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Effect of Swaddle Bathing versus Traditional Bathing on Physiological Stability and Comfort level among Neonates

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Abstract
Bathing the neonates is one of nursing practices in the neonatal intensive care units that increase manipulation and has an impact on the physiological and behavioural parameters. **Aim:** Evaluate the effect of swaddle bathing versus traditional bathing on physiological stability and comfort level among neonates. **Research design:** Quasi experimental research design was utilized in the present study. **Sample:** The study sample consisted of all available healthy full-term neonates include (90 neonates)45 for the swaddle and 45 for traditional bathing groups**. Setting:** The study was conducted in the neonatal intensive care unit (NICU), at Minia University Hospital for Obstetrics and Paediatrics (MUHOP). **Tools:** Three tools were used; **Tool I:** Structured interview questionnaire sheet which was consisted of demographic characteristics of the neonates, **Tool II:** Physiological parameters recording sheet and **Tool III:** COMFORT neo scale. **Results:** The total mean score of discomfort was decreased in the swaddle versus traditional bathing group with a highly statistically significant differences at 10 minutes after bathing. There was stability in the mean score of body temperature in the swaddle versus traditional bathing group while there was an increase in the mean scores of heart rate and respiratory rate for traditional versus swaddle bathing group after bathing with statistically significant differences. **Conclusion.** Applying swaddle bathing technique is an effective method for improving physiological parameters and decreasing discomfort level for the neonates in NICU. **Recommendation:** Training program should be conducted in the neonatal intensive care units for nurses about swaddle bathing techniques.

Keywords: Comfort, Neonates, Physiological stability & Swaddle bathing.

Introduction
Neonatal skin acts as a barrier to infection, and a key in thermoregulation and maintaining homeostasis in the neonates. The management and protection of neonatal skin is important in maintaining the neonatal stability which is a corner stone in improving outcomes **(Kusari et al, 2019)** Bathing is one of the neonates' skin procedures in the neonatal intensive care units, in order to remove wastes and harmful substances from the skin surface, providing a good appearance, and avoiding the multiplication of microorganisms **(Gunay & Coskun, 2018).**

Bathing the neonates is one of nursing practices that increase manipulation and has an impact on the physiological and behavioural parameters such as temperature, heart rate, oxygen saturation with increased crying duration and stress signs (**Fernández & Antolín-Rodriguéz,2018).** There are different types of bathing with their specific advantages for the neonates such as, lap bath for attachment with the mother, sponge bath, tub bath to prevent heat loss, easy bath to save time for nurses, swaddle bath to decrease crying of neonates and oil bath for weight gain for preterm **(Swapna et al., 2017).**

Traditional bathing of the neonates especially the preterm infant can cause decreased temperature and increased stress signs, including increased heart rate, crying, decreased oxygen saturations, and increased pain levels, which can adversely affect proper growth and development. Swaddle bathing has been shown to be the best practice to maintain thermoregulation and decrease the adverse outcomes in the infant if it is correctly applied **(Fernandez & Antolín-Rodriguez, 2018; Ceylan, 2018).**

Association of Women's Health, Obstetric & Neonatal Nurses (AWHONN) recommends swaddled tub bathing as a safe and excellent method of bathing in contrast with sponge bathing. Full-term and late-preterm neonates experience thermal stability and show decreased crying duration and provide a quiet, calm state when they are bathed in a tub compared with neonates who received a sponge bathing **(Barmore et al., 2020).**

Swaddle bathing is a technique that includes immersing the neonate in warm water just below the shoulders, swaddled in blankets, the arms and legs is kept in flexion position. The process of unfolding, cleaning and returning the blankets is done carefully and sequentially, in order to promote containment.

This practice results in reduced behavioural tension, due to greater consistency of the nervous and motor systems, during and after the procedure **(de Freitas et al., 2018)**

A recent study done by **dos Santos and da Silva, (2020)** about swaddle bathing the preterm in a neonatal unit, proved that swaddle bathing has benefits for the neonates related to relaxation and less behavioural disorganization, with reflexes for the baby's growth and development, and avoiding complications, such as stress, crying, weight loss, drop in saturation and apnoea. And also, the study by **Passos et al., (2017)** about the neonates' behavioural stability during hot tub bath ,found that, the stress and pain scores were increased during and after the in-shower bathing, whereas the stress and pain scores didn't change in swaddled bathing.

Nurses have an important role to achieve humanized care for the high-risk newborns through greeting the family and individualized care, this promotes the neonatal development, the confidence and adjustment of family members during hospitalization. It is necessary to know the circumstances surrounding the neonatal unit to improve adherence of professionals to well practices, including those related to bathing **(Silva et al., 2018)**. The nurse has the opportunity to accomplish good general hygiene through bathing because it is the good time for the nurse to notice the neonate's behaviours, alertness, state of excitement and motor activity. **(Hockenberry & Wilson,2018).**

Significance of the study

During hospitalization in NICU, bathing procedure is an essential one which prevent accumulation of microorganisms and therefore avoid nosocomial infection, maintain skin condition, decreases epidermal water loss, improves feeding practices and thus creates an environment for optimum growth of the neonates (**Swapna et al., 2017).** Sponge baths, tub baths, swaddle baths and shower bathing are commonly used types of bathing in neonatal intensive care units **(Dağ, Yayan, & Özdemir, 2021).**

