

THE EFFECTIVENESS OF TOPICAL BREAST MILK (BREASTMILK) METHODS, STERILE GAUZE AND NON-TREATMENT METHODS ON THE DURATION OF THE UMBILICAL CORD DETACHMENT

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ABSTRAK EFEKTIFITAS METODE TOPIKAL ASI (BREASTMILK), KASA STERIL DAN NON TREATMENT TERHADAP LAMANYA PELEPASAN TALI PUSAT (UMBILICAL CORD)

Latar Belakang : Perawatan tali pusat penting untuk mencegah infeksi pada bayi baru lahir. Infeksi tali pusat merupakan penyebab penting dalam angka kematian bayi (AKB) di negara berkembang, dengan kejadian mencapai 55-97/1000 kelahiran hidup.

Tujuan : Penelitian ini bertujuan untuk melihat Perbandingan Metode Topikal ASI (Breastmilk), Kasa Steril dan Non Treatment Terhadap Lamanya Pelepasan Tali Pusat (Umbilical Cord) di Wilayah Kerja Dinas Kesehatan Kota Langsa Tahun 2018.

Metode : Penelitian ini menggunakan rancangan quasi experimental design studi Kohort Prospektif dengan Without control group design. Pengamatan dilakukan setelah dilakukan perlakuan Metode Topikal ASI (Breastmilk), Kasa Steril dan Non Treatment Terhadap Lamanya Pelepasan Tali Pusat (Umbilical Cord), Jumlah sampel untuk setiap kelompok sebanyak 10 orang Neonatus per kelompoknya. Analisis yang digunakan adalah One-Way ANOVA.

Hasil : menunjukkan lamanya pelepasan tali pusat rata-rata untuk ketiga metode selama 6 hari, sedangkan waktu tercepat pelepasan tali pusat selama 98,45 Jam (4 hari) dengan metode Topikal ASI (Breastmilk) dan waktu terlama pelepasan tali pusat selama 178,39 Jam (7 hari) dengan metode Kasa Steril dan Non Treatment dan hasil uji One-Way ANOVA. menunjukkan ada perbedaan yang signifikan dengan nilai p Value sebesar 0,002.

Kesimpulan : Hasil ini dapat disimpulkan bahwa ada perbedaan diantara tiga kelompok perlakuan dalam lamanya pelepasan tali pusat.

Saran : Penyuluhan kesehatan bagi masyarakat dalam menentukan bahan perawatan tali pusat dengan baik dan sesuai prosedur sehingga bayi terhindar dari infeksi tali pusat baik menggunakan metode Topikal ASI (Breastmilk), kasa steril maupun menggunakan metode lainnya.

Kata Kunci : Kasa steril, non treatment, pelepasan tali pusat , topikal ASI (breastmilk)

ABSTRACT

Background : Umbilical cord care is important to prevent infection in newborns. Umbilical cord infections are a leading cause of infant mortality (IMR) in developing countries, with incidence reaching 55-97 / 1000 live births.

Purpose: to know the comparison of topical breast milk methods, sterile gauze and non-treatment on the duration of umbilical cord detachment in the work area of Langsa City Health Service in 2018

Methods: this study used a quasi-experimental prospective cohort study design with Without control group design. Observations were carried out after treatment using topical breast milk method, Sterile Gauze method and Non- Treatment method on the umbilical cord detachment. Then, the number of samples for each group was 10 neonates per group. The data analysis used was one-way ANOVA

Results: the results showed that the average length of umbilical cord detachment for the three methods was 6 days, while the fastest time of the umbilical cord detachment was 98.45 hours (4 days) using the topical breast milk method and the longest time of the umbilical cord detachment was 178.39 Hours (7 days) with Sterile Gauze method and Non-Treatment method. Then, one-way ANOVA test results showed that there was a significant difference with the value p value of 0.002.

Conclusions: based on the results of this study, it could be concluded that there were differences between the three treatment groups in the duration of the umbilical cord detachment.

