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Gold Standard Umbilical Cord Practices: Comparison of Dry Cord Technique versus 70% Alcohol Application among Neonates

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Abstract: **Although, umbilical cord care practices for newborns vary widely between health facilities it can lead to disruption for both nurses and parents. Dry cord care is one of the essential gold standard nursing practices recommended by the World Health Organization to reduce morbidity and mortality amongst neonates. *Purpose* of this study is to examine the effect of gold standard dry cord practices versus 70% Alcohol application among neonates. *Design:* A Quasi-experimental comparative study was utilized at Obstetric and pediatric departments of the University hospital and the Teaching hospital in Shebein El-Kom, Menoufia Governorate, Egypt. Two hundred neonates and their mothers were included. *Instruments*: three instruments for data collection were used; 1: Socio-demographic characteristics structured questionnaire: it consisted of two parts. *A:* Socio- demographic characteristics of studied mothers and their neonates. *B:* Mothers' knowledge about umbilical cord care: 2- Mother's competency of skills observation check list...3: Newborns' Umbilical Cord Condition structured questionnaire from their Mothers' Perspectives. 4: Newborns' Umbilical Cord Condition Observation Check List. *Results*: the study results indicated that, 89% of the mothers reported that the dry cord care technique was very effective in the healing of the umbilical cord stump. 90% reported that this technique was very effective in decreasing risk for infection. 86% reported that this technique was very effective in decreasing the duration of cord separation time. *The study concluded that* dry cord care technique was very effective in healing of the umbilical cord stump, decreasing risk of cord infection and decreasing the time of cord separation compared with 70% Alcohol technique. *Recommendation:* Dry cord technique is importantly *recommended* as natural, safe and evidence based method for better healing and separation of neonatal umbilical cord.**

Keywords: **Dry cord care, Alcohol cord care, and gold standard nursing intervention.**

1. INTRODUCTION

Recently, there is awful dispute among pediatric medical staff about the most "influential umbilical cord care for neonates". One hundred and thirty million babies are delivered annually, four million (3.1%) die within the first four weeks of life. Twenty-five percent of these deaths are as a result of "cord infections" **[11, 12].** There has been extensive scope of recommended practices related to umbilical cord care that have included a diversity of cleaning techniques and agents such as the triple dye, Betadine, alcohol 70%, sterile water, and dry cord care method. Recent evidence based researches indicated that the current standard of umbilical cord care based on traditions and historical practices rather than scientific knowledge and justification in the context of modernistic infection control policies. These studies recommend utilizing the traditional use of antimicrobials for natural healing **[2]**.

The umbilical cord is an unrivaled tissue consists of one vein and two arteries covered by a connective tissue called "Wharton's Jelly". This cord plays a vital role during pregnancy which transfers oxygen and nutrients to the fetus and removes the waste products **[1].** It usually separates between "5 and 15" days after the birth. Before the cord separation,

the remaining umbilical cord stump can be considered to be "a healing wound" and thus lead to infection through the blood vessels into the newborns' bloodstream. The neonate does not begin to develop their own protective flora until after twenty four hours of life. The umbilical cord stump is colonized by bacteria from the external environment such as mother's vagina, skin flora, and the caregivers' hands. **[3]**

Separation of the umbilical cord stump is mediated by "inflammation" of the junction of the cord skin of the abdomen with leukocytes infiltration and subsequent digestion of the cord. During the normal separation process, small amounts of "cloudy mucoid materials" may collect at the junction, and may be misinterpreted as pus. Furthermore, as the cord is drying and separating from the umbilical stump, the cord may appear sticky, moist, or smelly. This normal healing process called "mucky appearance", this appearance has not been associated with infection. Parents and nurses need to comprehend the difference between the normal healing processes and real symptoms and signs of infection. **[4]**

Omphalitis (infection of the umbilical cord stump) "first commenced" to be observed in the 1940s when the hospitals started isolation the mothers from their neonates. With an increased use of nurseries. "Colonization" rate with pathogenic organisms became significantly higher among neonates kept in nurseries than neonates in rooming with their mothers. In the developed countries, although rare, individual cases of cord infections persistent to occur in birthing centers and hospitals. "One-third" of the neonatal deaths are caused by "infections" in the developing countries, mostly due to the delivery environment. Omphalitis may be localized to the umbilical cord stump or, enter into the bloodstream, it becomes systemic and causes neonatal sepsis for this reason, "standardized umbilical cord care" is considered an worthy issue that needs to be addressed **[5].**