Performing a daily bath for the newborn infants is an extremely stressful, which leads to undesirable physiological responses such as hypothermia, hypoxia, dyspnea, cyanosis, decreased oxygen saturation, and tachycardia as well as behavioural discomfort such as crying, open eyes, tongue extension, pain and distress level **(de Freitas, 2018).** Implementing evidence-based practices are generally well received by nursing staff and can improve outcomes in the neonatal population, evidence-based guideline promotes adherence to skin care bathing practices and including swaddle bathing, which improves outcomes in the neonate and reduces the risk for negative outcomes such as hypothermia and increased stress **(Williams, 2020).**

The swaddle bathing had a positive effect on physiological parameters and behavioural responses to preterm infants compared to sponge bath and traditional tub bath which can increase behavioural distress and instabilities of physiological parameters in the preterm infants **(Tambunan & Mediani , 2019).**

In Egypt there was no study done about neonatal swaddle bathing and its effect on the newborn but the routine bathing such as shower and sponge bath are the commonly used types of bathing in neonatal intensive care units, so the current study was done hopefully, to transfer the experience of swaddle bathing to be practiced by the nurses as a comfortable and safe bathing method in the neonatal intensive care units. Eventually, the current study results will provide guidelines and recommendations that will influence paediatric nursing education and provide evidence-based instructions that can promote nursing practice and research in the field of neonatal nursing.

Aim of the study

The aim of the current study was to evaluate the effect of swaddle bathing versus traditional bathing on physiological stability and comfort level among neonates.

Research hypotheses

H_0: Swaddle and traditional bathing will not make changes in physiological stability and comfort of the neonates.

H_1: The neonates who will receive swaddle bathing will experience stability in physiological parameters compared to neonate who receive traditional bathing

H_2: The neonates who will receive swaddle bathing will experience more comfort level compared to neonate who receive traditional bathing.

H_3: There will be a statistically significant difference between the neonates' selective demographic characteristics, physiological parameters and comfort level in both swaddle and traditional bathing groups.

Materials and Methods

Research design

Two groups (swaddle & traditional bathing groups) quasi experimental research design was utilized in the current study. A quasi-experimental design is one type of experimental design that is very similar to the true-experimental design except that there is no random assignment of the subjects to groups. Quasi-experiments are subjects to concern regarding internal validity because the intervention and control group may not be comparable at baseline **(Groves & Gray, 2018)**

Sample

The study sample consisted of all available healthy full-term neonates who admitted to neonatal intensive care unit at Minia University Hospital for Obstetric and Pediatrics (MUHOP)over three months period (the total number was 90 neonates). The sample was divided into two equal groups swaddle bathing group (45 neonates) and traditional bathing group (45 neonates).

Inclusion criteria.

- Full-term neonates 37-40 weeks.
- Neonates with post-natal age from1to 7 days
- Neonates with stable vital signs
- Neonates who were delivered by spontaneous vaginal delivery and lower segment caesarean section.

Exclusion criteria

- Neonates with major congenital anomalies
- Neonates with chromosomal or neurological abnormalities
- Neonates with impaired skin integrity
- Neonates who were receiving analgesic, sedative, or muscle relaxant medication.

Operational definitions

Swaddle bathing: It is a type of bath in which the newborn infant was snuggly wrapped with a soft towel, maintained in a flexed central position and placed in the standardized tub filled with warm water and immersed till the shoulder level. Then each part of the body is individually unwrapped, washed with, rinsed from upper and lower limbs, trunk and head then rewrapped.

Traditional bathing: Refers to shower bath given once to the newborn infant by placing the body parts under running water after adjustment of body temperature to be washed and rinsed for the duration of 5minutes.

Physiological stability: It is a dynamic condition of a living human body which involve maintenance of one or more physiological parameters within normal ranges that differed only slightly in the presence of stressful elements. The physiological parameters include temperature, heart rate, respiratory rate and oxygen saturation.

Setting

The study was conducted in the neonatal intensive care unit (NICU), located on the third floor at Minia University Hospital for Obstetrics and Paediatrics (MUHOP). It receives neonates from all over Minia governorate who complained of different diseases, and the total number of incubators in this unit is 30 incubators and provides levels of care up to the 3rd level.

Tools for data collection

The following tools were used to collect the data: -

Tool 1: Structured Interview Questionnaire Sheet: It was developed by the researcher after reviewing the related literature and consisted of demographic characteristics of the neonates include post-natal age, weight, sex, mode of delivery and type of disease.

Tool II: Physiological parameters recording sheet: It was developed by the researcher to record the neonates' vital signs such as respiratory rate, temperature, heart rate, as well as oxygen saturation which were taken immediately before and immediate after as well as 10 minutes after swaddle and traditional bathing.

Tool III: COMFORT neo scale: It is a numerical assessment scale help the researcher to assess pain and discomfort of the neonates, in addition to comfort level. The scale is composed of 7 behavioural dimensions such as, respiratory response, alertness, calmness/excitement, facial expression, muscle strength and body movement. The respiratory response is excluded by the researcher as it applied to ventilated neonates only, requiring continuous positive airway and actually the researcher used 6 dimensions, the scale was developed by **(Van Dıjk et al., 2009)**.

