

# Evaluating the Effectiveness of Foot Cover Lappet in Managing Hypothermia and Sleep Patterns in Newborns in Selected Hospitals at Meerut

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**Abstract:** Introduction: Newborns are vulnerable to hypothermia due to their limited adipose tissue and thin skin. They also have difficulty regulating their body temperature. Hypothermia is especially critical during the first five days of life, as it is associated with a mortality rate that is five times higher. Premature infants are at increased risk of hypothermia. It is important to establish strategies to ensure normothermia from birth throughout the hospital stay. Caregivers play a crucial role in comprehending the consequences of temperature fluctuations and their impact on newborns. Newborns sleep in a distinct pattern, with around 8 to 9 hours of daytime sleep and an equivalent duration at night. However, their sleep is typically fragmented, lasting only 1 to 2 hours at a time. Achieving uninterrupted sleep of 6 to 8 hours usually begins around the three - month mark or when infants reach a weight of 5 to 6 kilograms. Neonatal mortality rates have decreased significantly in recent decades, but hypothermia remains a leading cause of death in newborns. Caregivers can play a vital role in preventing hypothermia by understanding the risks and taking appropriate measures to maintain a warm and healthy environment for infants. Objectives of the Study: 1) To design and validate the comfort device i. e., foot cover lappet for newborns. 2) To evaluate the effectiveness of foot cover lappet on the level of temperature & sleep pattern among neonates in the experimental group. 3) To compare the post - test score of the temperature and sleep pattern level in the experimental and control group. 4) To find out the association between the pre - test score of levels of temperature with their selected demographic variables. Methods: The study was to evaluate the effectiveness of foot cover lappet among Newborns with hypothermia. The instruments used for this study were a ear thermometer and a smartwatch. A total of 60 newborns (30 experimental +30 Control group) were selected for the study as per the inclusion and exclusion criteria of the selection of the sample, 30 newborns were allotted for the experimental group with the administration of foot cover lappet and 30 allotted for the control group were given no intervention. The nature and purpose of the study were explained, and Demographic data were collected from the parents of newborns an ear thermometer and a smartwatch were used for assessing the temperature levels and sleep patterns respectively among newborns. Result: 1) Majority of the newborns were 1 - 3 days of age in both the control and experimental group. 2) The majority of the newborns had hypothermia and less sleep hours during the pre - test day in both the experimental and control groups. 3) Majority of the newborns were born at the gestational age of 37 weeks, 38 weeks, and 39 weeks. 4) Majority of the newborns were born via LSCS and in both experimental and control groups. 5) Majority of the newborns were born with birth weight of 2.4 - 2.9 kgs and in both experimental and control group. 6) Majority of the newborns were having moderate hypothermia on day 1 of data collection in both the experimental and control groups. 7) In the present study majority of the newborns had moderate hypothermia on day 1 of data collection in both the experimental and control groups. 8) In the study, on day 1st pre - test temperature scores and sleep hours were very less for both experimental and control groups simultaneously it improved on day 2 &3. 9) In the experimental group pre - test, there were 43.30% of the newborn had mild hypothermia, 30% of newborns had moderate hypothermia, 26.6% of newborns with low hypothermia compared to the post - test there was an increase in the percentage of 73.3% of newborns with low hypothermia, and the newborns with moderate hypothermia reduced to 16.6% and newborns with mild hypothermia were reduced to 10%. In the experimental group, the t - value for temperature was 17.7, for sleep pattern it was 10.9, In the control group, the t - value for temperature was 0.065, for sleep pattern it was 1.85, 10 - As per the study the association of the pretest of hypothermia with selected demographic variables there was a significant association between hypothermia and, age of the baby, and mode of delivery. Conclusion: The result of the study shows that foot cover lappet had an effective result on the level of hypothermia and sleep pattern and it could be used for the same purpose for the well - being of newborns with hypothermia and sleep pattern disruption due to it.

