

An Experiment to Assess the Efficacy of Lukewarm Water for Umbilical Cord Care Among Newborns in Chosen Hospitals in Akola

J. Gnanadhinahari^{1,*}, P. Shema²

Abstract

The study's conceptual framework, methodology, and tools were developed based on a review of relevant literature, drawing upon Ludwig von Bertalanffy's general systems theory. The research was conducted across three settings: Orbit Multispeciality Hospital and Deshmukh Multispeciality Hospital in Akola. Employing an experimental single-group post-test design, the study focused on mothers with newborns. The study employed a method of random sampling to choose participants. The finds are that majority, 17 (56.6%) of experimental group had no infection. Least number of experimental groups 3 (30%) had moderate infection whereas none reported severe level of infection. Majority, 13 (43.33%) of control group had a mild infection. Least number, 3 (30%) had moderate infection in control group and 3 (30%) of control group had severe infection.

Keywords: Single-group post-test design, newborns, experimental group, mothers, severe infection

INTRODUCTION

"Every child born into the world is a new thought of god, an ever fresh and radiant possibility"

—Kate Douglas Wiggin

Health is universally valued as the utmost priority, irrespective of individual backgrounds. Proper care during the earliest stages of life significantly increases children's chances of survival and healthy development. The first month of life holds critical importance in terms of healthcare, particularly for women and children, who are the cornerstone of both healthy families and nations. This is especially true for infants, whose future health hinges upon receiving adequate care during their initial year of life. Newborns represent hope for both the present and the future. Their bodies are highly sensitive, delicate, and vulnerable, requiring meticulous care to prevent harm. The birth of a baby is a momentous occasion,

marked by immense joy and gratitude for the gift of life bestowed by a higher power upon parents. Upon the arrival of their newborn, many parents eagerly engage in caring for their infant. Initial neonatal care involves ensuring a warm environment, clearing the oropharynx and nose, cleansing the eyes, clamping and severing the umbilical cord, weighing the baby, attaching an identification tag, and swaddling the infant. A mother's first smile often accompanies the cry of her newborn, overshadowing any pain she may have experienced during childbirth. Following delivery, the newborn undergoes a significant transition from the sterile environment of the uterus to the external world, facilitated by the cutting of the umbilical cord.

*Author for Correspondence

J. Gnanadhinahari

E-mail: jgnanadhinahari@gmail.com

¹Principal, Samarth Nursing College, Ranpise Nagar, Akola, Maharashtra, India

²Vice Principal, Samarth Nursing College, Ranpise Nagar, Akola, Maharashtra, India

Received Date: January 05, 2024

Accepted Date: March 28, 2024

Published Date: March 31, 2024

Citation: J. Gnanadhinahari, P. Shema. An Experiment to Assess the Efficacy of Lukewarm Water for Umbilical Cord Care Among Newborns in Chosen Hospitals in Akola. International Journal of Obstetrics, Perinatal and Neonatal Nursing. 2024; 10(1): 17–29p.

While no longer necessary after birth, the umbilical cord stump remains attached, providing a potential entry point for non-pathogenic bacteria such as coagulase-negative *staphylococci*, *E. coli*, *streptococci*, and *C. tetani*, which may cause infection if not properly cared for [1–6].

As per a UNICEF report presented at the National Conference on Child Survival and Development in New Delhi, approximately 1.2 million out of nearly 26 million infants born annually in India do not survive beyond the initial four weeks of life. This accounts for 30% of the global neonatal deaths, which totals 3.9 million. The current report on neonatal mortality indicates that a rate of 44 deaths per 1000 live births constitutes nearly two-thirds of all infant mortality (deaths before reaching one year of age) and close to half of all deaths among children under the age of five in India. India's neonatal mortality rate (NMR) decreased significantly from 69 deaths per 1000 live births in 1980 to 50 deaths per 1000 live births in 1990. However, in recent years, the NMR has stagnated, dropping only four points from 48 to 44 deaths per 1000 live births between 1995 and 2000. The primary causes of neonatal mortality are low birth weight and infections [7–10].

Hospitalized neonates are susceptible to infections from various sources, including tube feeding, contaminated clothing, inadequate hygiene practices such as skipping baby baths, and the use of excessive cosmetics. The environment poses a significant risk as the umbilical cord serves as an entry point for systemic infectious agents that inhabit the newborn's skin. Despite the presence of a cord clamp, the umbilical cord remains vulnerable to microbial entry due to its exposed opening. Therefore, maintaining cleanliness of the umbilical cord is crucial for preventing infections and facilitating normal healing until the stump naturally dries up and detaches. Providing proper umbilical cord care during the transitional period is imperative for neonatal health [11].

SIGNIFICANCE AND NEED FOR THE STUDY

In midwifery, ensuring newborn care is a paramount concern, with significant emphasis placed on providing immediate and ongoing attention following birth. Proper care of the umbilical cord holds particular significance due to the potentially life-threatening consequences of cord infections, which can ultimately result in neonatal mortality. The objective of this study is to examine the efficacy of applying lukewarm water to the umbilical cord of newborns in preventing umbilical cord infections. Researchers conducted a study to assess the impact of various cord care approaches on pre-term infants. The findings of the study indicated that cleansing the cord with alcohol, followed by wiping and applying sterzac powder, led to reduced incidences of cord-related infections and faster cord separation compared to other care methods. These compelling findings underscore the potential risks associated with leaving umbilical cords untreated, highlighting the importance of implementing appropriate care protocols [12–15].