Scoring system

The responses of the COMFORT neo scale ranged from 1 to 5 Likert score, the score ranged from 6 which is the lowest score and the highest score in the scale is 30, the higher scores indicated that the infant is less comforted comfortable and needs comforting measures. A score between 6 and 13 reveals that the neonate is comfortable, and a score between 14 and 30 indicates that the neonate is uncomfortable and has pain/stress and needs comforting interventions **(Taşdemir, & Efe, 2019).**

Ethical considerations

Written approval was obtained from the Research Ethics Committee at the Faculty of Nursing, Minia University. And also, the researcher obtained a written consent from the director of the previous mentioned hospital as well as from the director of the neonatal intensive care unit. A Written formal consent was obtained from the neonates' mothers who participated in this study. The researcher explained the study's purpose and nature through direct personal interviews ensuring that the data were confidential and is used for the research purpose only. The study adhered to common ethical principles to participate in the research, anonymity, and privacy was present through coding the data, and the mother has the right to reject participation in the study without any justification.

Pilot Study: -

The pilot study was conducted on 10% of neonateswho met the inclusion criteria, it was done to examine and ensure the feasibility, objectivity, applicability, clarity, adequacy and content validity and to determine the possible problems in the

methodological approach or tools. The results of the pilot study were used to investigate the proposed statistical and data analysis techniques. The neonates who participated in the pilot study were included in the total sample of the current study.

Validity and reliability

Three experts from Minia University, pediatric nursing department evaluate the tool. Content coverage, clarity, relevance, application, language, length, structure, and overall look were evaluated. The reliability of COMFRT neo scale scores was assessed and Cronbach's alpha values to be 0.805 was obtained.

Data collection procedure

- **For swaddle bathing group:** Before bathing, the neonate's clothing and diaper were removed and they were wrapped in a towel and the perineal region was washed with cotton swabs soaked in water then the neonates were placed in a flexed, midline position, swaddled with a soft towel.
- The neonates' temperature was measured axillary before bathing and should range from 36.5 – 37.5∘C and also, the water temperature was measured at the onset of each bath with a mercury thermometer for each type of bathing and adjusted at 37-38°C.
- After taking out the neonates from incubator, they were fully immersed in a tub of warm water, the water depth was adjusted at 10 cm to ensure that the majority of the infant's body was immersed till the shoulders and the infant's feet were maintained at the bottom corner of the tub for foot stabilization the bathing procedure was performed in a swaddle tub bath.
- The eyes and the face were washed with warm water and cotton wool balls and all the extremities including the arms, abdomen, genital region, and legs were unwrapped one at a time and washed then re-swaddled. The back was washed using wash cloth with emphasis on organization of the swaddling towel.
- Finally, the hair was washed before finishing the bath to prevent heat loss, the cloth was removed and the infant was quickly wrapped in a dry towel.
- **For traditional bathing group:** the neonates were taken out of the incubator and different parts of their bodies were washed under running warm water. Then, the body was covered and the head and face were washed then the neonates were quickly wrapped in a towel. The two types of baths in the current study took less than 5 min.
- The researcher measures the physiological parameters, such as temperature, pulse, respiration and oxygen saturation of the neonates immediately before and 10 minutes after bathing and documented it in the sheet.
- Comfort of the neonates was measured using COMFORT neo scale which is applied before and 10 minutes after bathing.
- Data collection was done over 3 months extending from the beginning of May 2021 to the end of July 2021

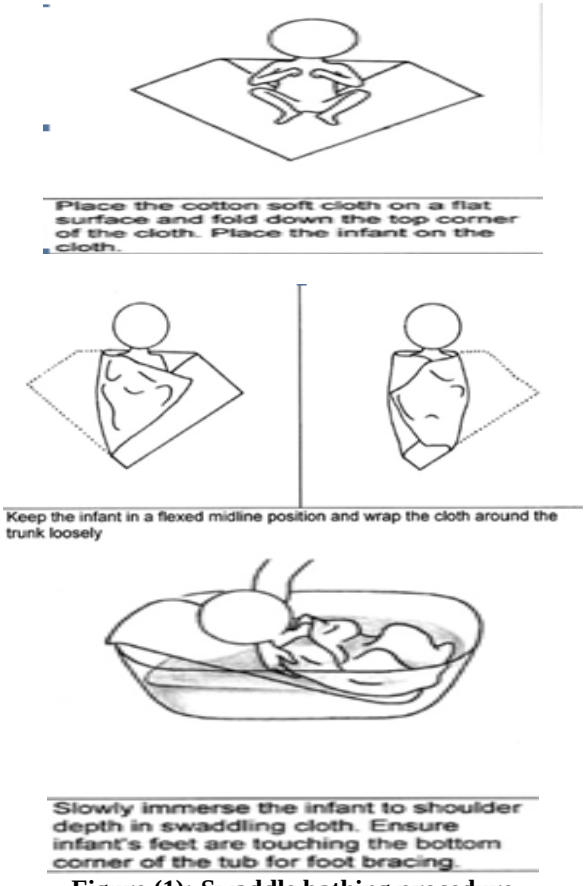

Figure (1): Swaddle bathing procedure

Ceylan, (2018). Effects of swaddled and sponge bathing methods on signs of stress and pain in premature newborns: Implications for evidence-based practice. Worldviews on Evidence-Based Nursing, 15(4), 296-303.

