What is the Effect of Topical Breast Milk Application on Umbilical Cord Separation among Healthy Newborn Babies in the Middle East?
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Abstract. Umbilical cord care is variable worldwide and is informed by firm traditional practices that are passed down as culture. Breast milk has been proposed as a topical substance to the umbilicus, as it is full of antibacterial properties. The analysis of two studies revealed a strong correlation between the use of topical breast milk and umbilical cord separation time among newborns in the Middle East. A supplemental analysis of two studies highlights the antibacterial properties of breast milk. Comparing the results of the studies included in this review, breast milk is not only effective in shortening the separation time of the umbilical cord over dry cord care, but is also just as optimal in reducing signs of infection as the antimicrobial chlorhexidine. These findings designate breast milk as an affordable, easy, and practical method of umbilical cord care. This is particularly useful in developing countries, where the risk of neonatal death due to infection is higher. The result is generalizable to healthy neonates born in a hospital setting, as such, more research concerning its practicality in rural areas, as well as among sick neonates, is suggested.

I. Introduction

Neonatal or newborn death is a tragic phenomenon defined as the death of a baby within its first month of life (World Health Organization, 2020). The world has seen an approximate 50% decrease in neonatal mortality from five million premature deaths in 1990 to 2.4 million deaths in 2019 (World Health Organization, 2020). According to the World Health Organization (2020), neonatal deaths compose 47% of all child deaths under the age of five. These deaths occur for a multitude of reasons, some of which are inexplicable, but many of which are able to be prevented or resolved with better access to medical resources and care; this fact may explain the extreme disparity between rich and poor countries, given two-thirds of the world’s neonatal deaths occur in Sub-Saharan Africa and Asia (Lawn et al., 2010).

A few of the major causes of neonatal death include congenital birth defects, complications within the gestational period, and preterm birth (Lawn et al., 2010). Additionally, it is estimated that 30 percent of all neonatal deaths are a result of infection, namely sepsis, pneumonia, diarrhea, and tetanus (Lawn et al., 2010). Infections among newborns can be particularly lethal considering their immune responses are still quite immature and require prolonged exposure to germs to build important antibodies (Simon et al., 2015). These infections can be contracted in various ways; however, the umbilical cord is a prime gateway for infection due to its connection to the bloodstream of the newborn and the numerous possible ways of bacteria encountering the umbilicus (Stewart & Benitz, 2016).

Umbilical cord care is variable all across the world and is informed by robust traditional practices that are passed down as culture (Coffey & Brown, 2017).
critical part of umbilical cord care, and, depending on the substance, it may be helpful or harmful in the prevention of infection until the cord separates from the neonate. For instance, mustard oil is a traditional substance that is applied to the umbilicus in communities in South Asia, specifically in some Pakistani communities (Coffey & Brown, 2017). However, it has been demonstrated to have negative implications for cord healing time as it breaks down the sensitive epidermal barrier of neonates (Darmstadt et al., 2007). Traditional practices like the use of mustard oil motivate the need for healthier alternatives, and ample research of this has been conducted in the Middle East, hence why it was chosen for review. Breast milk has been proposed as a topical substance to the umbilicus because it is full of antibacterial properties that have been proven to aid the fight against infection (Andreas & Mehring, 2015). This review of the literature aims to investigate the correlation between the topical application of breast milk on the umbilical cord and umbilical cord separation among infants born in hospitals in the Middle East.

To support the research question, the studies examined were chosen based on the following set of criteria: 1) must have included healthy newborns, 2) neonates must have been born to mothers living in the Middle East, and 3) study must have been conducted within the past ten years. With a search criterion in place, search terms like “newborn” and “neonate” and “topical application” - among others - were employed to garner relevant articles. From there, location was manually filtered to merely include studies occurring in countries in the Middle Eastern region of the world. The primary databases utilized within this search was the Vanderbilt Jean and Alexander Heard Library, as well as Google Scholar.

II. Breastmilk

Breast milk, also commonly referred to as mother’s milk, is produced from the mammary glands of the female breast and is chock-full of biologically active components that serve as a seminal source of nutrition and immunological protection for newborns (Andreas & Mehring, 2015). Breast milk is unique because of its ability to determine the immune health of a baby and adapt accordingly, making the components of each feeding specialized (Andreas & Mehring, 2015). Leukocytes (white blood cells) have long been observed in breast milk. Hassiotou et al. (2013) found rapid growth in leukocytes in response to infections displayed by mother and child, strengthening the evidence for breast milk as an immune system defense for newborns and giving it an advantage over baby formula, to which these leukocytes cannot be added. The anti-inflammatory and positive long-term effects of breast milk make it a “gold standard” for protective care (Walker, 2010). Besides being an incredibly useful biological shield to face sickness, breast milk has also been studied for its non-nutritional benefits in correcting various skin, nipple, and eye problems, among other things (Witkowska-Zimny et al., 2019).