Suggestion: health education for the community in determining the material for umbilical cord care properly should be according to the procedure so that babies are protected from umbilical cord infection either using the Topical Breast milk method, sterile gauze or other methods.

Keywords: Sterile Gauze, Non-Treatment, Umbilical Cord Detachment, Topical Breast milk

INTRODUCTION

The neonatal period is the period from birth to

4 weeks (28 days) after birth. Neonates are infants aged 0 (new birth) up to 28 days. Early neonates are infants aged 0-7 days. At birth, the umbilical cord is cut and will be exposed to the surrounding environment. These structures are susceptible to local infection (*omphalitis*), which if not recognized and treated early, it can develop into a systemic infection on multiple organs and even death. Umbilical cord care is important to prevent infection in newborns (Purnamasari, 2016).

Umbilical cord infection is a leading cause of infant mortality (IMR) in developing countries, with an incidence reaching 55 - 97/1000 live births. Every year 3.3 million newborns die worldwide. It can be said that 30% of the causes of newborn death are infections. Some of these infections start with infection in the umbilical cord. The umbilical cord is the most supportive area for the growth of microorganisms that are harmful or not. Umbilical cord infection can become *omphalitis* or after entering the bloodstream become systemic. Data on the incidence of *omphalitis* in poor countries are rare, and the available data estimate the risk of between 2-77%/1000 live births in hospital, with a mortality rate of between 1-15%, depending on the definition of *omphalitis* used (Nourian et al., 2009).

Based on data from Aceh Health Profile, it is known that the number of IMR is 15/1000 live births (Dinas Kesehatan Provinsi Aceh, 2016). According to data obtained from the Langsa City Health Office, the IMR data in Langsa City in 2016 showed that infant mortality was 37 people with 3,291 live births, or 11 per 1000 live births. The reason Infant mortality in Langsa City includes low birth weight babies (LBW), asphyxia, congenital abnormalities, pneumonia, diarrhea and so on (Dinas Kesehatan Provinsi Aceh, 2016).

According to Langsa City Health Office in 2016, it was known that the number of IMR was 11/1000 live births with a total of 3,291 babies born. However, regarding the cause of death, there were 9 babies who were born with low birth weight (LBW), 8 babies with asphyxia, 3 babies with congenital abnormalities, 3 babies with pneumonia, 1 baby with diarrhea, and 13 babies with infection who one of them was umbilical cord infection. Thus, the total number of deaths reached 37 babies.

Based on the results of a study conducted by Fortune (2017) entitled nursing practice on umbilical cord by mother with the incidence of umbilical cord infection in newborns in Semarang, the practice of umbilical cord care was partially unfavorable as many as 33 respondents (55%), and it could be concluded that there is a significant relationship between mother's practice of umbilical cord care with the

incidence of umbilical cord infection in newborns with p value of 0.003 (<0.05).

During childbirth assistance and unhygienic umbilical cord cutting, postnatal umbilical cord care should be paid attention to its cleanliness, because it is a port of entry for microorganisms that can cause neonatal infection and develop into *sepsis*. Clean maintenance techniques at the time of clamping, cutting and tying the umbilical cord and subsequent cord care are the main principles that are very important to prevent *sepsis* due to umbilical cord infection (Allam and Talat, 2015). There are various methods of umbilical cord care including dry clean care, the use of topical antiseptics/antimicrobials (chlorhexidine, povidone iodine, alcohol, triple dye) and traditional ingredients (breast milk, olive oil, mustard oil, shea butter). The effectiveness of each method is still controversial (Purnamasari, 2016).

Umbilical cord infection can actually be prevented in many cases. Hence, it is important to identify the best umbilical cord care technique to reduce IMR and provide an alternative for mothers to avoid harmful traditional practices. Factors that inhibit the process of releasing the umbilical cord include the use of antiseptics that can damage the normal flora and reduce the number of leukocytes around the umbilical cord (Allam and Talat, 2015). A study conducted by Zupan et al. (2007) showed a meta-analysis of 21 studies followed by 8959 participation to assess the effect of topical breast milk on the umbilical cord in preventing umbilical cord infection in IMR. The results of the study showed that there is no any advantage in using antibiotics over the dry method, and the use of antibiotics actually prolongs the time of umbilical cord detachment (Zupan et al., 2007).