Statistical Analysis

Data entry was done through using a compatible personal computer. After data collection, it was revised, coded, and fed to statistical software (SPSS) IBM 25. By using two-tailed tests, all statistical analysis was performed and an alpha error of 0.05. P-value less than or equal to 0.05 is considered to be significant. fisher test, Chi-square and percent to describe the scale and categorical data, was used for qualitative data and responses less than. five. Correlation is used to test the nature and strength of the relation between two quantitative/ordinal variables. The sign of the coefficient indicates the nature of relation (positive/negative) while the value indicates the strength of relation.

Results

Table (1): Comparison between the Swaddle and Traditional Bathing Groups regarding their Demographic Characteristics (n=90)

Demographic characteristics of neonates	Swaddle bathing Group (n = 45)		Traditional bathing Group (n = 45)		Test of significance	
	No.	%	No.	%	X^2	*P* – value
Post -natal age /days						
3 days	3	6.7	8	17.8	4.642	0.326
4 days	11	24.4	7	15.6		
5 days	11	24.4	9	20.0		
6 days	7	15.6	11	24.4		
7 days	13	28.9	10	22.2		
Sex of neonate						
Male	19	42.2	17	37.8	0.185	0.667
Female	26	57.8	28	62.2		
Birth weight						
Low birth weight	9	20.0	9	20.0	3.175	0.204
Normal birth weight	34	75.6	29	64.4		
Macrosomic	2	4.4	7	15.6		
Type of delivery						
Normal delivery	12	26.7	13	28.9	0.055	0.814
Lower segment C.S	33	73.3	32	71.1		
Type of disease						
Neonatal jaundice	20	44.4	25	55.6	1.116	0.572
Poor suckling	16	35.6	13	28.8		
Infant of diabetic mother	9	20.0	7	15.6		

Table (2): Comparison Between the Swaddle and Traditional Bathing Groups regarding COMFORT neo–Scale Items before and at 10 Minutes after Bathing (n=90)

Items	Before bathing				At 10 minutes after bathing			
	Swaddle bathing group (n = 45)		Traditional bathing group (n = 45)		Swaddle bathing group (n = 45)		Traditional bathing group (n = 45)	
	No.	%	No.	%	No.	%	No.	%
Alertness								
Quiet sleep	0	0.0	0	0.0	32	71.1	9	20.0
Active sleep	7	15.5	8	17.8	2	26.7	15	33.3
Quiet awake	17	37.8	10	22.2	1	2.2	18	40.0
Active awake	21	46.7	27	60.0	0	0.0	3	6.7
X^2 (P - Value)	2.631 (0.268)				33.322 (0.001) *			
Calmness								
Calm	0	0.0	0	0.0	26	57.8	15	33.4
Slightly anxious	3	6.7	11	24.4	19	42.2	11	24.4
Anxious	27	60.0	15	33.4	0	0.0	17	37.8
Very anxious	15	33.3	18	40.0	0	0.0	2	4.4
Panky	0	0.0	1	2.2	0	0.0	0	0.0
X^2 (P - Value)	9.273 (0.026) *				**26.935 (0.0001) ** **			
Crying								
No crying	0	0.0	2	4.4	29	64.4	10	22.2
Faint crying	4	8.9	4	8.9	16	35.6	19	42.3
Soft crying	26	57.8	16	35.6	0	0.0	14	31.1
Hard crying	15	33.3	23	51.1	0	0.0	2	4.4

Items	Before bathing				At 10 minutes after bathing			
	Swaddle bathing group (n = 45)		Traditional bathing group (n = 45)		Swaddle bathing group (n = 45)		Traditional bathing group (n = 45)	
	No.	%	No.	%	No.	%	No.	%
X^2 / fisher (P -Value)	5.709 (0.108)				27.614 (0.001) **			
Body Movement								
No or minimal movement	0	0.0	1	2.2	22	48.9	10	22.2
Up to three slight arms	2	4.4	7	15.6	21	46.7	19	42.2
More than three slight arms	17	37.8	14	31.1	2	4.4	14	31.2
Up to three vigorous arms	26	57.8	22	48.9	0	0.0	2	4.4
More than three vigorous arms	0	0.0	1	2.2	0	0.0	0	0.0
X^2 (P - Value)	**5.160 (0.249)**				**23.279 (0.0001) ****			
Facial tension								
Facial muscles fully relaxed, relaxed open mouth	1	2.2	1	2.2	25	55.6	6	13.3
Normal facial tension	3	6.7	6	13.3	20	44.4	25	55.6
Intermittent eye squeeze and brow furrow	19	42.2	16	35.6	0	0.0	13	28.9
Continuous eye squeeze and brow furrow	22	48.9	22	48.9	0	0.0	1	2.2
X^2 (P - Value)	**1.478 (0.739)**				**28.561 (0.0001) ****			
Muscle tone								
Full muscle relaxation	0	0.0	1	2.2	27	60.0	8	17.8
Reduction of muscle tone; less resistance than normal	10	22.2	8	17.8	18	40.0	16	35.6
Two much muscle tone (tightness of hands and/or clenched, bent toes)	12	26.7	20	44.4	0	0.0	5	11.0
Muscle tone is normal	23	51.1	15	33.4	0	0.0	16	35.6
Intense muscle tone	0	0.0	1	2.2	0.0	0.0	0	0.0
X^2 (P-value	5.906 (0.206)				34.516 (0.001)**			