**Keywords:** Newborns, Hypothermia, Sleep Pattern, Foot Cover Lappet, Temperature Control

## 1. Introduction

the dynamic between babies and their families involves mutual influence; babies shape their families as much as they shape them.

- Erik H. Erikson

Upon the separation of the umbilical cord, newborns face a range of challenges, including the risk of hypothermia. Hypothermia is particularly critical during the first five days of life, as it is associated with a mortality rate that is five times higher. This underscores the need for evidence - based guidelines to address this issue.

Premature infants are especially susceptible to hypothermia due to their limited adipose tissue and thin skin.

Despite advancements in knowledge and equipment, maintaining optimal body temperature remains challenging, especially for preterm babies. Failing to achieve and maintain proper body temperature not only poses morbidity risks but also significantly increases mortality rates.

However, even full - term infants are not exempt from hypothermia risk, which can lead to various birth - related complications. As a result, it is imperative to establish strategies to ensure normothermia from birth throughout the hospital stay.

In order to fully understand the effects of temperature changes on infants, caregivers are essential.

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Stanford Children's Health emphasizes that infants struggle more with temperature regulation than adults, with low birth weight or premature infants being particularly vulnerable due to their limited body fat. Appropriate measures, such as layering clothing and using accessories like socks, are recommended to maintain a warm and healthy infant environment.

### Neonatal Vulnerability and Mortality Rates:

The neonatal phase encompasses the initial four weeks of an individual's existence, and is the most difficult period of the child's life. Global data for 2020 shows a decline in the number of premature babies; There were 17 deaths per 1,000 live births, a 54% decrease from 1990 when there were 37 deaths per 1,000 live births. Further research shows that One out of three infant fatalities happen within the first 24 hours after birth, and almost three-quarters in the first week of life; This underlines that the situation is not very good right now.

### Newborn's Sleep Patterns:

According to the Sleep Foundation, There are two stages of sleep for newborns: rapid eye movement (REM) and non-rapid eye movement (NREM). These phases are equally split during a newborn's sleep cycle.

REM is often called "active sleep" because babies may make small movements, such as eye movements, limb twitches, and changes in breathing.

NREM is called "quiet sleep" because babies are still and do not make these movements.

Newborns typically sleep for Approximately 8 to 9 hours during the day and an equivalent amount of time during the night. However, their sleep is often fragmented, lasting only 1 to 2 hours at a time. An uninterrupted sleep of 6 to 8 hours usually begins around the three-month mark or when infants reach a weight of 5 to 6 kilograms.

## 2. Need for the study

The decline in IMR in India is a positive development. However, it is important to note that neonatal mortality remains a significant public health challenge in the country. In 2019, an estimated 774,000 newborns died in India, accounting for 67% of all infant deaths.

### Infant Mortality Rate (IMR) in India

Year	Value	Change (%)
2022	27.6	-3.74
2021	28.7	-3.61
2020	20.3	-5.14
2019	21.4	-5.73
2018	22.7	-4.22
2017	23.7	-4.44
2016	24.8	-4.25
2015	25.9	-4.07
2014	27	-4.26
2013	28.2	-4.08
2012	29.4	-3.92
2011	30.6	-3.77
2010	31.8	-3.93

Increased heat loss from many systems in premature babies is of particular concern. Specific physical characteristics include a heavier body for a comparable area, reduced adipose tissue (BAT), a fragile and permeable epidermis resulting in decreased insulation, immature vasomotor control, and exposure of more body parts to flexing postures, which together exacerbate gets. Sensitivity to cold stress. Stress plays a significant role in the alteration from inside the womb to outside the womb underscoring the importance of creating a suitable environment for maintaining proper thermoregulation. The basis of this article is the concept of thermoregulation, which represents the balance of heat production and distribution to maintain body temperature and metabolic balance. This balance keeps energy low and oxygen used. Therefore, creating a thermoneutral environment is an important aspect of infant care, especially for premature babies.