In 1998, a study was conducted to evaluate the efficacy of topical agents for umbilical cord care in preventing infections, illnesses, and mortality among newborn infants in developed nations. Their findings showed that using warm water for cleansing, both for newborns born in hospitals and those born outside, resulted in a decrease in the incidence of umbilical sepsis over the years: 2001 (10 cases), 2002 (24 cases), 2003 (19 cases), and 2004 (until January)—15 cases. Early-onset neonatal sepsis typically manifests within 72 hours of birth, with a mortality rate ranging from 15% to 50%. Late-onset neonatal sepsis, occurring after 72 hours of life, involves infections acquired in healthcare settings, with an overall mortality rate of 10–20%. According to a UNICEF report presented at the National Conference on Child Survival and Development in New Delhi, approximately 1.2 million out of nearly 26 million children born in India annually do not survive beyond the first four weeks of life, accounting for 30% of the 3.9 million global neonatal deaths. As per the latest neonatal mortality report, a rate of 44 deaths per 1000 live births accounts for nearly two-thirds of all infant deaths (deaths before the age of one) and almost half of deaths among children under the age of five in India. The NMR in India has significantly decreased from 69 deaths per 1000 live births in 1980 to 50 deaths per 1000 live births in 1990. However, in recent years, the NMR has remained relatively stable, only decreasing by four points

from 48 deaths per 1000 live births in 1995 to 44 deaths per 1000 live births in 2000. India accounts for 20% of global births and holds the record for the highest number of neonatal deaths within a single country. Each year, India witnesses the birth of 26 million infants, among whom 1.2 million face neonatal mortality within the initial four weeks of life. This translates to two newborn deaths occurring every minute within the country. In the Konduga local government area of Borno state in 2005, traditional cord care practices were prevalent, including methods such as hot fermentation (31.5%), use of rag and lantern (19.5%), application of Vaseline (9.5%), ash/charcoal (9.3%), groundnut/palm oil (8.3%), utilization of powder (6.5%), and red sand (3.5%). However, these practices pose risks as the substances involved are often contaminated with bacteria and spores, thus heightening the likelihood of infection. Over time, traditional nursing procedures are gradually being replaced by more modern practices in response to technological advancements and evolving healthcare standards [16–21].

OBJECTIVES

1. To evaluate the condition of the umbilical cord following cord care in both the experimental and control groups.
2. To examine the efficacy of cord care between the experimental and control groups.
3. To determine any potential correlations between the experimental group and certain demographic variables.
4. To ascertain any potential correlations between the control group and specific demographic variables.

HYPOTHESES

- *Hypothesis 1 (H1):* A notable discrepancy is anticipated between the experimental and control groups following cord care.
- *Hypothesis 2 (H2):* A substantial correlation is expected between the experimental groups and certain demographic factors.
- *Hypothesis 3 (H3):* A significant correlation is predicted between the control groups and specific demographic variables.

OPERATIONAL DEFINITIONS

Effectiveness

In this study, the outcome of an experimental investigation is indicated by the presence of a noteworthy contrast among tests conducted on newborns.

Newborn

This study refers to the time frame spanning from birth to 28 days of life, commonly known as the neonatal period, during which the infant is referred to as a neonate or newborn baby.

Umbilical Cord Care with Lukewarm Water

In this study, warm water within the temperature range of 70–97 degrees Fahrenheit or 26–36 degrees Celsius is used to cleanse the umbilical cord, after which the cord is allowed to air dry.

ASSUMPTION

1. *Application of lukewarm water:* It promotes early healing.
2. *Application of lukewarm water:* It prevents the incidence infection.

DELIMITATIONS

1. The research is constrained to newborns delivered via cesarean section.
2. The investigation is confined to the period from birth to the first 10 days of life.

PROJECTED OUTCOME

The findings of the study will enable the researcher to ascertain the efficacy of using lukewarm water for cord care in newborns. This research will facilitate the promotion of prompt healing of the umbilical cord and the prevention of infections. Additionally, the results concerning demographic factors will aid in identifying variables that may contribute to delayed cord healing.

UMBILICAL CORD

Examine the umbilical cord region to ensure the presence of the appropriate number of blood vessels, consisting of two arteries and one vein. The diameter of the umbilical vein is expected to be greater than that of the umbilical arteries. The presence of a yellow-brown or green hue on the cord suggests the passage of meconium. It is important to monitor the umbilical cord for any signs of bleeding or seepage in the initial hours following birth. Ensure that the clamp is firmly secured, avoiding any entrapment of skin or tissue injury [22].

Pathophysiological Background

The umbilical cord comprises two arteries and one vein enveloped by a gelatinous connective tissue known as Wharton's jelly, along with a delicate mucous membrane. Throughout pregnancy, the placenta facilitates the provision of nutrients to the fetus for its growth and development while eliminating waste products. Blood circulation within the umbilical cord transports oxygen and nutrients to the fetus and eliminates carbon dioxide and metabolic waste materials. Following delivery, while the placenta remains attached and the umbilical cord continues to pulsate, a small quantity of blood may be transferred from the placenta to the infant. This transfusion of blood to the newborn serves to mitigate neonatal anemia. The volume of blood transfused is contingent upon the timing of cord clamping and the positioning of the infant relative to the mother during this process.