III. Umbilical Cord

The umbilical cord is one of the earliest connections a developing fetus has to its mother and is developed in the early stages of embryological development (Basta & Lipsett, 2021). This cord serves as a fundamental pathway for nutrients and oxygen to the fetus and the disposal of waste products produced by the fetus (Basta & Lipsett, 2021). After birth, the cord is generally cut and clipped to then be observed until it falls off, leaving no evidence of any connections except the umbilical scar (Fahmy, 2018). While there is no correct or consistent timing for the detachment of the cord, separation of the umbilical cord generally occurs before the first three weeks after delivery (Basta & Lipsett, 2021). Umbilical cord care is varied across the globe and is influenced by cultural traditions (Stewart & Benitz., 2016). Care practices range from the topical application of substances - like breast milk and ethanol - to none at all, with the best practices of antiseptic care stirring controversy around the world (Stewart & Benitz., 2016).

IV. Breast Milk Application and Umbilical Cord Separation in Newborns

Allam et al. (2015) conducted a study to investigate the effect of breast milk on the separation time of the umbilical cord stump in newborn babies.
The sample consisted of 400 newborns chosen from the postpartum unit of hospitals in Cairo, Egypt and Al Riyadh, Saudi Arabia (Allam et al., 2015). The criteria for inclusion required a healthy, full-term baby with no congenital anomalies, with the intention that they were breastfed and shared a room with their mother (Allam et al., 2015). Using a simple random assignment technique, 200 newborns were selected to be a part of group A or B. Group B would serve as the control group and practice dry umbilical cord care, which is simply cleaning the site with sterile water and letting the cord dry out until it falls off, and Group A would spray a few drops of mother milk on the baby’s umbilical cord stump 3 times a day until cord detachment and a few days thereafter (Allam et al., 2015).

All the newborns in the sample were required to have a swab taken of their umbilicus immediately after birth and then 3 days after birth. The first swab was tested 24 hours after it was taken to determine the presence of infection; if there was infection the baby would be excluded from the study (Allam et al., 2015). The swab collected three days after birth was tested “to detect the early occurrence of colonization” (Allam et al., 2015).

At the start of the study, the mothers from both group A and group B were instructed by the researchers on proper handwashing techniques before implementing cord care (Allam et al., 2015). This was a strength of the study in how it attempts to control for differential hygienic practices in the mothers. Each mother was given a checklist to keep track of cord care and to document any signs of infection in the area. Additionally, the researchers called the mothers for a daily check-in until cord separation and examined the umbilical cord two days after separation to observe any possible complications in the separation process.

Allam et al. (2015) concluded statistically significant differences between the two groups. The mean cord separation time in the breast milk group was significantly shorter ($p < 0.001$) than in the dry cord care group (Allam et al., 2015). The mean cord separation time was 4.2 ± 20.45 days among the breast milk group and 7.12 ± 10.39 days in the dry cord care group (Allam et al., 2015). Bleeding time of the cord after separation was significantly shorter ($p < 0.001$) among the breast milk group than the dry cord care group (Allam et al., 2015). While the researchers found a statistically significant difference, a weakness of the study is that they failed to report effect size; thus, the magnitude of the results is unknown. Ultimately, the researchers took great care in ensuring that there were minimal threats to internal validity. The swab collections at the start of the study were thorough in how they tested for equivalence of the sample prior to the start. Harmful bacteria can invade the umbilicus at any point of the birthing process and be the cause of infection, so the swabbing served as a pretest by ensuring there was a necessary baseline of no infection in the sample prior to the beginning of the experiment. Swabs were also collected after cord separation to ensure that there were no bacteriological differences between the two after receiving the respective treatments.

Another strength of the research was their use of a pilot study to determine the practicality of the research. Ten percent of the sample were included in the pilot and subsequently removed from the research sample. This allowed the researchers to work out any potential flaws in the design. It is noted that five experts validated the clarity and construct of the tools being used, whereas it is not specified the nature of these pundits. Still, it is noteworthy that great care was taken to ensure the conciseness and sensibility of the tools used. The study also naturally possesses high external validity as babies are born all over the world in hospitals that provide consistency of care for babies and mothers. However, this study is specifically generalizable to babies who meet the criterion for selection: healthy, full-term, C-section birthed babies lacking any birth defects.

V. Human Milk versus Chlorohexidine on Umbilical Cord Separation

Abbaszadeh et al. (2016) is the first study to be conducted comparing the effects of breast milk and chlorhexidine on umbilical stump separation. Chlorhexidine is the one antiseptic recommended by the World Health Organization for umbilical cord care, particularly in areas with high infant mortality (World Health Organization, 2013). The sample observed in this study included 174 newborns in Kashan, Iran who were selected based on similar criteria to that of Allam et al.: healthy, full-term, without
any congenital defects who would be breastfed and room with mother. The neonates were split into either group one, which received breast milk as their umbilical cord care from three hours after birth every 12 hours until cord separation, and group two which received the same treatment but with chlorhexidine as a treatment instead of breast milk (Abbaszadeh et al., 2016).