### Problem Statement

"An Evaluative Study to Assess the Effectiveness of Foot cover Lappet in Terms of Hypothermia and Sleep Pattern Among Newborn in a Selected Hospital, at Meerut."

### Objectives of the study

- To design and validate the comfort device i. e., foot cover lappet for newborns.
- To evaluate the effectiveness of foot cover lappet on the level of temperature & sleep pattern in the experimental group.
- To compare the post-test score of the level of temperature and sleep pattern in the experimental and control group.
- To find out the association of the pre-test Score of level of hypothermia with their selected demographic variables.

### Research Hypothesis

Significance level for following hypothesis testing are set at 0.05.

H1: There will be a significant difference between the score of the mean pre-test and mean post-test of the level of temperature before and after administration of foot cover lappet among newborns in the experimental group.

H2: There will be a significant difference in comparison of mean post-test scores of hypothermia in the experimental and control group.

H3: There will be a significant association between the mean pre-test score of the level of temperature among newborns with their selected demographic variables.

### Null Hypothesis

significance level for following hypothesis testing are set at 0.05.

H01: There will not be significant changes in temperature and sleep patterns after administration of foot cover lappet to Newborns in the experimental group.

H02: There will be not a significant difference in comparison of mean post test scores of temperature in the experimental and control group.

H03: There will not be a significant association between the mean post - test score of level of temperature with their selected demographic variables

Assumptions

**Ethical Consideration:** Ethical clearance was obtained from the university ethical committee concerned to particular setting from ethical committee

- All the subjects were informed about the objectives of the study freedom to participate and withdraw participate any time during the study without causing personal harm or loss.
- Written voluntary consent was obtained from samples before collecting the data.
- Informed consent is taken from the participants & the concerned authorities of community health centres.

**Conceptual Framework:** THE "HELPING ART IN CLINICAL NURSING THEORY" BY ERNESTINE WIEDENBACH (1964) SERVES AS THE FOUNDATION FOR THE CONCEPTUAL FRAMEWORK OF THIS INVESTIGATION.

### 3. Methodology

Research Approach A time series quasi - experimental research methodology was chosen to meet the specified goals.

Setting - selected hospitals of Meerut

Samples: neonates aged 1 - 7 days.

Sample size: 60.

The tools used for this study demographic data of the sample Questionnaire, temperature measurements by ear thermometer actigraphy by smartwatch.

#### Section A: Demographic Data of the Sample

This section encompasses inquiries related to various demographic factors, including gestational age, age of the newborn in days, birth weight baby, mode of delivery, and the baby's gender.

#### Section B: Temperature Measurements by Ear Thermometer

This tool is designed to assess the core body temperature of the selected samples.

#### Section C: Actigraphy by Smart Watch

This tool is employed to measure and record the sleep duration and patterns of the selected samples.

#### Data Collection Procedure:

“Data collection is the gathering of information needed to address a research problem.”

Formal authorization was acquired from the hospital's head of department to undertake the study project in August 2023. The Non - Probability Purposive Sampling Technique was used to select subjects. A total of 60 samples (30 experimental + 30 control group) were chosen for the investigation. The sample's parent provided informed consent.

The demographic information was gathered 15 minutes before the pre - test.

Following that subjects up to 7 days of age in the experimental group were applied the foot cover Lappet for 6 - 14 hours post - tests were recorded Five times throughout the day, by ear thermometer and wristwatch.

The procedure was done two more days to In order to evaluate the efficacy of the foot cover Lappet, the procedure was conducted twice more.

Demographic information for the control group was obtained 15 minutes before the pre - test. A pre - test was performed with an ear thermometer and a wristwatch. The control group received foot cover Lappet, and post - tests were administered at 10 a. m., 2 p. m., 4 p. m., 6 p. m., and 10 p. m. The practice was repeated for two more days to evaluate Lappet's efficacy.