Umbilical Cord Healing Process

As the umbilical cord dries out, it darkens and contracts, eventually detaching from the newborn's body within a period of 7–14 days. During this time, it is important for the cord to remain dry and free from any discharge. Following the detachment of the cord, a small pink, granulated region approximately a quarter inch in size may persist. It should be kept clean and dry until it has fully healed, typically within the next 24–48 hours [23].

Umbilical Cord Infection

In umbilical cord, if the ulcerous area has remained as long as one week it indicates of sign of infection.

Source of Infection

- Unhygienic environment of delivery.
- Contaminated cord cutting instrument.
- Infected hands of care giver or infected clothing.

Causative Organisms

- *Staphylococcus*
- *E. coli*
- *C. tetani*

Signs and Symptoms

- Swollen and moist per umbilical tissue with redness
- Foul smelling
- Serous or purulent discharge.
- Delayed falling of umbilical cord
- Fever

Management

- Umbilical cord should leave uncovered rather than application of dressing.
- Systemic antibiotic is given in complicated cases.

Complication

- Jaundice
-

- Hepatitis
- Peritonitis
- Umbilical granuloma

Prevention

- Aseptic technique and clean practices at birth.
- Administration of tetanus toxoid to antenatal mothers.

Prognosis

The prognosis relies on factors such as the type of infection, promptness of treatment initiation, and quality of nursing care provided. Preventing umbilical cord infections is crucial and relatively straightforward in newborns.

CORD CARE DO'S AND DONT'S

Do's

- Cut the cord with a clean instrument.
- Tie the cord tightly with clean or sterile thread or clamp.
- Tie napkin or diaper below the umbilical cord.

Don'ts

- Bandages are unnecessary and may delay in cord healing and introduce infection to the newborn.
- Alcohol cleaning may delay in healing and cause pus.
- Applying traditional remedies to the cord may cause infection.

Prognosis

Prognosis depends upon the nature of infection, initiation of management, and nursing care. Prevention of umbilical cord infection is easier and more important in neonates.

CONCEPTUAL FRAMEWORK

The conceptual framework of this study was crafted by the researcher drawing from von Bertalanffy's General System Theory of learning (1968), which views individuals as interconnected components within a larger system. According to this theory, all living systems are open and engage in varying degrees of interaction with their environment, receiving inputs, and producing outputs in the form of matter, energy, and information. In the context of this study, inputs include demographic variables of the mother (such as area of residence, education, occupation, parity, gender, and infant weight) and post-test assessments to evaluate the efficacy of lukewarm water. These factors were considered as inputs for evaluating the early healing process of the umbilical cord (Figure 1) [24].

Throughput

In this study, it denotes the process through which the input is modified or transformed, enabling it to be utilized by the system. It encompasses the steps required to accomplish the desired goal or assignment. The task is to implement the cord care using lukewarm water and assess the post-test level of effectiveness of lukewarm water. The following process was adopted. Assessing the post-test observation and practice on observational checklist and assessing the healing of umbilical cord.

Output

The output varies considerably depending on the characteristics and objectives of the system interacting with the environment. It relates to the lack of umbilical cord infection and the swift recovery of the umbilical cord.

Feedback

It shows that whether absence umbilical cord infection or early umbilical cord healing.