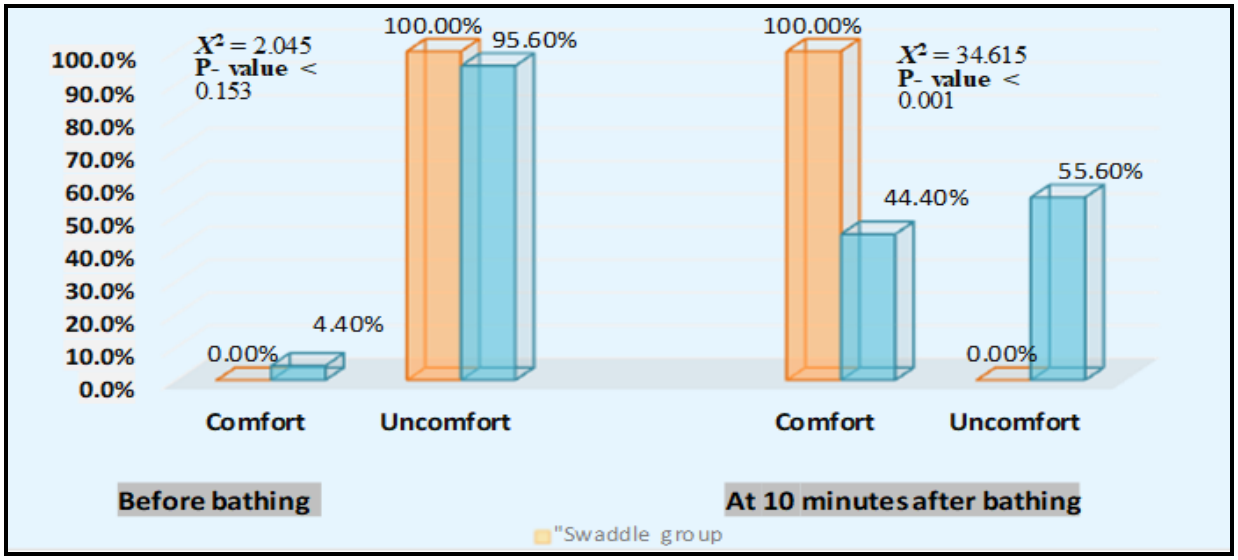

Figure (2): Comparison Between the Swaddle and Traditional Bathing Groups regarding Comfort Level before and at10 minutes after Bathing (n = 90)

Table (3): Comparison between the Swaddle and Traditional Bathing Groups Regarding Total Mean Score of Comfort before and after10 Minutes of Bathing (n=90)

	Before bathing		At 10 minutes after bathing	
	Swaddle bathing group (n = 45)	Traditional bathing group (n = 45)	Swaddle bathing group (n = 45)	Traditional bathing group (n = 45)
	Mean ± SD	Mean ±SD	Mean ± SD	Mean ± SD
COMFORT	19.8 ± 2.3	19.9 ± 2.8	8.4 ± 1.3	13.4 ± 3.2
t -test (*P* - Value)	0.125 (0.451)		35.729 (0.0001) **	

Table (4): Comparison between the Swaddle and Traditional Bathing Groups regarding Mean scores of Physiological Stability before, immediate and 10 minutes after Bathing (n = 90)

Physiological parameters	Before bathing		Immediately after bathing		At 10 minutes after bathing	
	Swaddle bathing group (n=45)	Traditional bathing group (n=45)	Swaddle bathing group (n=45)	Traditional bathing group(n=45)	Swaddle bathing group (n=45)	Traditional bathing group (n=45)
	Mean ± SD	Mean ±SD	Mean ±SD	Mean ± SD	Mean ± SD	Mean ± SD
Axillary temperature	37.3 ± 0.2	37.3 ± 0.3	37.0 ± 0.3	37.0 ± 0.3	37.3 ± 0.3	37.2 ± 0.2
t -test (*P* - Value)	1.797 (0.915)		0.141 (0.889)		2.333 (0.02) *	
Heart rate	134.4±10.2	138.3±10.9	134.3±11.5	135.7±11.2	135.3±12.5	140.3±11.0
t -test (*P* - Value)	1.593(0.062)		0.274 (0.547)		3.593(0.001) **	
Respiratory rate	45.2 ± 4.5	46.4 ± 5.1	47.3 ± 4.0	48.9 ± 4.1	48.3 ± 3.5	50.9 ± 2.1
t -test (*P* - Value)	1.762(0.06)		2.101 (0.032) *		4.214 (0.001) **	
Oxygen saturation	96.9 ± 1.7	97.2 ± 1.3	97.5 ±1.6	96.9 ± 1.6	98.9 ± 1.1	97.9 ± 1.4
t -test (*P* - Value)	1.907 (0.057)		1.607 (0.056)		2690 (0.004) **	

** =*Highly statistically significant differences*

* = *s*tatistically significant differences

Table (5): Relation between Comfort Level of Swaddle and Traditional Bathing Groups and their Demographic Characteristics at 10Minutes After Bathing (n = 90).