### 4. Data Analysis and Interpretation

#### Section - A

**Table III:** Distribution of samples according to demographic characteristics of the samples by frequency and percentage. N=60

Demographic Variables		Experimental		Control	
S. No.		Frequency	Percentage	Frequency	Percentage
1	<b>Gestational age of baby</b>				
	a) 37weeks	6	20%	9	30%
	b) 38weeks	10	33.33%	10	33.30%
	c) 39weeks	14	46.60%	11	36.60%
2	<b>Sex of the baby</b>				
	a) Male	12	40%	14	46.60%
	b) female	18	60%	16	53.30%
3	<b>Age of baby in days</b>				
	a) 1day	19	63.30%	13	43.30%
	b) 2day	9	30%	11	36.60%
	c) 3day	2	0.66%	6	20%
4	<b>Mode of delivery</b>				
	a) Normal Delivery	8	26.60%	17	56.60%
	b) LSCS	22	73.30%	13	43.30%

5	Birth weight					
	a) 2.4 - 2.5kgs	6	20%	9	30%	
	b) 2.6 - 2.7kgs	15	50%	11	36.60%	
	c) 2.8 - 2.9kgs	5	16.60%	7	23.30%	
	d) 3kgs	4	13.30%	3	10%	

**Table III** Displays the frequency and percentage distribution of subjects based on their socio - demographic characteristics within both the experimental and control groups.

**Table no. III** In the present study shows that 20% of the newborns took birth at a gestational age of 37 weeks, 33.3% of newborns took birth at the gestational age of 38 weeks, and 46.6% of newborns were born at 39 weeks of gestational age. In the control group, 30% of newborns took birth at 37weeks of gestational age, 33.3% were at 38weeks of gestational age and 36.6% were of gestational age 39

With regards to the sex of the baby, 40% of newborns were male and 60% of newborns were female.

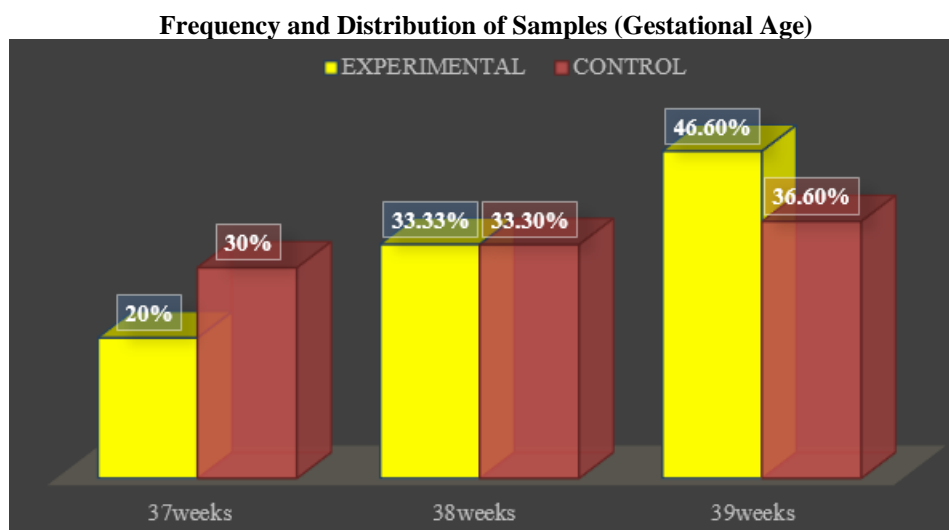
In the control group, 14 (46.6%) newborns were male and 53.3% were females.