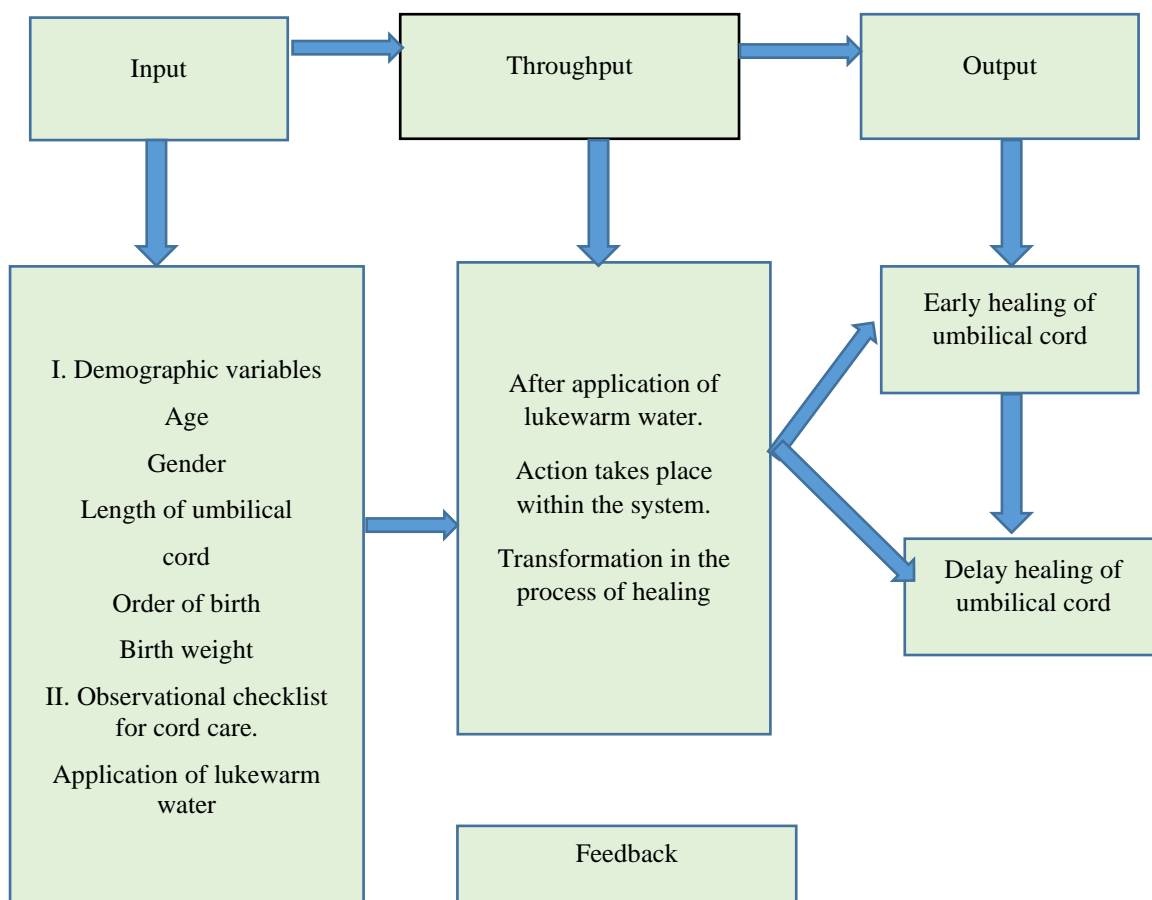


Figure 1. Conceptual framework based on von Bertalanffy's General System Theory (1968).

METHODOLOGY

Research Approach

The research approach selected for the present study was an experimental approach.

Research Design

The research design used for the study is experimental, one group post-design only.

Setting of the Study

The study was conducted in 2 setting in Orbit Multispeciality Hospital and Deshmukh Multispeciality Hospital. The Orbit Multispeciality Hospital was selected for experimental group and Deshmukh Multispeciality Hospital were selected for the control group.

Orbit Multispeciality Hospital

It is situated 5 kilometers away from Samarth Nursing College, Akola. The hospital is a total of 150 bedded Multispeciality hospital. Among them four wards allotted for both antenatal and post-natal mother. On average 80 deliveries was conducted per month.

Deshmukh Multispeciality Hospital

It is situated 5 kilometers away from Samarth Nursing College, Akola. The hospital has a total of 200 bedded maternity hospitals. Among them three wards for both antenatal and post-natal mother. On average 40 deliveries was conducted per month.

DATA COLLECTION PROCEDURE

Data were collected from 6 weeks; permission was sought from the hospitals to conduct the study. Mothers of the newborn identified and selected based on inclusion criteria. The participants were briefed

on the study's aim, and their agreement to take part was secured. Newborn in the experimental group were given cord care with lukewarm water, whereas newborns in the control were observed. A simple random sampling method was used to select the newborns for this study. 1–10 newborns that fulfilled the inclusion criteria on Monday, Tuesday, Wednesday, Thursday, Friday, and Saturday were assigned to the experimental group from 9.30 a.m. to 11.30 a.m. and the first 1–10 newborns selected on Monday, Tuesday, Wednesday, Thursday, Friday, and Saturday were assigned to the control group from 2.30 p.m. to 4 p.m. Consistent sampling methodology was maintained during the data collection process, with each observation being recorded on the observational checklist. The evaluation of the efficacy of lukewarm water was performed on the 10th day. The investigator expressed her gratitude to the mothers for their cooperation [25, 26].

PLAN FOR DATA ANALYSIS

The data were analyzed using descriptive and inferential statistics.

PILOT STUDY

A pilot study was carried out at K. S. Patil Multispeciality Hospital in Akola, involving 6 newborns, after receiving official authorization from the hospital authorities. The experimental group received cord care using lukewarm water, and the process was completed within the designated time frame. The tool was deemed satisfactory in terms of its simplicity and clarity. Based on the time for collecting the data, an arbitrary decision was taken to keep the same size (60) in which the final study was done. No modification in the tool was made after the pilot study.

PROTECTION OF HUMAN RIGHTS

The proposed study was approved by of dissertation committee of the college prior to the pilot study. The purpose of the study was explained to the mothers before data collection (Table 1).

Table 1. Schedule for data collection.

Groups	Procedure	Number of newborns				
		1	2	3	4	5
Experimental group	Observation	9–9:15a.m.	9:30–10a.m.	10–10:30a.m.	10:30–11a.m.	11:30–12a.m.
	Application of lukewarm water	9–9:15a.m.	9:30–10a.m.	10–10:30a.m.	10:30–11a.m.	11:30–12a.m.
Control group	Observation	1–1:30p.m.	1:30–1:45p.m.	1:45–2p.m.	2–2:15p.m.	2:15–2:30p.m.
	Establishing rapport with mother	1–1:30p.m.	1:30–1:45p.m.	1:45–2p.m.	2–2:15p.m.	2:15–2:30p.m.