Items	At 10 minutes after bathing							
	Swaddle bathing group (no=45)				Traditional bathing group(no=45)			
	Comfortable (n = 45)		Uncomfortable (n = 0)		Comfortable (n = 20)		Uncomfortable (n = 25)	
	No.	%	No.	%	No.	%	No.	%
Sex								
Male	19	100.0	0	0.0	8	47.1	9	52.9
Female	26	100.0	0	0.0	12	42.9	16	57.1
Fisher test (P - value)	……..				0.076 (0.783)			
Mode of delivery								
Normal Delivery	12	100.0	0	0.0	3	23.1	10	76.9
Lower segment C. S	33	100.0	0	0.0	17	53.1	15	46.9
Fisher test (*P* - value)	……				3.380 (0.066)			
Type of disease								
Neonatal jaundice	20	100.0	0	0.0	10	40.0	15	60.0
Poor suckling	16	100.0	0	0.0	6	46.2	7	53.8
Infant of diabetic mother	9	100.0	0	0.0	4	57.1	3	42.9
Fisher test (*P* - value)	……				0.673 (0.714)			

Table (6): Correlation between Total Comfort Scores and Physiological Parameters for Swaddle and Traditional Bathing Groups before Bathing (n=90)

Time	Items		Total Comfort Score Before Bathing	
			Swaddle bathing groups (n=45)	Traditional bathing group n= (45)
Before bathing	Temperature	R	-.144-	-.093-
		P – value	0.346	.545
	Pulse	R	0.155	.173
		P – value	0.310	.255
	Respiration	R	0.314	.004
		P – value	0.06	.981
	Oxygen saturation	R	0.161	-.096-
		P – value	0.291	.531

Correlation is significant at the 0.05 level ***Correlation is significant at the 0.01 level*

Table (7): Correlation between Total Comfort Scores and Physiological Parameters for Swaddle and Traditional Bathing Groups at10 Minutes after Bathing (n=90)

Time	Items		Total comfort At 10 minutes after bathing	
			Swaddle bathing group(n=45)	Traditional bathing group (n=45)
After 10 minutes of bathing	Temperature	r	.037	.197
		P – value	.808	.194
	Heart rate	r	-.163-	-.043-
		P – value	.286	.781
	Respiratory rate	r	**- 0.319**	-.212-
		P – value	**0.033***	.163
	Oxygen saturation	r	-.129-	**0.397**
		P – value	.397	**0.007****

Correlation is significant at the 0.05 level ***Correlation is significant at the 0.01 level*

Table (1): Cleared that 57.8%and 62.2 % in the swaddle and traditional bathing groups respectively were female while 75.6%and 64.4% of the swaddle and traditional bathing groups respectively had normal birth weight. Regarding mode of delivery73.3 and 71.1% of the swaddle and traditional bathing group/ respectively was delivered by lower segment C. S. On the other hand, the large percentage of neonates 44.4 % and 55% in the swaddle and traditional bathing group respectively had neonatal jaundice, with no statistically differences between the swaddle and traditional bathing groups regarding their demographic characteristics.

Table (2): Provedthat71.1% versus 20% of the swaddle and traditional bathing group respectively experienced quiet sleep state after 10 minutes of bathing. In addition,57.8% versus 33.4% experienced calm state. Regarding crying, it was observed that 64.4% versus 22.2% and 0.0% versus 4.4% of the swaddle and traditional bathing group respectively experienced no crying and hard crying respectively after 10 minutes of bathing. Regarding body movement,51.1% versus 22.2% experienced no or minimal movement for swaddle and traditional bathing group respectively. In respect to facial tension,55.6% and 13.3 % of the swaddle and traditional bathing group respectively experienced full relaxation of facial muscle after 10 minutes of bathing. Regarding muscle tone, 60 % versus 40% of the swaddle and traditional bathing group respectively experienced full relaxation of facial muscles after 10 minutes of bathing

Figure (2): Cleared that 100% versus 95% of the swaddle and traditional bathing groups respectively was uncomfortable before bathing but after bathing10 minutes 100% versus44.4% of the swaddle and traditional bathing group respectively was comfortable with highly statistically significant differences p. value 0.001.

Table (3): Cleared that the total mean score of discomfort was decreased in the swaddle bathing group compared to traditional bathing group with a highly statistically significant differences P. value 0.0001 at 10 minutes after bathing.

Table (4): Proved that there was stability in the mean score of axillary body temperature in the swaddle bathing group compared to traditional bathing group at 10 minutes after bathing with statistically significant differences P. value at 0.02.but immediately after bathing the body temperature was maintained for both groups. Furthermore, the mean score of heart rate was higher in traditional bathing group but in swaddle bathing group the heart rate was maintained immediately and at 10 minutes after bathing. Concerning respiratory rate, the mean score was higher in traditional bathing group but it was maintained immediate and after bathing 10 minutes for swaddle bathing with statistically significant differences P .value at 0.032 and 0.001. Regarding oxygen saturation the mean score was higher in the swaddle bathing group compared to traditional bathing group immediately and at 10 minutes after bathing with statistically significant differences P. value at 0.004 at 10 minutes after bathing, but it showed no statistically significant differences immediately after bathing.

Table (5): Cleared that there were no statistically significant differences between comfort level for the swaddle and traditional bathing groups and their sex, mode of delivery and type of disease.