Delayed cord separation has also been proven to increase the incidence of infection **[6]**. The use of antimicrobial umbilical cord disinfection such as isopropyl alcohol (alcohol) has consistently been proposed to lengthen the cord separation time **[7]**. Despite many researches of many cord care regimens, recommended and practiced in the United States currently continue to vary from hospital to hospital and include the triple dye, isopropyl alcohol, povidone-iodine (Betadine), antibiotic ointments, soap and water, or no disinfectant at all**[8]**.

The World Health Organization (WHO) had been advocated since 1998 for the use of dry technique for umbilical cord care [keeping the cord clean without application of anything and leaving it exposed to air or loosely covered by a clean cotton cloth, in case it becomes soiled it is only cleaned with sterile water].**[9]** Also the American Academy of Pediatrics considered no antiseptic treatment to be superior to any other, but support the guidelines of the German Association for Neonatology and Pediatric Intensive Care who recommended with clean cord care and keeping the umbilical cord dry **[10]**.Further, Association of Women's Health, Obstetric and Neonatal Nurses, 2007 recommended no treatment at all for the umbilical cord care for the neonates and considered it this new approach as a golden standard of nursing care for neonate **[3]**.

Unfortunately, there was some confusion regarding the policy of umbilical cord care since both dry and wet techniques of cord care had been emphasized. This confusion resulted in conflicting information given to the parents. Also, many hospitals still utilized the traditional and old methods for umbilical cord care and not follow the world health organization recommendations. These strengthen and highlight the need for changing the policy of the practice and urgently use the recent gold standard nursing cord care. So, this study aims to investigate the effect of utilizing dry cord care technique compared with 70 % Alcohol application for neonates.

1.1 Purpose of the Study:

The present study aims to investigate the effect of utilizing dry cord care technique compared with 70% Alcohol application for neonates.

1.2 Research Hypotheses:

1. Neonates who utilized dry cord care technique will show better cord healing signs and decrease risk of infection than neonates who receive 70 % Alcohol application.
2. Neonates who exposed to dry cord care practices will experience shorter cord separation time than neonates who receive 70 %Alcohol application.
3. Mothers who utilize dry cord care practices will experience higher level of satisfaction compared with mothers who use 70 % Alcohol application.

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2. METHODS

2.1 Research Design:

A quasi experimental comparative research design was used for this study.

2.2 Settings:

The present study conducted at Obstetric and pediatric departments of University hospital and Shebein El-Kom Teaching hospital, Menoufia Governorate, Egypt

2.3 Sample and Sampling Technique:

Two hundred full term neonates and their mothers who were convenient at the time of data collection and meet the criteria for selection were included.

Inclusion Criteria for neonates:

1. Full term neonates
2. Medically stable
3. Not receiving any antibiotics or anti-inflammatory drugs

Inclusion Criteria for Mothers:

1. Medically stable
2. Have the desire to learn and practice

Based on the previous similar studies and inclusion \ exclusion criteria of the this study a total of (200) mothers were allocated into two groups: control group (n= 100) and experimental group (n= 100). The sample size was calculated at the confidence level of 99% and an acceptable margin of error at 10 %. The sample size was calculated using the following equation.

$$N= \frac{(z^2 p}{e^2}$$

$^{n=}$ **sample size**

z= z value for 99 % =2.57

p (prevalence)=0.5

q= (1-p) = (1-0.50)

e=margin of error=0.10

$$n= (2.57)^2 \times 0.50 \times (1-0.50) + (0.10)^2 = 189$$

So, considering the probability of loss, the sample size was increased to 200. The researcher added 11 cases to the total sample size to become 200 cases and the researcher divided it into 100 experimental and 100 control groups respectively.

2.4 Instruments of Data Collection:

Three instruments for data collection were developed by the researcher after a review of past and current literature.

Instrument one: Socio- demographic characteristics structured questionnaire: it divided into two parts.

Part one:

a- Socio- demographic characteristics of studied neonates.