- Time spent to assess the umbilical cord healing.
- Application of lukewarm water for 10 days at above-mentioned time.

DATA ANALYSIS AND INTERPRESENTATION

This article deals with the description of the sample and analysis and interpretation of the data collected from a selected group of 60 newborns to interpret the effectiveness of lukewarm water using cord care.

Table 2 reveals that among the newborns studied, majority (16, 53.3%) in experimental group and 19 (63.3%) in control group were first of order of birth and majority (21, 70%) in experimental and 18 (60%) in control group were females. Most of them (14, 53.3%) in experimental group and 13 (43.3%) in control group were 2–3 kg of newborn.

Figure 2 shows that the least number 3 (30%) of control group had severe level of infection. Majority 17 (56%) of the experimental groups had no infection. None of the experimental groups reported severe level of infection. The experimental group had early healing of umbilical cord compare than control group.

Table 2. Distribution of newborns based on their demographic variables in experiment group and control group ($n = 60$).

Demographic variables	Experimental group		Control group	
	<i>n=30</i>		<i>n=30</i>	
	<i>no</i>	<i>%</i>	<i>no</i>	<i>%</i>
1. Birth weight				
2–3 kg	14	53.3	13	43.3
3–4 kg	16	46.7	17	56.7
Above 4 kg	0	0	0	0
2. Gender				
Male	9	30	12	40
Female	21	70	18	60
3. Parity				
First	20	66.7	19	63.3
Second	9	30.0	8	26.7
Third	1	3.3	3	10
4. Length of umbilical cord				
Less than 2 cm	3	10	0	0
2-5 cm	27	90	11	36.7
Above 5 cm	0	0	19	63.3
5. Area of residence				
Rural	14	46.7	11	36.7
Urban	9	30.0	6	20.0
Suburban	4	23.3	13	43.3

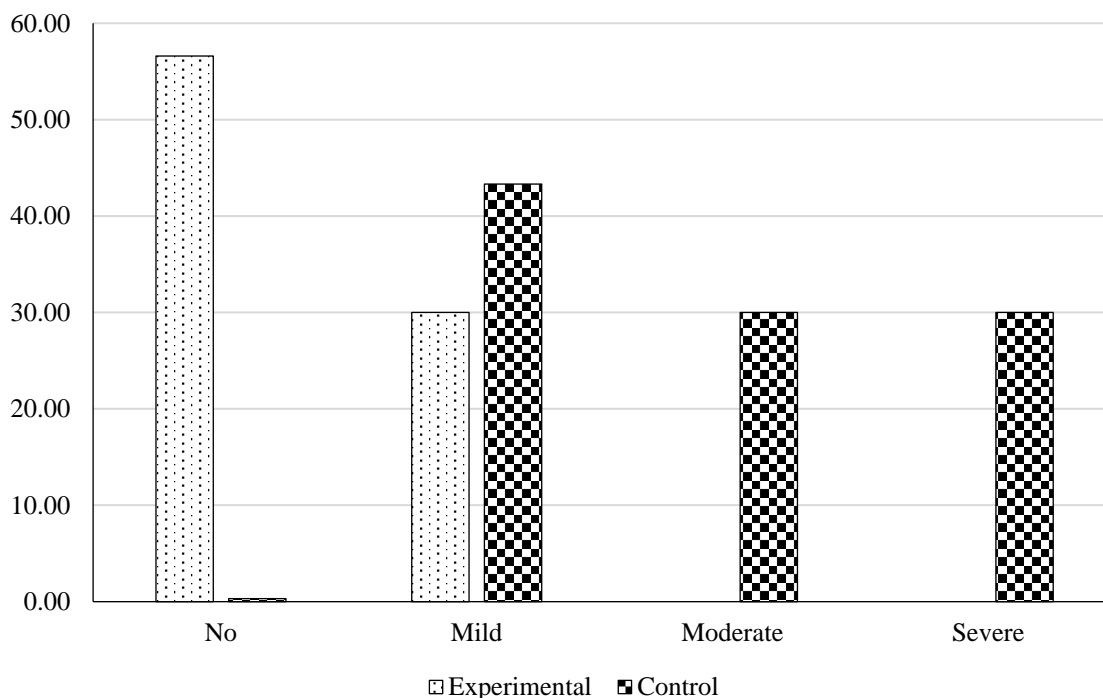


Figure 2. Distribution of cord care among newborns in experimental and control group.

Table 3 shows that the experimental and control group mean ‘t’ was calculated to determine the statistical significance of the difference. The calculated difference in means between the control and experimental groups yielded a ‘t’ value of 5.74, which was determined to be highly significant. Newborns in experimental group had early healing of cord when compared to newborn in control group.

Table 4 shows that the obtained chi-square value $X^2 = 11.028$ ($p < 0.05$) showed significant association between the parity and effectiveness of lukewarm water.

The obtained chi-square value $X^2 = 0.71$ ($p < 0.05$) showed no significant association between length of umbilical cord and effectiveness of lukewarm water.

Table 3. Effectiveness of cord care among newborns in experimental and control group (n = 60).

