Mothers in this group was recommended not to use any other compound on the umbilical cord and were asked not to cover the cord with diapers and not to bath the newborns in bathtub till the cord is separated.

Total observation is done within the first three hours after birth at hospital and days 3, 7 and 2 days after umbilical cord separation. Mothers in the two groups received forms to record the exact time of mother's milk or ethanol application during the day. Moreover, they asked to record signs of cord infection daily in special forms, which includes discharge, redness, inflammation, and swelling of the umbilical cord. The mothers educated how to fill this sheet .All mothers were asked to continue completing the forms till two days after the cord separation. Follow-up with the mothers by telephone calls was done daily to get information on date and hour of cord separation. . In order to make sure the presence of the infection, researchers observed umbilical cord and in cases of delay in cord separation or any cord related adverse events such as blood leakage, mucoid discharge or granuloma formation the newborn was immediately visited by neonatologist. The cord generally falls off in 7 to 10 days.

Statistical design:

The collected data were organized, tabulated and statistically analyzed using SPSS software, version 21. For Quantitative data, the range, mean and standard deviation were calculated. For qualitative data, comparison between two groups and more was done using Chi-square test (c2). Level of significance $p<0.05$, 0.01, 0.001 were used as the cut of value for statistical significance.

3. RESULTS

Table (1): Shows that the mean age of the mothers was 25.52 ± 3.8 years in mother milk group compared to 25.76 ± 3.4 years in ethanol group. The mean birth weight in breast milk group was 3261.5 ± 149.10 kg while in the ethanol group was 3255. 38 ± 137.19kg. More than half (54%, 66%) of mothers live in rural area in mother milk and ethanol groups respectively.

Figure (1): Shows about (26% & 24%) of mothers in both groups can read and write, and more than half (52%, 54%) of both groups had primary education respectively, while (10%) of mother milk group were university graduate, with non-significance difference ($P>0.05$) between the two groups.

Figure (2): Illustrate that the percentage between genders of the neonates were approximately equivalent in male: female in mother milk and ethanol groups.

Table (2): Demonstrate that more than two third (74%) of mother milk group and majority (90%) of ethanol group used alcohol in cord care previously while more than half (56%) of mother milk groups sometimes used warm water in cord care and more than half (58%) of ethanol group never used warm water previously.

Table (3) Shows the highly significant difference between the two groups as regards cord separation times, it showed that the majority (88%) of mother milk group the cord were separated between 4 to 6 days as compared to (8%) in ethanol group. ($P\leq 0.001$).

ISSN 2394-7330

International Journal of Novel Research in Healthcare and Nursing
Vol. 4, Issue 1, pp: (1-11), Month: January - April 2017, Available at: **www.noveltyjournals.com**

Table (4): Showed that signs of cord infection and complications were less in the mother milk group as compared to ethanol group during the first and second follow -up visits.

Table (5): Revealed a highly significant difference (p <0.001) between mother milk and ethanol group. It shows earlier cord separation in mother milk than in ethanol group and bleeding continuation and mucoid secretion were less in mother milk than in ethanol group.

Table 1: Distribution of the studied sample according to their socio-demographic characteristics (n= 50 each group).