RESEARCH METHODOLOGY

The research design of applied this study was a quasi-experimental design for a prospective cohort study with a without control group design. This study was aimed to determine the effectiveness of the topical method of breast milk, sterile gauze and non-treatment method on the duration of umbilical cord detachment.

This study used designs without control group, X O1. X is the posttest and the position from left to right showing the temporal order. The absence of a pretest made it difficult to know whether changes have occurred. Then, the absence of control groups without treatment made it difficult to know what would happen without treatment.

This study was carried out in the work area of the Langsa City Health Office in 5 (five) public health center. This study was carried out in 09 July to

October 20, 2018, with a total sample of 10 samples for each groups, and using 3 groups with a total sample of 30 people.

RESEARCH RESULTS

Table 1
Frequency Distribution of the Duration of Respondent's Umbilical Cord Detachment Using the Topical Breast milk Method

The Duration in Hours (Days)	f	%
98,45 Hours (4 days)	1	10
129,28 Hours (5 days)	1	10
132,45 Hours (5 days)	1	10
136,24 Hours (5 days)	1	10
148,29 Hours (6 days)	1	10
148,32 Hours (6 days)	1	10
149,38 Hours (6 days)	1	10
152,58 Hours (6 days)	1	10
157,37 Hours (6 days)	1	10
159,48 Hours (6 days)	1	10
Total	10	100

The table 1 above shows the method of topical breast milk on the duration of umbilical cord detachment at the fastest time interval of 98.45 hours (4 days) and the longest time interval of 159.48 hours (6 days).

Table 2
Frequency Distribution of the Duration of Respondent's Umbilical Cord Detachment Using Sterile Gauze Method

The Duration in Hours (Days)	f	%
149,48 Hours (6 days)	1	10
153,45 Hours (6 days)	1	10
156,29 Hours (6 days)	1	10
162,43 Hours (6 days)	1	10
172,38 Hours (7 days)	1	10
172,56 Hours (7 days)	1	10
175,38 Hours (7 days)	1	10
175,45 Hours (7 days)	1	10
181,35 Hours (7 days)	1	10
182,43 Hours (7 days)	1	10
Total	10	100

Table 5
ANOVA Test Comparison of Topical Breast milk Method, Sterile Gauze Method, Non-Treatment Method on the Duration of Umbilical Cord

The table 2 above shows the sterile gauze method on the duration of umbilical cord detachment at the fastest time interval of 149.48 hours (6 days) and at the longest time interval of 182.43 hours (7 days).

Table 3
Frequency Distribution of the Duration of Respondent's Umbilical Cord Detachment Using Non-Treatment Method

The Duration in Hours (Days)	f	%
132,38 Hours (5 days)	1	10
138,25 Hours (5 days)	1	10
142,35 Hours (5 days)	1	10
143,27 Hours (5 days)	1	10
151,42 Hours (6 days)	1	10
158,28 Hours (6 days)	1	10
160,42 Hours (6 days)	1	10
161,58 Hours (6 days)	1	10
163,48 Hours (6 days)	1	10
178,39 Hours (6 days)	1	10
Total	10	100

The table 3 above shows a non-treatment method for the duration of umbilical cord detachment at the fastest time interval of 132.38 hours (5 days) and the longest time interval of 178.39 hours (7 days).

Table 4
The Results of Normality Test of the Duration Umbilical Cord Detachment

Test of Normality						
Kolmogorov-Smirnov ^a			Shapiro-Wilk			
Statistic	df	Sig.	Statistic	df	Sig.	
Duration	,108	30	,200*	,949	30	,157

*. This is a lower bound of the true significance
a. Lilliefors Significance Correction

The above table shows that variable X has Sig = 0,157 (>0, 05) meaning that the data distribution is normal so that variable X can be used in the next ANOVA analysis.