It included, gender, gestational age, birth weight, actual weight, type of delivery and medical status.

b. Socio- demographic characteristics of studied mothers.

It included, Age, Education level, Occupation, Parity and type of delivery.

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Part two: **Mothers' knowledge structured questionnaire about Dry cord technique.**

Scoring system:

Weak	Medium	Good	Very good	Excellent
0	1	2	3	4

Instrument two: Mother's competency of skills about dry cord care observation check list.

Not Done	Poor done	Excellent done
0	1	2

Instrument three: Newborns' Umbilical Cord Condition from Mothers' Perspectives.

Scoring system:

Poor	Moderate	Good	Very good	Excellent
0	1	2	3	4

Instrument four: Newborns' Umbilical Cord Condition Observation Check List:

Scoring system:

Poor	Moderate	Good	Very good	Excellent
0	1	2	3	4

3. RELIABILITY OF THE TOOLS

The reliability of the tools was conducted to investigate the instrument internal consistency which used in the study. Internal consistency describes the extent to which all the questionnaire items measure the same concept or construct. Cronbach alpha coefficients were calculated to examine the measurement reliability with multipoint items. The accepted values of Cronbach alpha coefficient range from 0.60 to 0.95**. [14, 15]** The questionnaire items of the present study were proven reliable where $\alpha = 0.91$

3.1. Validity of the Tools:

Tools were reviewed by four experts in the field of pediatric nursing and newborn and maternity health (Two pediatric nursing experts and two experts in newborn and maternity health).

3.2. Data Collection Methods:

Data was collected at the first of October 2017 to the end of March 2018.

An official permission to carry out the study was obtained from the director of each setting after submitting an official letter from the Dean of the Faculty of Nursing at EL- Menoufia University and Vice Dean for post graduates studies and researches explaining the purposes of the study and methods of data collection.

Ethical Consideration: For ethical considerations an oral and written consent was obtained from mothers of the selected neonates to share in the study. Therefore, nature of the study, the objectives, its importance safety and confidentiality were explained. Mothers were informed about the privacy, and their right to withdraw at any time.

3.3. Pilot Study:

A Pilot study was carried out on 20 pre-term neonates (10% of the total sample) to test the clarity and applicability of the tools. No modifications were done. So, the pilot study sample was included in the total sample of the study.

4. PROCEDURE OF DATA COLLECTION

4.1. Assessment Phase:

This study compared **"**two umbilical cord care**"** procedures: dry cord care and 70% alcohol cord care techniques. Data collection was started on the first of October, 2017 and lasted until the end of March 2018. All necessary data were collected for all of the studied mothers and neonates who were available and meet the criteria for sample selection.

4.2. Implementing Phase:

All of the studied mothers and neonates were divided into two groups, group A and group B. Group A demonstrated dry cord care technique at the university hospital while group B demonstrated 70 % Alcohol cord care technique at the teaching hospital.

Procedure:

At 10 a. m. on the first day of study, all of the convenient mothers of the studied neonates in group A, instructed to use dry cord care technique while Group B, advised about prober use of 70 % Alcohol cord care technique.

A pre-test regarding use of dry cord technique was introduced to the studied mothers of group A. They also, given a schedule of the scientific sessions concerning dry cord care technique, it consisted of two sessions for each subgroup who included five available mothers to estimate twenty subgroups with a number of one hundred studied mothers and their neonates. Constructed scientific sessions were utilized. One session was applied at the first day of delivery after mothers' improvement and the other after two hours at the same day. It consisted of Educational presentation regarding {cord composition, blood supply, signs of healing, signs of infection and technique of dry cord care. Also, demonstration and re-demonstration of skills were performed.

A scientific colorful booklet was given to group A, it contains all the scientific information and its related colorful practices of dry cord care technique. All mothers instructed to visit hospital at pediatric department every three days for continuous checkup of neonates' umbilical cord condition. Posttest was completed from group (A) after completion of all scientific sessions and also after healing and separation of the umbilical cord. The same consequences were applied for group (B) who also divided into twenty subgroups with a number of five mothers in each group. They also received two scientific sessions concerning use of 70% Alcohol cord care. A comparison was done among two studied groups regarding umbilical cord condition and time of cord separation.