Variables	Mother milk group N (%)		Ethanol group N (%)		Test	P value
Mother's Age (years) Mean± SD	25.52 ± 3.8		25.76 ± 3.4		209	> 0.05
Birth weight (kg) Mean ± SD	3261.5 ± 149.10		3255. 38 ± 137.19		1.48	> 0.05
Residence						
Urban	23	46.0	17	34.0		
Rural	27	54.0	33	66.0	1.7	> 0.05
Employed	14	28.0	11	22.0	2.5	> 0.05
Parity						
Primi Para	14	28.0	18	36.0		
2-	22	44.0	19	38.0		
3-	8	16.0	10	20.0	16.19	> 0.05
> 4	6	12.0	3	6.0		
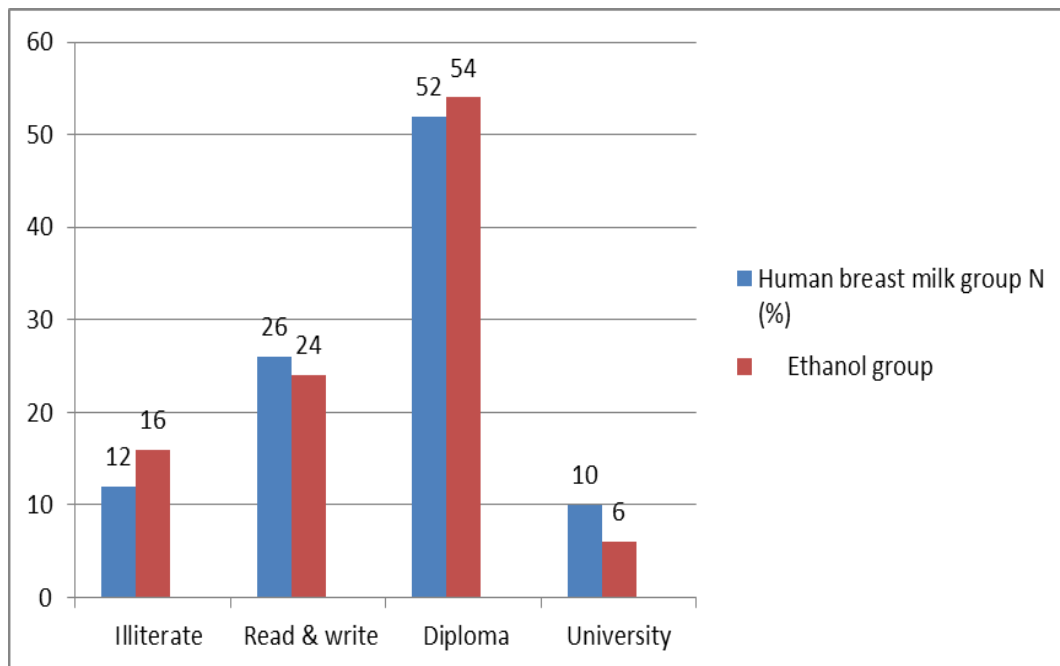
Fig (1): Distribution the studied sample according to their educational level

ISSN 2394-7330

International Journal of Novel Research in Healthcare and Nursing
Vol. 4, Issue 1, pp: (1-11), Month: January - April 2017, Available at: www.noveltyjournals.com
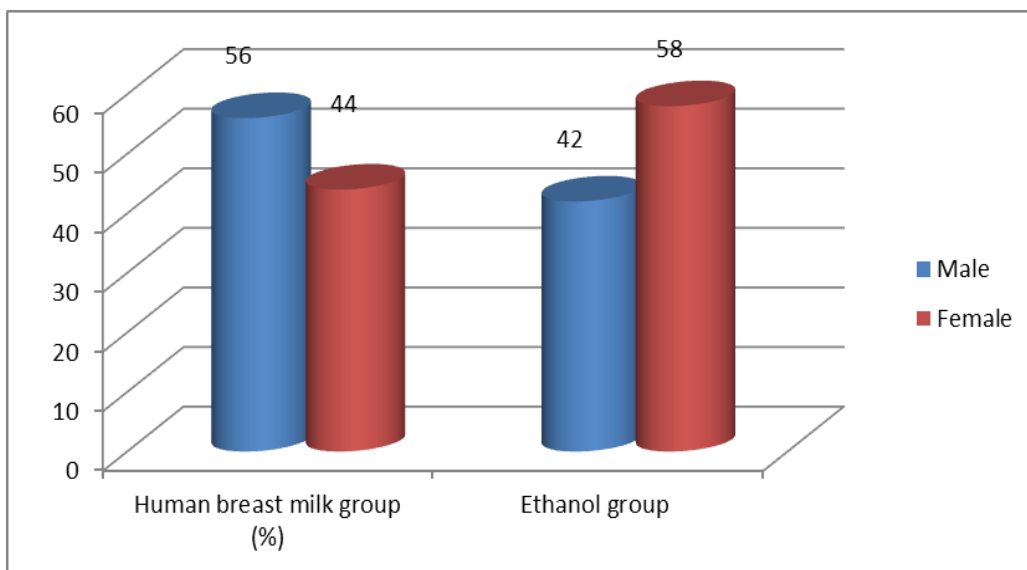
Figure (2) Frequency distribution of neonates' gender in mother milk and ethanol group

Table 2: Distribution studied sample regarding to their back ground about cord care methods (n = 50 each).

Cord care methods	Mother milk group N (%)						Ethanol group N (%)					
	Frequency of usage						Frequency of usage					
	Always		Sometimes		Never		Always		Sometimes		Never	
Warm water	9	18.0	28	56.0	13	26.0	6	12.0	15	30.0	29	58.0
Soap and water	19	38.0	31	62.0	0	0.0	6	12.0	11	22.0	33	66.0
Cooking oil	6	12.0	10	20.0	34	68	4	8.0	13	26.0	33	66.0
Olive oil	10	20.0	40	80.0	0	0.0	39	78.0	10	20.0	1	2.0
Alcohol	37	74.0	13	26.0	0	0.0	45	90.0	2	4.0	3	6.0
Dusting powder	31	62.0	19	38.0	0	0.0	10	20.0	5	10.0	35	70.0
Breast milk	4	8.0	8	16.0	38	76.0	3	6.0	47	94.0	0	0.0
Cord Bandaging on a abdomen	8	16.0	7	14.0	35	70.0	8	16.0	9	18.0	33	66.0
Beta dine	8	16.0	14	28.0	28	56.0	6	12.0	9	18.0	35	70.0
Ordinary water only	5	10.0	7	14.0	38	76.0	8	16.0	18	36.0	24	48.0

Table 3: Distribution of the studied sample according to the cord separation time per days (n = 50 each).