Groups	Mean	SD	't'
<i>Experimental</i>	10.3	4.8	5.74
<i>Control</i>	19.6	7.4	

Significance level $p < 0.005$

Table 4. Associations between umbilical cord care in the experimental group and selected demographic variables (n = 30).

Demographic variable	Above mean	Below mean	X^2
1. Parity			
1	7	6	11.028*
2	6	4	
Above 2	3	4	
2. Bright weight			
2-3 kg	6	7	0.4#
3-4 kg	9	8	
Above 4 kg	0	0	
3. Gender of the newborn			
Male	2	7	3.9*
Female	12	9	
4. Length of the umbilical cord			
Less than 2 cm	2	11	0.73#
2-5 cm	11	16	
Above 5 cm	0	0	

*- significant, # - not significant

Table 5. Associations between umbilical cord care in the control group and selected demographic variables (n = 30).

Demographic variable	Above mean	Below mean	X^2
1. Parity			
1	7	6	12.468*
2	6	4	
Above 2	3	4	
2. Bright weight			
2-3 kg	6	7	0.3#
3-4 kg	9	8	
Above 4 kg	0	0	
3. Gender of the newborn			
Male	2	7	0.463#
Female	12	9	
4. Length of the umbilical cord			
Less than 2 cm	2	11	0.0169#
2-5 cm	11	16	
Above 5 cm	0	0	

*: significant, #: not significant

Table 5 shows that the obtained chi-square value $X^2 = 11.028$ ($p < 0.05$) showed significant association between the parity and effectiveness of lukewarm water. The obtained chi-square value $X^2 = 0.0169$ ($p < 0.05$) showed no significant association between length of umbilical cord effectiveness of lukewarm water.

DISCUSSION

The study findings had been discussed in terms of the objectives and theoretical base.

To Evaluate the Condition of the Umbilical Cord Following Cord Care in Both the Experimental and Control Groups

The study showed that majority 17 (56.6%) of experimental group had no infection least number of experimental groups 3 (30%) had moderate infection, whereas non-severe infection reported severe level of infection. Majority (13, 43.33%) of control group had a mild infection. Least number (3, 30%) had moderate infection in control group and 3 (30%) of control group had severe infection.

The findings are consistent with Mullany's study conducted in 2002, indicating that the average duration for cord healing was reduced in both the dry cord care (4.24 days) and warm water (4.25%) groups compared to the chlorhexidine group (5.32 days). This suggests that implementing a positive approach in the experimental group could enhance the early healing of the umbilical cord.

To Evaluate the Comparative Efficacy of Cord Care Between the Experimental and Control Groups

The research findings indicated a notable contrast between the experimental group (mean 10.3, standard deviation 4.8) and the control group (mean 19.6, standard deviation 7.4). The calculated 't' value of 5.74 ($p < 0.05$) surpassed the level of significance (2.021), leading to the acceptance of the hypotheses. These findings are in line with Patricia's study from 2003, which indicated that the warm water group had a significantly higher likelihood of *E. coli* colonization (34.2% vs 22.1%) and foul odor (0.7%). Kelley's research in 2006 also supported these results, showing a significantly shorter period in the warm water group compared to the alcohol group (13.0 vs 16.0 days). Regular counselling for control group to change the cord regimen such as warm water will promote the early healing of cord and prevent the infection of umbilical cord.

To Investigate the Correlation Between Umbilical Cord Care in the Experimental Group and Certain Demographic Factors

The study findings showed that association of birth weight, length of umbilical cord on the level of infection was analyzed using inferential statistics namely chi-square obtained value in each of these variables showed that there was no significant association between the experimental groups. At a chi-square value $X^2 = 11.028$ ($p < 0.05$) shows that there was significant association between the order of birth and the experimental group. A chi-square value of $X^2 = 3.9$ ($p < 0.03$) indicates a meaningful correlation between gender and the experimental group. These findings align with Chandra's research from 2009, which demonstrated a statistically significant distinction between warm water ($p < 0.05$) and herbal application, with warm water representing 85% and herbal application 86.6%. Increasing awareness regarding the importance of cord care can positively impact the health of newborns. Cultural norms or traditional practices may be adopted to decrease the mortality rate among newborns.

To Explore the Relationship Between Umbilical Cord Care in the Control Group and Various Demographic Variables

The study examined the relationship between birth weight, gender, and umbilical cord length with the occurrence of infection using chi-square analysis. The findings indicated that there was no significant correlation between these variables and the control group. However, a significant association was observed between birth order and the control group, with a chi-square value of $X^2 = 12.4608$ ($p < 0.05$). These findings were consistent with those of Chamanvanaki's study conducted in 2005, where infants in group 1 had significantly longer time to cord separation compared to group 2 ($p = 0.036$) and group 3 ($p = 0.003$) [27, 28].

Limitations

All the newborns could not be included in the study as basis delivered by normal vaginal delivery were discharge by 3 days of birth, thus the babies could not be assessed for signs of infection and cord healing.