Table (6) Cleared that there was no statistically significant correlation between total comfort scores and physiological parameters for swaddle and traditional bathing groups before bathing.

Table (7): Cleared that, there was a fair negative correlation between respiratory rate and total comfort after 10 minutes of bathing r= - 0.319 and p-value at 0.033for swaddle bathing group, while there was a fair positive correlation between oxygen saturation and comfort level for traditional bathing group.

Discussion

The neonates have been exposed to stress by traditional bathing as evidenced by behavioural indicators as well as physiological instability such as temperature changes, hypoglycaemia, apnea and hypoxia. Swaddled bathing technique is recommended by AWHONN as a safe and accepted method of bathing compared with sponge bathing. Term and late-preterm neonates who are bathed in a tub exposed to less changes in body temperature and show decrease in crying period, provision of quiet, calm state compared with neonates who are exposed to traditional bathing (**McKim, 2020).**

Demographic characteristics of the studied neonates

Regarding the demographic characteristics of the studied neonates the study results cleared that, the relatively high percentage of neonates in the swaddle bathing group and traditional bathing group aged 7 days and 6 days old respectively with the mean± SD 5.4 ± 1.3 and 5.2 ± 1.4. On the other hand, more than half of neonates were female in the swaddle and traditional bathing group. Furthermore, three quarter and less than two thirds of the swaddle and traditional bathing group respectively had normal birth weight with the mean± SD 2797.0 ± 568.2 and 2973.3 ± 633.6 respectively. Concerning mode of delivery less than three quarters of the swaddle and traditional bathing group were delivered by lower segment caesarean section and the large percentage of them had neonatal jaundice.

The current study results were congruent with the study of **Freitas et al. (2018)** about the effect of two techniques of bathing on the axillary temperature of preterm newborns who indicated that the majority of preterm newborns were female, and the same study results was contradicted with our study results regarding mode of delivery which cleared that near three quarters of the studied newborns were born vaginally .Furthermore , our study results were contradicted with the study by **Ceylan, (2018)** about the swaddle and sponge bathing techniques and their effect on pain and stress of preterm who indicated that, more than half of the studied sample was male.

On the other hand, the current study result also was consistent with **Hansen, (2021)** who studied the epidemiology of neonatal jaundice and cleared in his study that most of the newborn infants' nonspecific time during the first days of life have hyperbilirubinemia and the majority of newborn infants are diagnosed with neonatal jaundice

Concerning to COMFORT neo scale items

Regarding alertness, it was noticed that near three quarters versus near one quarter of the swaddle and traditional bathing group respectively experienced quiet sleep state at 10 minutes after bathing. In addition, more than half versus one third of the swaddle and traditional bathing group respectively experienced calm state at 10 minutes after bathing. From the researcher point of view the current study results proved that, the neonates who were exposed to swaddle bathing were experienced a safe feeling, quiet and calm state as this type of bathing promotes more comfort and less stress and leads to quiet sleep.

Regarding crying item, it was observed that nearly two thirds of swaddle bathing group experienced no crying at 10 minutes after bathing compared to nearly one quarter in traditional bathing with statistically significant differences. On the other hand, nearly half versus near one quarter were experienced no or minimal movement for swaddle and traditional bathing group respectively.

The current study results were supported by **Çinar et al. (2020)** about the effect of training on neonatal bathing with the tub and swaddled methods for

primiparous pregnant women and they proved that, the duration of crying, face and forehead grimacing were found to be higher in the tub bathing group versus swaddle bathing group .The study results were also congruent with **Renfeng et al. (2018)** who studied the swaddle and tub bathing techniques and their effects on behavioral responses in preterm neonate sand cleared that the majority of neonates were kept quiet during the swaddle bathing process, compared to half of the neonates in the tub bathing group and less percentage of neonates n swaddle bathing group were crying, significantly lower than the percentage in tub bathing group.

In respect to facial tension, more than half and minority of the swaddle and traditional bathing group respectively experienced full relaxation of facial muscles, with statistically significant differences. The current study results were supported by **Swapna et al. (2017)** who reported that the newborn who were bathed using conventional bathing were experienced more stressful behaviours such as crying, agitated, back arching, finger spreading, grimacing, truncal stiffness and tongue extension. And also, the study by **Paran et al. (2016)** was also consistent with our study results who cleared that, the occurrence of behavioral responses including facial grimacing, mouthing movements, tongue extension, eyes open, and fussing or crying were significantly decreased in the swaddle bathing group than in the tub bathing group.

Regarding muscle tone, more than half versus two fifth of the swaddle and traditional group respectively experienced full muscles relaxation at 10 minutes after bathing with statistically significant differences. The current study results were in the same line with **Çaka, & Gözen (2018)** who indicated that the newborns during swaddle bathing experienced a reduction in physiological and behavioural stress which will help the newborn to feel that he is the intrauterine environment and will ensure the sense of comfort.