4.3. Reassessment Phase:

After each session each mother was asked to re-demonstrate the recommended umbilical cord technique to ensure competency of the skill. Also, they asked sparely to recall signs of good and boor healing of the umbilical cord. Neonates were reassessed every three days by the researcher for signs of umbilical cord healing and time of cord separation.

Statistical Analysis:

All statistical analyses were done using SPSS version 22. Initially, the internal consistency coefficients were examined to ensure the reliability of the used instrument for the present samples. Frequencies, means, and standard deviations were calculated to describe the samples. T-test was used to compare the means of two different groups. Independent t-test was used in order to compare the mean scores between groups before and after the intervention. Chi-square test was used for determining the differences between mother's and neonatal characteristics and the cord condition post-intervention. Statistical significance was considered at **p-value <0.05.**

5. RESULTS

Table (1): Socio-demographic characteristics of the studied sample. This table showed that, 68% and 75% were vaginal delivery for the dry cord group and 70% alcohol group respectively. Also, there was a highly statistical significant difference between the studied groups regarding type of feeding at discharge.

Table (2): Mothers' knowledge about umbilical cord care technique: This table showed that 60% of the studied sample used Alcohol cord care technique and believed that this technique is effective. Unfortunately, 85% of the sample didn't use dry cord technique and 50% of them believed that it isn't an effective method for healing of the umbilical cord.

Table (3): Mean and SD of mother's competency of skills regarding dry cord care technique. This table presented that there were highly statistical significant differences between pre and post- test of all aspects of mother's skills regarding dry cord technique.

Table (4): Comparison of umbilical Cord Condition post-intervention among two studied groups. This table clarified that, there were highly statistical significant differences between the dry cord care group and 70 % Alcohol cord care group regarding cord detachment time where the dry cord care group had shorter duration of the cord separation time. Also, there were no signs of cord infection for the two studied groups.

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Table (5): Newborns' umbilical cord condition from mothers' perspectives. This table clarified that there were highly statistical significant differences between the dry cord care group and 70 % Alcohol cord care group regarding all aspects of newborns' cord condition from their mothers' perspectives. Also, 85% of the mothers were satisfied of dry cord care technique compared to 43% of 70 % Alcohol cord care technique respectively.

Figure (1): Relationship of studied sample socio-demographic characteristics and level of umbilical cord healing and detachment.

This figure indicated that, 50% the studied mothers who adhered to proper nursing intervention and practice regarding dry cord technique had better umbilical cord healing and separation.

Figure (2): **Effectiveness of the dry umbilical cord care technique as reported by studied mothers.** This figure illustrated that 89% of the studied mothers reported that, the dry cord care technique was very effective in the healing of the umbilical cord stump. 90% reported that this technique was very effective in the decreasing risk for infection. 86% reported that this technique was very effective in decreasing the duration of cord separation time.

Figure (3): Cord detachment time of the dry cord care group. This figure clarified that, 60% of the studied neonates had 4-6 days compared to 40% had 7-10 days regarding cord detachment time respectively.

Table (1): Socio-demographic characteristics of the Studied Groups

characteristics	Dry Technique Group (n=100)		70% Alcohol Group (n=100)		P-value
Mothers' Age(years)	**No**	**%**	**No**	**%**	
15< 25	**50**	**50**	**60**	**60**	
25 < 35	**30**	**30**	**20**	**20**	**0.198**
35 < 45	**20**	**20**	**20**	**20**	
Mothers' Educational level					
Primary	**30**	**30**	**40**	**40**	
Secondary	**30**	**30**	**40**	**40**	**0.542**
Tertiary	**20**	**20**	**10**	**10**	
University	**20**	**20**	**10**	**10**	
Mothers' occupation					
House wife	**30**	**30**	**40**	**40**	**0.122**
Employee	**40**	**40**	**40**	**40**	
Teacher	**30**	**20**	**20**	**20**	
Mothers' Parity					
≤ 3 times	**5**	**5**	**3**	**3**	
4-6 times	**53**	**53**	**48**	**48**	**0.436**
> 6 times	**42**	**42**	**49**	**49**	
Type of delivery					
Normal	**68**	**68**	**75**	**75**	**0.060**
C.S	**32**	**32**	**25**	**25**	
Gender					
Male	**51**	**51**	**52**	**52**	**0.890**
Female	**49**	**49**	**48**	**48**	
Gestational age(weeks)					
38 < 40 weeks	**85**	**85**	**90**	**90**	**0.385**
40 -42 weeks	**15**	**15**	**10**	**10**	
Birth weight(kg)					
2.5< 3.5	**90**	**90**	**80**	**80**	**0.385**
3.5- 4.5	**10**	**10**	**20**	**20**	