Summary and Recommendations

The study aimed to evaluate the efficacy of utilizing lukewarm water for umbilical cord care in newborns. Employing an experimental research design, it drew its conceptual framework from Ludwig von Bertalanffy's general system theory. An observational checklist, developed following a review of existing literature and consultation with experts, was employed as the primary data collection tool, and its reliability was evaluated using the test-retest approach. Data gathering occurred over a six-week time frame utilizing simple random sampling. The study was conducted primarily at Orbit Multispeciality Hospital and Deshmukh Multispeciality Hospital in Akola.

Main Findings of the Study

- The majority (17, 56%) of experimental group had no infection and 3 (30%) had mild infection and none of the experimental had severe infection in experimental group. The experimental group had early healing when compared to control group.
- The majority (13, 43.3%) of control group had mild infection and 3 (30%) had both moderate and severe infection. The control group had delay healing of umbilical cord when compared to experimental group.
- The majority (21, 70%) of experimental group were females in Orbit Multispeciality Hospital. They were first born children and weighed 2–3 kg of newborn.
- The majority (19, 63.3%) of control group were first order and 13 (43.3%) were from rural setup.
- The study revealed a notable contrast between the experimental group (mean 10.3, SD 4.8) and the control group (mean 19.6, SD 7.4). The calculated 't' value of 5.74 ($p < 0.05$) indicated a statistically significant difference between the experimental and control groups.
- At a chi-square value $X^2 = 11.028$ ($p < 0.05$) shows that there was significant association between the order of birth and the experimental group.
- At a chi-square value $X^2 = 3.9$ ($p < 0.03$) shows that there was significant association between gender and the experimental group.
- At a chi-square value $X^2 = 12.4608$ ($p < 0.05$) shows that there was a significant association between the parity and the control group.

CONCLUSION

- The majority of experimental group had no infection, moderate and none of the experimental group had severe infection of experimental group. The majority of control group had mild infection.
- The experimental group did not exhibit any notable correlations between demographic factors such as birth weight and length of the umbilical cord. Similarly, no significant correlations were observed between the demographic variables (birth weight, order of birth, length of umbilical cord) in the control group. However, significant associations were detected between the experimental group and certain demographic variables such as order of birth and gender, as well as between the control group and the order of birth.

Implications

The study findings hold significance for the field of nursing across various domains, including nursing services, administration, education, and research.

Nursing Service

1. The findings of the study will aid nurses in enhancing their understanding of the significance of umbilical cord care.
2. The nurse has responsibility in educating the mothers regarding umbilical cord care.
3. Mothers need to be taught about the complications and danger signs of infection in reduce to mortality.

NURSING EDUCATION

- The research enriches the nursing curriculum by incorporating modules that facilitate student learning on the topic of maintaining a healthy umbilical cord and preventing infections.

- In-service education should be extended to nursing staff across various tiers to enhance their understanding of diverse cord care methods.
- Nurse educators need to stay abreast of the latest advancements in umbilical cord care treatment modalities to ensure their knowledge remains current.

Nursing Administrator

- Nursing administration should engage in policymaking concerning healthcare, formulating protocols, procedures, and standing orders regarding health education pertaining to umbilical cord care.
- Nurse administrators ought to launch community-oriented awareness initiatives, leveraging available resources within both the hospital and the community.
- Utilizing mass media campaigns extensively can aid in preventing the occurrence of perilous symptoms associated with umbilical cord infections.
- Nurse administrators should instigate community-based awareness initiatives with the active backing of resources available within the community.

Nursing Research

1. The study can be published in journals to disseminate knowledge regarding umbilical cord care using lukewarm water.
2. The findings of the study served basis for the nursing professional and the students in different aspects of umbilical cord care like core care using dry cord care, olive oil, and prevention of complications, treatment of infections.
3. Different ways of caring the newborn can be explored.

Recommendations

- This study could be reproduced across diverse environments.
- A comparison between olive oil and lukewarm water could be explored in rural areas.
- A comparable investigation could be conducted, focusing on different domains such as practical application.
- An analogous research endeavor could be pursued, specifically targeting infected umbilical cords.
- A replication with a larger sample size could enhance the potential for broader applicability.
- An investigation could be conducted to evaluate the impact of a structured educational program on promoting safe cord care practices.

REFERENCES

1. Alan G, Richard. A textbook of children and young's people's nursing. London: Churchill living stone; 2006.
2. Adele P, Pillteri. Maternal and child health nursing. 5th edition. Philadelphia: Lippincott Williams; 2009.
3. Assuma T. Textbook of Paediatric Nursing. Haryana: Elsevier; 2009.
4. Barbara F, Sheila. Paediatric Nursing. 3rd edition. London: ELBS;1991.
5. Baswanthappa BT. Nursing Research. 3rd edition. New Delhi: Jaypee Publications; 2003.
6. Chiris M. Mayes's Midwifery. 13th edition. Bailliere Tindall; 2003.
7. Data, P. Pediatric Nursing. 2nd edition. New Delhi: Jaypee Publications; 2009.
8. Dennise F, Cheryl T. Nursing research principles and method. 7th edition. New York: Lippincott Williams and Wilkins; 2007.
9. Emily S, Susan. Maternal and child health nursing. 2nd edition. Philadelphia: Elsevier; 2005.
10. Ghai OPO. Essential of paediatrics. 6th edition. New Delhi: CBS; 2007.
11. Unar-Munguía M, González de Cosío T, Escalante-Izeta EI, Ferré-Eguiluz I, Sachse-Aguilera M, Herrera C. Evaluating the effect of the initiative 'caring for the newborn and the mother at home' in Mexico. Public Health Nutr. Jan 2021; 24(1): 157–168. DOI: 10.1017/S1368980020003948.