Variabel	Mean	Sd	F	p
The Group of Umbilical Cord Care				
Topical Breast milk Method	141,18	18,14		
Sterile Gauze	168,12	11,82	8,222	0,002
Non-Treatment	154,09	14,00		

The results of the ANOVA analysis showed that there was a significant difference with p value of 0.002. These results can be concluded that there is a difference between the three treatment groups in the duration of umbilical cord detachment. From the results of the Post Hoc test, it was found that there was a significant difference in the duration of umbilical cord detachment between the groups using the Topical Breast milk Method and the Sterile Gauze Method, while the Topical Breast milk Method found in the Non-treated group did not show a difference, as well as between groups using sterile gauze method and the non-treatment group, it did not show any difference. Thus, it could be concluded that respondents who were given the topical breast milk method experienced umbilical cord detachment faster than the other two groups.

DISCUSSION

Comparative Effectiveness of Topical Breast milk Method, Sterile Gauze Method and Non-Treatment Method on the Duration of Umbilical Cord in the Work Area of the Langsa City Health Service

This is in line with the comparison study of the use of topical breast milk with dry care on the duration of the baby's umbilical cord. The detachment of which was given breast milk care was 4 days 3 hours, while the dry treatment was 6 days 4 hours. Treatment of the umbilical cord using breast milk has several benefits for both mother and baby. The advantage of this treatment is that it is easy for the mother to do and is clean. In the care of newborns, it is necessary to pay attention to the care of the umbilical cord. The faster the umbilical cord falls off, the less the risk of infection, by paying attention to cleanliness around the umbilical cord and washing hands before and after caring for the umbilical cord. The results of a study conducted by Sari et al. (2016) proved that the detachment of the umbilical cord with topical use Breast milk is faster than dry care.

Human colostrum is the first milk produced after birth and is very rich in immunoglobulin (Ig), an antimicrobial (lactoferrin and lactoperoxidase) and other bioactive molecules, including important factors for nutrition, growth and development of newborns and also for passive immunity. Colostrum containing immunity can regulate response immune system,

growth factors to help repair damaged cells and anti-inflammatory substances to reduce inflammation (Ballard et al., 2013).

A histological study revealed that polymorphonuclear leukocytes (PMNs) present in colostrum (milk) are able to penetrate blood vessels between the umbilical cord and important tissues of the abdominal wall so as to form a demarcation zone (boundary line) for the entry of pathogenic bacteria. Polymorphonuclear leukocytes (PMN) are cells found in colostrum in days 1-4 post-partum which contains 5 million leukocytes/mm³. Colostrum (breast milk) can accelerate the process of releasing the umbilical cord through polymorphonuclear leukocytes, proteolytic enzymes and other immunological compounds contained in it (Faraharani et al., 2008).

Another study explains that polymorphonuclear leukocytes, proteolytic enzymes, or other immunology can increase drying and detachment of the umbilical cord. This is supported by a study showing that umbilical cord care using breast milk accelerates umbilical cord detachment compared to open treatment. The average time of umbilical cord detachment with topical breast milk is shorter (5.69 days) than dry treatment (7.06 days) (Ahmadpour, 2006).

Other growth factors in colostrum that aid in wound healing including growth hormone (GH) has been shown to accelerate Insulin-Like Growth hormone factor 1 (IGHF-1) which is an important factor for metabolism, wound healing and repair. This is the reason that umbilical cord care using colostrum (Breast milk) is considered good for speeding up the process of releasing the umbilical cord and preventing infection of the umbilical cord (*omphalitis*). Based on scientific evidence in a study entitled "Human Milk Composition: Nutrients and Bioactive Factors", it is explained that breast milk is not just nutrition, but breast milk also contains various factors with medicinal qualities that have a major role in infant survival and in the health sector.