Variable	Mother milk group N (%)		Ethanol group N (%)		X^2	P value
Between 4-6 days	44	88.0	4	8.0		
6-10 days	6	12.0	8	16.0	13.11	0.001
More than 10 days	0	0.0	38	76.0		

A statistical significant difference (P ≤ 0.05)

A highly statistical significant difference (P ≤ 0.001)

ISSN 2394-7330

International Journal of Novel Research in Healthcare and Nursing
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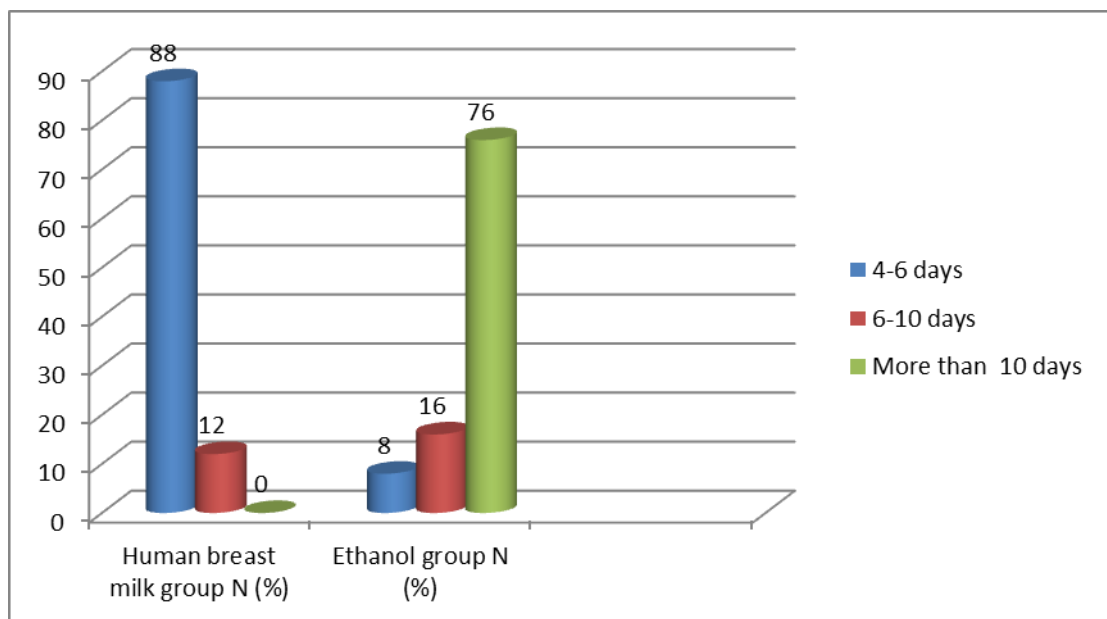
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Table 4: Distribution of the studied sample according to signs of cord infection in the first and the second visit.

Variable	First visit(3rd day)		P value	Second visit (7th day)		P value
	Mother milk n = 50 (%)	Ethanol 70% n = 50 (%)		Mother milk n = 50 (%)	Ethanol 70% n = 50 (%)	
Elevated baby body temperature	0(0.0)	0(0.0)	>0.005	0 (0.0)	3(6.0)	<0.001
Hotness and mild redness	9(18.0)	13(26.0)	< 0.001	1(2.0)	5 (10.0)	<0.001
Moderate or severe redness	0(0.0)	0(0.0)	> 0.005	0 (0.0)	3(6.0)	<0.001
Severe redness with pus	0(0.0)	0(0.0)	> 0.005	0 (0.0)	2(4.0)	<0.001
Foul odor of cord	0(0.0)	0(0.0)	> 0.005	0 (0.0)	5 (10.0)	<0.001
Exudates from the cord	0(0.0)	0(0.0)	> 0.005	0 (0.0)	4(8.0)	<0.001
Abnormal skin color	0(0.0)	0(0.0)	>0.005	0 (0.0)	8(16.0)	<0.001

Table 5: Mean scores of cord separation time, bleeding continuation and mucoid secretion among the two groups.