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Type of Feeding at Discharge					
Breast	**82**	**82**	**94**	**94**	
Formula	**4**	**4**	**5**	**5**	**0.001****
Combination	**14**	**14**	**1**	**1**	

*** Level of significance at p ≤0.05, highly significant difference at p ≤0.01***

Table (2): Mothers' knowledge about umbilical cord care: (n= 200)

Questions	Options	Frequency	Percent
How many different cord care techniques have you used in the past with your children?	Betadine	40	20
	Alcohol	120	60
	Triple die	20	10
	Sterile water	10	5
	Dry cord care	10	5
Which of these methods do you believe is most effective?	Betadine	40	20
	Alcohol	120	60
	Triple die	20	10
	Sterile water	10	5
	Dry cord care	10	5
How many times a day do you clean the umbilical cord?	Once	20	10
	Two-times	40	20
	Three times	100	50
	with the change of nappy	40	20
How many days does the umbilical cord take to separate and fall?	7 days	20	10
	10 days	60	30
	15 days	40	20
	didn't now	80	40
Are you aware of, or have ever used in the past dry cord care methods?	Yes	10	5
	No	170	85
	Aware of ,but never have used	20	10
From your point of view using dry cord care methods is……	Somewhat effective	40	20
	Not effective	100	50
	Effective	60	30

Table (3): Mean and SD of mother's competency of skills regarding dry cord care technique

Mother's Skills	N=100		t	p-value
	Pre- test M±SD	Post- test M±SD		
Keep cord clean and dry	1.62 ± 0.28	12.95 ± 0.65	11.890	<0.000**
Wash hands before handling umbilical stump	1.52 ± 0.18	11.93 ± 0.63	12.125	< 0.001**
Keep umbilical stump exposed to air or loosely covered with clean clothes	2.17± 0.38	14.62 ± 0.48	25.395	<0.000**
Keep diaper folded down and away from umbilical stump to prevent contamination with urine/stool	1.17± 0.38	16.62 ± 0.38	12.132	< 0.001**
Keep diaper folded down and away from umbilical stump to prevent contamination with urine/stool	1.92 ± 0.65	1.32 ± 0.45	6.568	<0.000**

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If the cord stump becomes soiled with urine or stool, cleanse the area with warm water	**1.65 ± 0.45**	**18.62 ± 0.28**	**10.127**	**< 0.001****
After cleansing with water, dry thoroughly with clean absorbent gauze to remove excess moisture, then discard this gauze	**1.45 ± 0.25**	**20.62 ± 0.28**	**15.128**	**< 0.001****
Assure that the umbilical cord clamp is secure	**2.25 ± 0.55**	**0.23 ± 0.43**	**19.500**	**<0.000****
Differentiate normal cord healing from potential problems	**2.77 ± 0.55**	**1.55 ± 0.3**	**12.300**	**<0.000****
Notify pediatrician if the cord stump area shows signs of infections	**11.85 ±4.03**	**3.62±2.42**	**22.850**	**<0.000****

*** Level of significance at p ≤0.05, highly significant difference at p ≤0.01*

Table (4): Comparison of umbilical Cord Condition post-intervention among two studied groups

Newborns' Umbilical Cord Condition	**Dry Group N =100**		**Alcohol Group N=100**		**t**	**P-Value**
1- Cord detachment time:	No.	%	No.	%		
Between 4< 6 days	61	61	0	0	22.40	0.000**
From 6< 10 days	39	39	0	0	44.93	0.000**
From 10≤ 15 days	0	0	64	64	25.55	0.000**
> 15 days	0	0	36	36	17.75	0.000**
2-Signs of cord infection: **Yes**	0	0	0	0	3.33	0.855
No	100	100	100	100		

*** Level of significance at p ≤0.05, highly significant difference at p ≤0.01*

Table (5): Newborns' Umbilical Cord Condition from Mothers' Perspectives.