Cultures of the umbilical stumps were taken before the start of the study to ensure the presence of microorganisms in the stump as well as the lack of infection right after birth (Abbaszadeh et al., 2016). Mothers in both groups were given forms to record exactly when they applied their respective treatments, as well as any signs of infections until the 2 days after the separation of the cord. The researchers kept consistent track of the newborns with home visits on days three, seven, and two days after the separation of the cord (Abbaszadeh et al., 2016). The results of the study revealed a statistically significant difference in the separation time of the umbilical cords, with the topical application of chlorhexidine resulting in a much longer separation time than with breast milk. The chlorhexidine and breast milk groups had a separation time of 13.28 ± 6.7 and 7.14 ± 2.15 days respectively (P < 0.001) (Abbaszadeh et al., 2016). Within five to ten days of birth, 67.5 percent (58/87 babies) of umbilical stumps had detached in the breast milk group, and just 34.5 percent (27/87 babies) had detached in the chlorhexidine group (Abbaszadeh et al., 2016). These results are comparable with the results of Allam et al. (2015) in which 80 percent (160/200 babies) of cords had fallen off at days 4 to 5 of age in the breast milk group compared to the minimal 3 percent (6/200 babies) in the dry cord care group. Both of these studies provide strong evidence that breast milk is a legitimate and useful method of umbilical cord care. Comparing the results of both studies, breast milk is not only effective in shortening the separation time of the umbilical cord over dry cord care, but it is just as effective in reducing signs of infection relative to the antimicrobial chlorhexidine (Abbaszadeh et al., 2016).

The following analyses do not detail the effect of human breast milk on the umbilical cord separation time but provide a brief overview of studies done on other parts of the neonate body.

VI. Comparing Breast Milk and Hydrocortisone 1% on Diaper Rash

Farahani et al. (2013) conducted a study that would compare the effectiveness of both breast milk and one percent hydrocortisone on diaper dermatitis - diaper rash, a very common skin problem with a range of seven to 35% of infants being affected by it (Farahani et al., 2013). In a sample of 141 infants, the application of either one percent hydrocortisone or breast milk was continued for a week and scored on days three and seven to measure improvement in the rash from a baseline taken at the beginning of the
The findings revealed comparable efficacy of both treatments and conducted a chi-square test to reject the hypothesis that hydrocortisone is superior to breast milk (Farahani et al., 2013). This result is a prime example of another non-nutritional, topical use of breast milk and underscores its anti-inflammatory benefits.

VII. Colostrum as a preventative measure

Conjunctivitis or pink eye, while generally resolved on its own or treatable with antibiotics, can have severe consequences on a newborn and may lead to blindness among other life-altering symptoms (Ghaemi et al., 2014). Ghaemi et al. (2014) sought to evaluate the preventative effects of colostrum, a nutrient-rich early form of breast milk, against neonatal conjunctivitis. The researchers sampled 300 preterm newborns split into a control group, a colostrum group, and a topical antibiotic group. The results revealed that colostrum was effective as a preventative measure for neonatal conjunctivitis. Of the 66 babies that were reported to have pink eye after treatment, the control group had the most, followed by topical colostrum and then topical antibiotic (Ghaemi et al., 2014). This study furthers evidence of the pharmaceutical properties of breast milk, as it has been shown to not only heal disease, but also to prevent it.

VIII. Conclusion

The review of the literature demonstrates a correlation between the use of topical breast milk and a decrease in umbilical cord separation time among newborns in the Middle East. The study by Allam et al. (2015) provides evidence for the use of breast milk as superior to dry cord care given the experimental group experienced a statistically significant shorter detachment time when compared to the control group. The study by Abbaszadeh et al. (2016) also showed a decrease in detachment time of the cord. Abbaszadeh et al. (2016) and Ghaemi et al. (2014) demonstrated the pharmaceutical powers of breast milk, as it was just as effective to chlorhexidine and hydrocortisone, both established antimicrobial and anti-inflammatory medications. On the other hand, Farahani et al. (2013) touched more on the preventative facet of breast milk. These findings designate breast milk as an affordable, easy, and practical method of umbilical cord care. These implications are monumental in regions with high neonatal deaths with less access to resources and hospital care. If breast milk is adopted as a mode of umbilical cord care in these regions, the rate of infection within neonates is likely to decrease, which would prompt a decrease in the need for hospital visits and lead to a decrease in the world infant mortality rate.

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References