Variable	Mother milk (Mean ± SD)	Ethanol 70% (Mean ± SD)	T test	P value
Cord separation time (days)	4.68 ± 0.74	8.46 ± 1.11	19.65	<0.001
Bleeding continuation after separation (day)	1.44 ± 0.50	2.64 ± 056	12.66	<0.001
Moucouid secretion after separation (day)	1.26 ± 0.44	2.36 ± 0.48	10.57	<0.001

A statistical significant difference (P ≤ 0.05)

A highly statistical significant difference (P ≤ 0.001)

4. DISCUSSION

In this study human milk efficiency regarding the time of cord separation was analyzed. Human milk has many immunologic and disinfecting factors and is the best nutrition source for newborns. It protects newborns against the infections. As regards socio-demographic characteristic of the studied sample, the study results revealed that overall, the mothers in both groups, predominately, were: in their twenties; can read and write or secondary school graduates; and, housewives. There were no statistically significant differences between study and control groups in socio-demographic characteristics of mothers. This indicated that both groups were homogenous before conduction of the study. Similarly, *Abbaszadeh, et al (2016)* compared the impact of the topical application of human milk and chlorhexidine on cord separation time in newborns and found that the mean age of the mothers was 27.20 ± 5.14 years and approximately 35% of mothers had not completed their high education.

Concerning mother's knowledge about the care of umbilical cord, the findings of the present study illustrated that, most of the mothers in the two groups previously used alcohol in cord care, this may be related to increased awareness about cord care and that mothers have information about umbilical cord care. These results partially supported by (*Achora & Susan 2012)* who assessed knowledge attitudes and practice of postnatal mothers regarding care of the umbilical cord and reported that the knowledge on postnatal cord care continuity was dependant on who was caring for the cord, that was better knowledge was exhibited by the mothers who were helped by the students on domiciliary midwifery experience. *Priyadarshanie, & Pethiyagoda, (2015)* found in their study about mother's knowledge regarding neonatal baby care that knowledge of mothers was not of satisfactory level regarding umbilical cord care. More than half of them were with less than average knowledge level.

Concerning the comparison between signs of infection in mother milk and ethanol 70%, the present study showed significant difference with little infection in mother milk group than ethanol group. This may be due to, mother milk can be effective more than ethanol (broad-spectrum antibiotics) in reducing signs of infection of cord and human milk has many immunologic and disinfecting factors and is the best nutrition source for newborns and reduced bacterial colonization and leukocytes secretion, which were necessary for umbilical cord separation .These findings disagree with *Abbaszadeh,.etal (2016)*.Who reported no significant correlation between signs of infection (discharge, redness and swelling) in both groups. No cases of granuloma formation and sepsis were found in the present study and none of the neonates needed to be hospitalized.

As regards the mean score of cord separation time, bleeding continuation and mucoid secretion in mother milk and ethanol group the present study reported that, earlier cord separation in mother milk group than in ethanol group with less bleeding continuation and mucoid in breast milk than in ethanol group. This may be due to the effect of human breast milk in umbilical cord separation. Breast milk has a lot of immunologic and anti-infective agents and colostrum contains significant quantities of complement components that act as natural antimicrobial agents and is also equipped with protective factors that provide specific and nonspecific passive immunity. This study is supported by *Golshan & Hossein, (2013)* in his study about the impact of ethanol, dry care and human milk on the time for umbilical cord separation; found that the mean of umbilical cord separation time had significant difference among the three groups. Umbilical separation time in neonates of the human milk group had significant differences with the other two groups. A similar observation in the study reported by *Farahani, et al, (2008)* and *Ahmadpour-Kacho et al (2006)* who found that the mean of umbilical cord separation time in the human milk group was significantly lower than the other groups, and increased respectively in alcohol, drying and silver sulfadiazine groups.

5. CONCLUSION AND RECOMMENDATION

Use of the topical application of mother milk on umbilical cord stump was associated with shorter cord stump separation time than in ethanol 70%. Breast milk also reduced the incidence of cord infection and it can be used as an easy, cheap and noninvasive way for cord care. Therefore, it is recommended that the study can be replicated on large sample size with longer duration in the different setting so that the findings can be generalized to a large population.

ISSN 2394-7330

International Journal of Novel Research in Healthcare and Nursing
Vol. 4, Issue 1, pp: (1-11), Month: January - April 2017, Available at: **www.noveltyjournals.com**

Limitation of the study:

1- The difficulty of access to the mother to observe the umbilical cord

2- Two mothers withdraw from the study after the pair refused

3- Interfere with family members during the interview with the mother and the difficulty of persuading everyone

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