(n= 200)

Newborns' Umbilical Cord Condition	**Dry Cord Care Group, n =100**	**70% Alcohol Cord Care Group, n=100**	**P-Value**
1-Cord detachment time/days	**6 ± 2**	**15 ±2**	**< 0.001****
2-Signs of cord infection			
Yes	**0**	**0**	**0.855**
No	**100**	**100**	
3-level of healing of the umbilical stump			
Weak	**0**	**0**	**< 0.001****
Medium	**0**	**5**	
Good	**5**	**65**	
Very good	**45**	**20**	
Excellent	**50**	**10**	
4-Parent satisfaction			
Yes	**85**	**43**	**< 0.001****
No	**15**	**57**	

*** Level of significance at p ≤0.05, highly significant difference at p ≤0.01*

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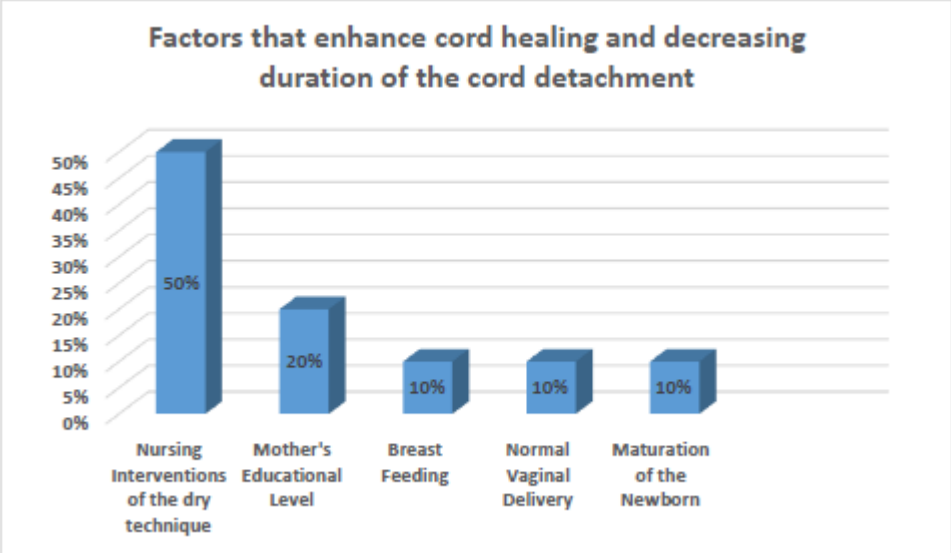

Figure (1): Relationship of socio-demographic characteristics and level of cord healing and detachment.

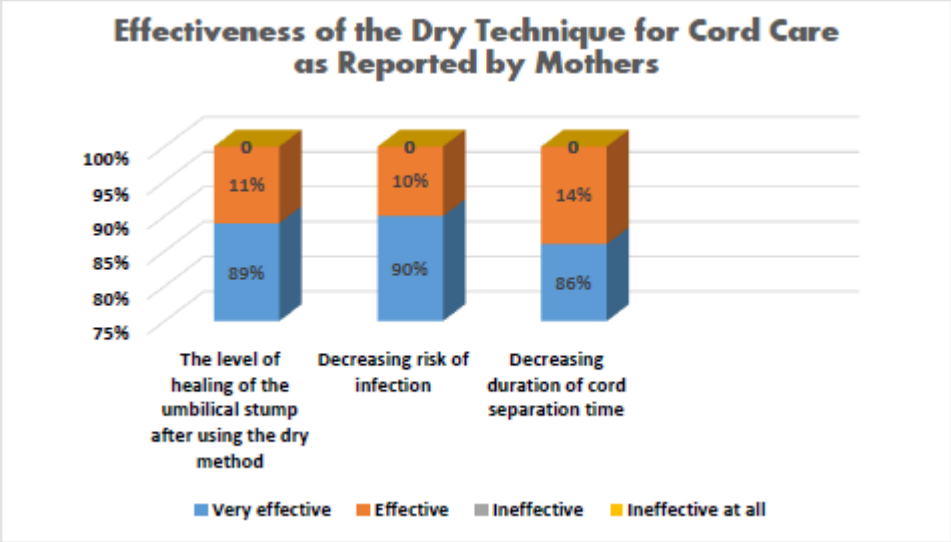

Figure (2) Effectiveness of the dry umbilical cord care technique as reported by mothers