This is in line with a study conducted by Faraharani et al. (2008) stating that with the presence of high content found in breast milk such as anti-inflammatory and anti-inflammatory infection, it is proven to be used as a topical and to accelerate the detachment of the umbilical cord. It is in line with the results of a study conducted by Jayanti et al. (2013) showing that the duration of detachment of umbilical

cord given treatment was 1.37 days faster than dry treatment.

The results in the present study showed that the average time to remove the umbilical cord with topical breast milk method was faster than dry treatment, and there was no risk of infection. It was found nipples umbilical cord with reddish markings which is one sign of infection can be caused due to lack of exposure to air, humidity, so this inhibits the process of mummification, drying, and detachment. The detachment process of the umbilical cord is very complex. It occurs due to the infiltration of nuclear polymorph leukocytes in the umbilical cord stump attached to the baby's abdominal wall, and a drying process occurs and forms maceration. Breast milk contains leukocytes, proteolytic enzymes, and immunological substances, which helps the process of releasing the umbilical cord. Physiologically the remaining umbilical cord that is still attached to the baby's stomach (umbilical stump) will dry out and will usually come off on its own. The duration of the umbilical cord detachment is fast if it is less than 5 days, it is normal if between 5 to 7 days, and it is slow if more than 7 days.

Topical breast milk, especially colostrum, is very rich in anti-body, anti-inflammatory, and leukocyte substances that play an important role in suppressing the colonization of pathogenic microorganisms, which can cause infection of the umbilical cord, and can accelerate the duration of the umbilical cord detachment. All babies get breast milk so that they get natural protection from the colostrum content obtained from the mother. Most babies are bathed by immersed in water, but this is not a moisture factor that can increase colonization of pathogenic microorganisms. It is also not a factor that causes infection or neonatal tetanus and trigger the length of time the umbilical cord detachment, as long as after bathing the baby is immediately dried optimally, especially the area around the umbilical cord. The hygiene factor when the mother/family is in contact with the baby is also important, always washing their hands before and after bathing. Afterward, keeping the area around the umbilical cord clean and dry is also important.

CONCLUSIONS

There were differences between the groups of topical breast milk method, sterile gauze method and non- treatment method in the length of umbilical cord detachment. The fastest time to release the umbilical cord was 98.45 hours (4 days) using the topical breast milk method

SUGGESTIONS

Umbilical cord care using the topical breast milk method can be recommended to be the standard of care in newborns, because the umbilical cord detachment time is shorter and can prevent infection. Then, all health workers are expected to be able to perform umbilical cord care using the topical breast milk method. It can be used as an option in providing midwifery care to the community in accordance with evidence-based that can be adapted to the existing procedures and can provide complete service postpartum visits (PV) and neonatal visits ().