The current study results cleared that all neonates of the swaddle bathing group versus only two fifth of traditional bathing group were comfortable at 10 minutes after bathing with a highly statistically significant difference (Figure 2). In addition, the study results cleared that, there was a decrease in the total mean score of discomfort for the swaddle versus traditional bathing group at 10 minutes after bathing with a highly statistically significant difference (Table 3).The current study results were supported with **Lund, (2016)** who indicated that when the newborn become flexed in swaddling position this promote a calm, quiet, and gentle touch to the bath water and decreased stress parameters in neonates and also it increased comfort level, decreased crying, decreased extremity movement and prevent agitation that conserve energy. The study results were further supported by a study of **Kuller, (2014)** about the updates on newborn bathing, found that the neonates become comfortable when their bodies are immersed into warm water.

Regarding the physiological parameters of the neonates

As regards body temperature, it was clear from the current study results that there was stability in the mean score of body temperature in the swaddle bathing group compared to traditional bathing group with statistically significant differences after10 minutes of bathing, but immediately after bathing the body temperature was maintained for both groups.

The current study results were supported with the result of **Çaka & Gözen (2018)** who found that the newborns who were receiving swaddle bathing were significantly maintained their body temperatures immediate and 10 minutes after bathing compared with the other group. But the current study results were inconsistent with the study by **Freitas, (2018)** who indicated in his study that the mean axillary temperature of the newborns between conventional baths and swaddled baths show no significant differences.

Regarding heart rate, the current study results cleared that, the mean score of heart rate was higher in traditional bathing group but in swaddle bathing group the heart rate was maintained stable immediate and at 10 minutes after bathing. The current study results were agreed with **Taşdemir & Efe, (2019)** studied the tub bathing and sponge bathing and their effects on neonatal comfort and physiological parameters in late preterm infants proved that, the swaddle bathing promotes skin integrity as well as it had positive effects on the pulse rate and blood pressure, and increased the level of SpO2 by improving the respiratory status.

Concerning respiratory rate, the mean score was higher in traditional bathing group but it was maintained for swaddle bathing immediate and 10 minutes after bathing with statistically significant differences P .value at 0.032 and 0.001. The study results were supported with **Çinar, (2020)** who cleared that the respiratory rate was higher in tub bathing group before and after bathing and the respiratory rate value in the swaddle bath group decreased after bathing. In addition, our study results were congruent with the study by **Paran et al. (2016)** who cleared that the respiratory rates in the conventional bathing group were significantly higher after bathing than in the swaddle bathing group with statistically significant differences.

Regarding oxygen saturation, the mean score was higher in the swaddle bathing group compared to

traditional bathing group immediately and at 10 minutes after bathing with statistically significant differences but show no statistically significant differences immediately after bathing .The current study results were supported with the study by **Çaka & Gözen, (2018)** who indicated in their study that although oxygen saturation level in the swaddle bathing group before bathing was significantly lower compared to traditional bathing group, it was higher in the swaddle bathing group after bathing. This fact may be due to applying swaddle bathing technique provide more relaxation for the newborn than the traditional bathing. Also, the study by **Paran, et al. (2016)** concluded that the conventional bathing technique leads to decrease the mean blood oxygen saturation after bathing compared to the swaddle bathing group with statistically significant differences P. value at <0.001.

Relations and correlation between the neonates' level of comfort and physiological parameters

The current study results cleared that, there were no statistically significant differences between comfort level for the swaddle and traditional bathing group and their sex, mode of delivery and type of disease (Table 5). The current study results were in the same line with **Ceylan, (2018).** who cleared that, there was not significant difference between gender, age, and weight and the distribution of the mean pain and stress scores over time.

In addition, the current study results proved that,there was no statistically significant correlation between total comfort scores and physiological parameters for swaddle and traditional bathing groups before bathing (Table 6),The study also revealed that , after10 minute of bathing ,there was a fair negative correlation between respiratory rate and total comfort scores r= - 0.319 and p-value at 0.033,while there was a fair positive correlation between oxygen saturation and total comfort score(Table 7).

From the researcher point of view, this study results explained that when the neonates had exposed to swaddle bathing became more comfortable and less distressed which in turns leads to stability of respiratory rate and increased oxygen saturation.

The current study results were consistent with the study by **Swapna et al. (2017)** who found in their study that swaddle bathing decrease the occurrence of tachypnea for preterm infant because it provides a familiar containment through swaddle bathing. Furthermore, our study results were also supported with the study of **Caka & Gozen (2018)** who indicated that swaddle bathing was effective in maintaining heart rate within the normal limits and increasing oxygen saturation which make the infant feel more relaxed.

Conclusion:

The current study results concluded that, there was a reduction in the total mean score of discomfort in the swaddle versus traditional bathing group with a highly statistically significant differences at 10 minutes after bathing. On the other hand, the mean score of axillary body temperature was maintained in the swaddle versus traditional bathing group at 10 minutes after bathing with statistically significant. And also, the mean scores of respiratory rate and heart rate were stable for the swaddle versus traditional bathing group , as well as there was an increase in oxygen saturation for swaddle bathing groups after 10 minutes of bathing.

Recommendations

- Training program should be conducted in neonatal intensive care unit for nurses about swaddle bathing techniques as it is a safe, secure and comfortable nursing practice in neonates
- The findings of the current study should be transferred to the nurses working in various hospitals as well as student nurses
- The nurse should train the mothers about swaddle bathing as a part of newborn care to maintain thermal stability and reduce crying duration at home settings.
- The study should be replicated on large sample size
- The swaddle bathing procedure should be adopted in the practical curriculum of paediatric nursing to inform the students about this type of bathing.

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