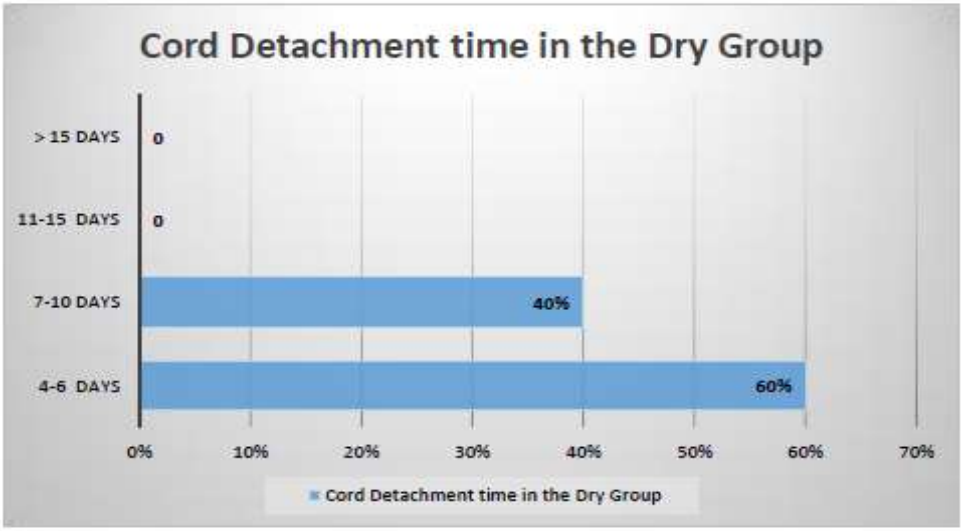

Figure (3): Cord Detachment Time in the Dry Cord Care Group

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6. DISCUSSION

Usually, caregivers and healthcare working in the neonatal intensive care units use different procedures for the umbilical cord care according to their experiences and their preferences. Although, mortality rate is very low, more frequently adverse events such as irritation, redness, weeping and bleeding of the stump, rarely infections like omphalitis, sepsis, and umbilical granuloma occurred. Indeed, these unpopular adverse effects increase the time of cord separation. "WHO" since 1998 recommended clean "natural dry cord care" for neonates born in health facilities and at home **[16].**

Consequently, the present study aims to examine the effect of gold standard dry cord care versus 70% Alcohol application among neonates. The present study hypothesized that, (1). Neonates who exposed to dry cord care technique will show better healing signs and decrease risk of infection than neonates who receive 70 % Alcohol application. (2). Neonates who exposed to dry cord care technique will experience shorter cord separation time than neonates who receive 70 %Alcohol application. (3). Mothers who utilize dry cord care technique will experience higher level of satisfaction compared with mothers who use 70 % Alcohol application.

The results of the current study covered four main areas as follows; ***firstly***, socio-demographic characteristic of studied neonates and their mothers. ***Secondly*****,** Mothers' knowledge and Competency of skills about dry cord care technique. ***Thirdly*****,** Newborns' Umbilical Cord Condition structured from their Mothers' Perspectives. ***Lastly,*** Newborns' Umbilical Cord Condition Observation Check List.

The researchers found there were highly statistically differences between the natural dry cord care method compared with Alcohol 70% method in the duration of the cord separation time in the two groups (**8 ± 2** days versus **15 ±2** days; p=0.001) respectively. ?