REFERENCES

- Purnamasari, Lina. 2016. Perawatan Topikal Tali Pusat Untuk Mencegah Infeksi Pada Bayi Baru Lahir. *Journal UNAIR*. Vol. 45 No. 5.
- Nourian M, Allaii F, Heidari A. Comparison of the effect of alcohol 70% versus dry cord care on cord bacterial colonization and cord separation time among newborns. *Pak J Med Sci* 2009;25(1):103-7.
- Dinas Kesehatan Aceh. 2016. Profil Kesehatan Aceh.
- Dinas Kesehatan Kota Langsa. 2016. Profil Kota Langsa.
- Rejeki. S, Machmuda dan Juwarningsih. 2017. Pratik Perawatan Tali Pusat Oleh Ibu dengan Kejadian Infeksi Tali Pusat Bayi Baru Lahir Di Semarang. *Prosiding UNAD*. Yogyakarta.
- Allam, Megrin dan Talat. 2015. Efek Pemberian Topikal ASI Pada Waktu Pelepasan Tali Pusat Pada Bayi Baru Lahir. *Amerika Journal of Nursing Scienc*.
- Zupan J, Garner P, Omari AAA. Topical umbilical cord care at birth. *Cochrane Database Syst Rev* 2007;4: CD001057. Available from: www.who.int/rhl/reviews/CD001057.pdf.
- Sari, F., Nurdianti, D.S., dan Astuti, D.A. (2016). Perbandingan Penggunaan Topikal ASI Dengan Perawatan Kering Terhadap Lama Pelepasan Tali Pusat Bayi. *Jurnal Kebidanan dan Keperawatan*, Vol 12 No 1 Juni 2016.
- Ballard, Olivia, Morrow, A. L., 2013, Human Milk Composition: Nutrients and Bioactive Factors, *Pediatric. Clin. Am.*, 1 – 22.
- Faraharani, L.A., Mohammadzadeh, A., Tafazzoli, M., Esmaeli, H., dan Ghazvini, K. (2008). Effect of Topikal Application of Breastmilk and Dry Cord Care on Bacterial Colonization and Umbilical Cord Separation Time in Neonatus. *Journal of Chinese Clinical Medicine*, Vol 3 No 6 Juni 2008, pp. 327-332. Available online: http://journal.9med.net/html/qikan/lcyx/zhlcyxzywb/2008636/Articles/20080831020412401_395366.Html

- Ahmadpour MK., Zahedpasha Y., Hajian K., Javadi GH., Talebian H., 2006. The effect of topical application of human milk, ethylalcohol 96%, and sulfadiazine on umbilical cord separation time in newborn infant, *Archives of Aranian Medicine*, Vol. 9: 33–38. (<http://www.ncbi.nih.gov/pubmed/16649375>)
- Subiastutik, E., 2011, Efektifitas Pemberian Topikal Asi Terhadap Kecepatan Waktu Lepas Tali Pusat Dibanding dengan Perawatan Kering, Universitas Gajah Mada, Yogyakarta, from: [http://etd.ugm.ac.id/index.php?mod=penelitian_detail &sub= PenelitianDetail &act=view&typ=html&buku.id=51239&obyek_id=4](http://etd.ugm.ac.id/index.php?mod=penelitian_detail&sub=PenelitianDetail&act=view&typ=html&buku.id=51239&obyek_id=4).
- Jayanti, N., Masruroh., dan Pranowowati, P. (2015). Perbedaan Lama Pelepasan Tali Pusat Antara Perawatan Kasa Topikal ASI Dan Kasa Steril Di Wilayah Kerja BPM Istiqomah Kabupaten Banjarnegara 2015. Available Online: <http://perpusnwu.web.id/karyailmiah/documents/4458.pdf>.
- Enkin, M.E, Keirse, M.J.N.C., Neilson. J. Crowthe.C., Duley. L., Hodnett. E. & Hofmeyr.J. (2000). *A Guide to effective care in fregnancy & childbirth*. New York : Oxford University Press.
- Permanasari, D.K., Susyanto, B.E., 2009, Perbedaan Lama Pelepasan Tali Pusat Antara Perawatan Tertutup Dengan Dibiarkan Terbuka, dalam http://digilib.fk.umy.ac.id/gdl.php?mod=browse&op=read&id=yoptumy_fkpp-gdl-diankartik-58, Diakses tanggal 26 November 2012 (Jurnal).
- Hamid AA, Fadil NA, Azzam HF. Effect of two different cord care regimens on umbilical cord stump separation time among neonates at Cairo University Hospitals. *J Am Sci* 2011;7:920-6. Available from: <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4795877>. [Last accessed on 2015 Sep 2015].
- Mahrous E, Darwish M, Dabash S, Marie I, Abdelwahab S. Topical application of human milk reduces uZmbilical cord separation time and bacterial colonization compared to ethanol in newborns. *Transl Biomed* 2012;3:1-5. Available From: <Http://Www.Transbiomedicine.Com/Translational-BioMedicine/Topical-Application-Of-Human-Milk-Reduces-Umbilical-Cord-Separation-Time-And-Bacterial> Last accessed on 2015 Sep 17].
- Kaur P. A Study to Compare the Efficacy of 4% Chlorhexidine, 70% Isopropyl Alcohol and Dry Cord Care on Colonization of Umbilical Cord with Pathogenic Bacteria and Cord Separation Time in Preterm Babies <35 Weeks of Gestation Born at Labour Room, PGIMER, Unpublished Thesis Chandigarh; 2010-11.
- Abbaszadeh F, Hajizadeh Z, Atrian M, Bagheri A, Sarafranz N. Comparison Of The Effect Of Topical Application Of Human Milk And Dry Cord Care On The Bacterial Colonization Of Umbilical Cord In Newborn Infants. *J Kermanshah Univ Med Sci* 2014;18:1-8. Available From: <Https://Www.Ncbi.Nlm.Nih.Gov/Pmc/Articles/PMC4795877/>. [Last Accessed On 2015 Sept 06].
- Kheir A, Mustafa A, Osman A. Impact of umbilical cord cleansing with 4%chlorhexidine on rate of omphalitis and separation time among newborns in Khartoum State, Sudan. *Health Care Low Resour Settings* 2015;3:34-7. Available from: https://www.researchgate.net/.../2799297001mpact_of_umbilical_cord_cleansing_with_4_chlorhexidine_on_rate_of_omphalitis_and_separation_. [Last accessed on 2015 Oct 07].
- Golshan M, Hossein N. Impact of ethanol, dry care and human milk on the time for umbilical cord separation. *J Pak Med Assoc* 2013;63:1117-9.
- Mullany LC, Shah R, El Arifeen S, Mannan I, Winch PJ, Hill A, et al. Chlorhexidine cleansing of the umbilical cord and separation time: A cluster-randomized trial. *Pediatrics* 2013;131:708-15. Imdad A, Mullany LC, Baqui AH, El Arifeen S, Tielsch JM, Khatry SK, et al. The effect of umbilical cord cleansing with chlorhexidine on omphalitis and neonatal mortality in community settings in developing countries: A meta-analysis. *BMC Public Health* 2013;13 Suppl 3:S15.
- Zupan J, Garner P, Omari AA. Topical umbilical cord care at birth. *Cochrane Database Syst Rev* 2004;[3]:CD001057.
- Imdad A, Bautista RM, Senen KA, Uy ME, Mantaring JB 3rd, Bhutta ZA, et al. Umbilical cord antiseptics for preventing sepsis and