12. 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*. Jul 2005; 88(7): 967–972.
13. Vural G, Kisa S. Umbilical cord care: A pilot study comparing topical human milk, povidone-iodine, and dry care. *J Obstet Gynecol Neonatal Nurs*. Jan–Feb 2006; 35(1): 123–8. DOI: 10.1111/j.1552-6909.2006.00012.x.
14. Ford LA, Ritchie JA. Maternal perceptions of newborn umbilical cord treatments and healing. *J Obstet. Gynecol. Neonatal Nurs*. Sep–Oct 1999; 28(5): 501–6. DOI: 10.1111/j.1552-6909.1999.tb02023.x.
15. Satishchandra DM, Naik VA, Wantamutte AS, Mallapur MD. Impact of training of traditional birth attendants on the newborn care. *Indian J Pediatr*. Jan 2009; 76(1): 33–36. DOI: 10.1007/s12098-008-0229-9.
16. Seema Chapadiya, Ponmani P, Jeenath Justin Doss. K. A study to assess the effectiveness of structured teaching programme on knowledge regarding umbilical cord stem cell banking among antenatal mothers in selected hospital, at Rajkot. *Asian J. Nursing Education and Research*. 2020; 10(1): 60–62. DOI: 10.5958/2349-2996.2020.00014.2.
17. Pillay T, Nightingale P, Owen S, Kirby D, Spencer A. Neonatal nurse staffing and delivery of clinical care in the SSBC Newborn Network. *Arch Dis Child Fetal Neonatal Ed*. May 2012; 97(3): F174–178. DOI: 10.1136/adc.2011.300224.
18. World Health Organization. Pocketbook of hospital care for children: Guidelines for the management of common childhood illnesses. 2nd edition. Geneva; 2013. Problems of the neonate and young infant. [Online] Available from: <https://www.ncbi.nlm.nih.gov/books/NBK154443/>.
19. WHO. (1999). Standard of midwifery practice for safe motherhood. Who publication. [Online] Available from: <https://iris.who.int/bitstream/handle/10665/205910/B0101.pdf>.
20. Guala A, Pastore G, Garipoli V, et al. The time of umbilical cord separation in healthy full-term newborns: A controlled clinical trial of different cord care practices. *Eur. J Pediatr*. 2003; 162: 350–351. [Online] Available from: <https://doi.org/10.1007/s00431-003-1174-2>.
21. Smith CK. Some traditional umbilical cord care practices in developing countries. *Midwifery Today Int Midwife*. 2009 Autumn; (91): 12–3.
22. Alam MA, Ali NA, Sultana N, Mullany LC, Teela KC, Khan NU, Baqui AH, El Arifeen S, Mannan I, Darmstadt GL, Winch PJ. Newborn umbilical cord and skin care in Sylhet District, Bangladesh: implications for the promotion of umbilical cord cleansing with topical chlorhexidine. *J Perinatol*. 2008 Dec; 28 (Suppl 2): S61–S68. DOI: 10.1038/jp.2008.164.
23. Ahmadpour-Kacho M, Zahedpasha Y, Hajian K, Javadi G, Talebian H. The effect of topical application of human milk, ethyl alcohol 96%, and silver sulfadiazine on umbilical cord separation time in newborn infants. *Arch Iran Med*. 2006 Jan; 9(1): 33–38.
24. Barclay L, Harrington A, Conroy R, Royal R, LaForgia J. A comparative study of neonates' umbilical cord management. *Aust J Adv Nurs*. 1994 Mar–May; 11(3): 34–40. Erratum in: *Aust J Adv Nurs*. 1994 Sep–Nov; 12(1): 35.
25. Malá K, Stranák Z. Osetrování pupečního pahýlu u donosených novorozenců [Umbilical stump care in full-term neonates]. *Ceska Gynekol*. 2004 Dec; 69 Suppl 1: 105–7. Czech.
26. Mullany LC, Darmstadt GL, Tielsch JM. Safety and impact of chlorhexidine antiseptic interventions for improving neonatal health in developing countries. *Pediatr Infect Dis J*. 2006 Aug; 25(8): 665–75. DOI: 10.1097/01.inf.0000223489.02791.70.
27. Asiedu SSO, Apatu NAA, Tetteh R, Hodgson A. Neonatal Cord Care Practices among Mothers and Caregivers in the Volta Region of Ghana. *Int J MCH AIDS*. 2019; 8(1): 63–69. DOI: 10.21106/ijma.272. PMID: 31321147.
28. Mullany LC, Darmstadt GL, Khatri SK, Katz J, LeClerq SC, Shrestha S, Adhikari R, Tielsch JM. Topical applications of chlorhexidine to the umbilical cord for prevention of omphalitis and neonatal mortality in southern Nepal: a community-based, cluster-randomised trial. *Lancet*. 2006 Mar 18; 367(9514): 910–18. DOI: 10.1016/S0140-6736(06)68381-5.