Regarding mothers' knowledge about umbilical cord care: the study results showed that 60% of the studied sample used Alcohol cord care technique and believed that this technique is effective while, 85% of the sample didn't use dry cord technique and 50% of them believed that this method not effective for healing and separation of umbilical cord. These results comes in agreement with (***Imdad et al, 2013)*** who concluded that, there was insufficient evidence to support the use of antimicrobials or antiseptics when compared with dry cord care in hospitals in developed countries. **[17]**

Concerning, mother's competency of skills about dry cord care technique. This result presented that, there were highly statistical significant differences between pre and post- test of all aspects of mother's skills about the dry cord care technique. The study result was supported by ***Shoaeib et al (2005),*** who conducted a research to compare different methods of cord care. Authors concluded that, nurses could advocate for the no treatment/natural drying approach to cord care. **[18].** In the researcher opinion , dry cord care technique is an easy and applicable way of care for mothers.

For Cord Condition post-intervention of the studied groups. The results clarified that, there was highly statistical significant differences between the dry cord care group and alcohol cord care group regarding cord detachment time where the dry cord care group had shorter duration of the cord detachment time. Also, there were no signs of cord infection for the two studied groups. This result congruent with ***(Dore et al, 2006)*** **[19]** who studied new approach cord care and concluded that, new evidence did not support the continued use of Alcohol 70% for umbilical cord care for neonates as it increasing length of cord separation compared with dry cord technique. In the study of ***(Janssen et al, 2003)*** **[20]** who studied advances in newborns' umbilical cord care and illustrated that, the average time of cord separation among two groups was statistically significant**.** The researchers' emphasis on importance of good hand washing with dry cord care methods by the nurses and the caregivers. Also, ***Evens et al, (2004)*** **[21]** supported the previous result and concluded that the median cord separation time was significantly shorter in the natural drying group compared to the alcohol group (13.0 versus 16.0 days; p=0.003). the study of ***Breindahl et al, (2016)***, who studied a comparison of dry method and Alcohol 70% method in the cord detachment time. They found highly statistical significant differences between the dry method and Alcohol 70% method in the cord detachment time and they concluded that, natural drying method of the cord care is a straight-forward, an easy, safe, and cost-effective method of handling the umbilical cord care in the healthy newborn infants born in a high-income setting. **[22]**

Regarding, newborns' umbilical cord condition from their mothers' perspectives. One of the important results of the present study was that, no statistical significant differences between the studied groups related to neonatal cord infection, 100% were free from any signs of infection post intervention in the two studied groups. This result comes in agreement

with ***Zupan et al, (2004)*** who studied Right Aseptic techniques for Newborns' cord care and concluded that, all of the studied neonates in either group developed no signs of umbilical cord infection. **[23]. Also,** this result matched with ***Mullany et al, (2009)*** who conducted a research about neonatal cord care nowadays and indicated that, there were no cases of cord infection was detected with different cord care techniques. This result of the study could be due to the researchers' efforts in for continuous follow-up care for studied neonates and their caregivers. Also, the emphasis on following the scientific instructions regarding use of different umbilical cord care methods. **[24]**

Regarding, mothers' comfort and satisfactions. The results showed that, 85% of the newborns' mothers were satisfied of dry cord care technique compared to 43% were satisfied of Alcohol cord care technique respectively. This result matched with ***vural and kisa, (2006)*** **[25]** who studied dry and natural cord care and concluded that, dry umbilical cord care group expressed more comfort and satisfaction than Alcohol 70% group. Although this result comes in contraverses with ***Dore et al, (2006)*** **[19]** who indicated that, the parents in both groups expressed similar levels of comfort and satisfaction. In the researchers' point of view this respective result could be related to the shorter duration of the cord separation time, simplicity of dry cord methods and the cost-effective benefits concerned with dry cord care technique.

Effectiveness of the dry cord technique as reported by mothers. The results illustrated that, 86% of the studied mothers reported that, the dry cord care technique was very effective in cord's healing and in decreasing the duration of detachment time. Consequently, the present study proven that, dry cord care technique is very effective for healing and early separation of neonatal umbilical stamp than 70% Alcohol cord care technique. Also, mothers expressed more satisfaction of this gold approached of care.

7. CONCLUSIONS

The present study concluded that, dry cord care technique was very effective in the healing of the umbilical cord stump, decreasing risk of cord infection and decreasing the time of cord separation compared with 70% Alcohol technique.

8. RECOMMENDATIONS

The present study recommended with, urgently change the policy of neonatal cord care practices towards utilization of dry cord care technique as an evidence-based nursing intervention, natural, safe, and cost-effective method for the healthy neonates**.**

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