- death among newborns. *Cochrane Database Syst Rev* 2013; [5]: CD008635.
- Chamnanvanakij S, Decharachakul K, Rasamimaree P, Vanprapar N. A randomized study of 3 umbilical cord care regimens at home in Thai neonates: Comparison of time to umbilical cord separation, parental satisfaction and bacterial colonization. *J Med Assoc Thai* 2005;88:967-72.
- Darmstadt GL, Hassan M, Balsara ZP, Winch PJ, Gipson R, Santosham M, et al. Impact of clean delivery-kit use on newborn umbilical cord and maternal puerperal infections in Egypt. *J Health Popul Nutr* 2009;27:746-54.
- Semrau KEA, Herlihy J, Grogan C, Musokotwane K, Yeboah-Antwi K, Mbewe R, et al. Effectiveness of 4% chlorhexidine umbilical cord care on neonatal mortality in southern province, Zambia (ZamCAT): A cluster-randomised controlled trial. *Lancet Glob Health* 2016;4:e827-36.
- Gallina L, Tina AL, Basso T, Brusafar S, Quattrin R. Umbilical cord care after the first day from birth: A case control study in a Northeastern Italian Hospital. *Pediatr Neonatal Nurs Open J* 2016;3:4-8. Available from: http://www.openventio.org/.../umbilical_cord_care_after_the_first_day_from_birth_a_case_control_study_in_a_northeastern_italian_hospital_PNNO. [Last accessed on 2016 Aug 24].