With regards to the age of the baby in days 30% were of 1 day, 46.6% were 2 days of age, and 23.3% were 3 days of age, in the control, group 43.3% newborns were of 1day of age, 36.6% were of 2 days of age and 20% of newborns were of 3days of age

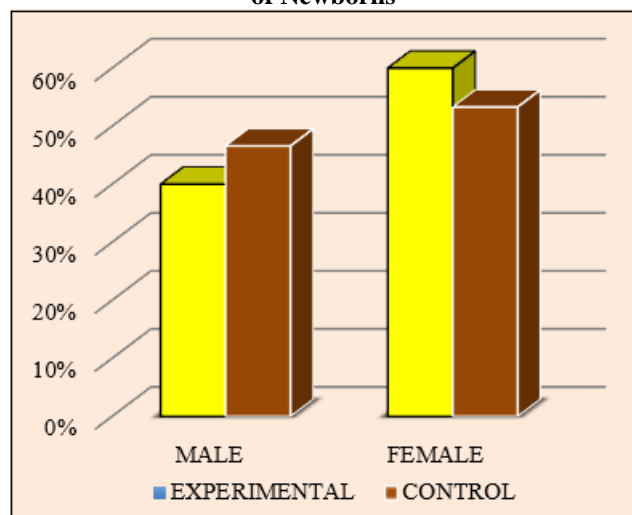
With regards to the Mode of delivery, in the experimental group, 33.3% had undergone normal delivery and 66.3% had undergone LSCS. In the control group, 56.6% had undergone normal delivery and 43.3 had undergone LSCS.

With regards to birth weight of the newborns in the experimental group, 20% were 2.4 - 2.5kgs 50% were of 2.6 - 2.7kgs and 16.6% were of 2.8 - 2.9kgs and 13.3% were of 3kgs

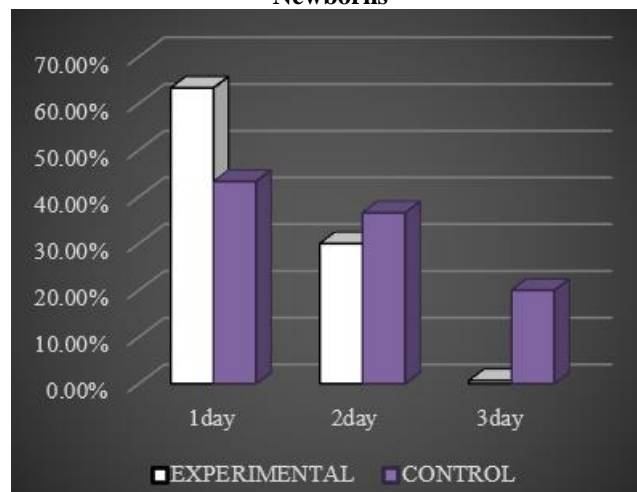
In the control group, 30% of newborns were 2.4 - 2.5kgs, 36.6% of newborns were of weight 2.6 - 2.7kgs, 23.3% of newborns were of weight 2.8 - 2.9kgs and 10% were of 3kgs respectively.



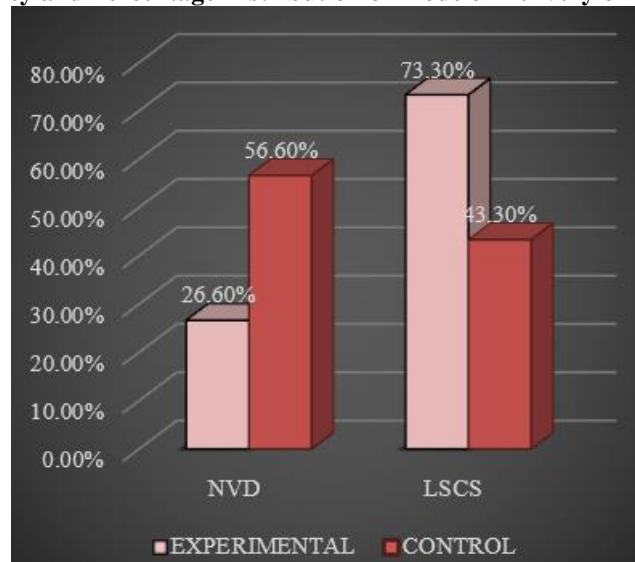
**Frequency and Percentage Distribution of Samples Sex of Newborns**



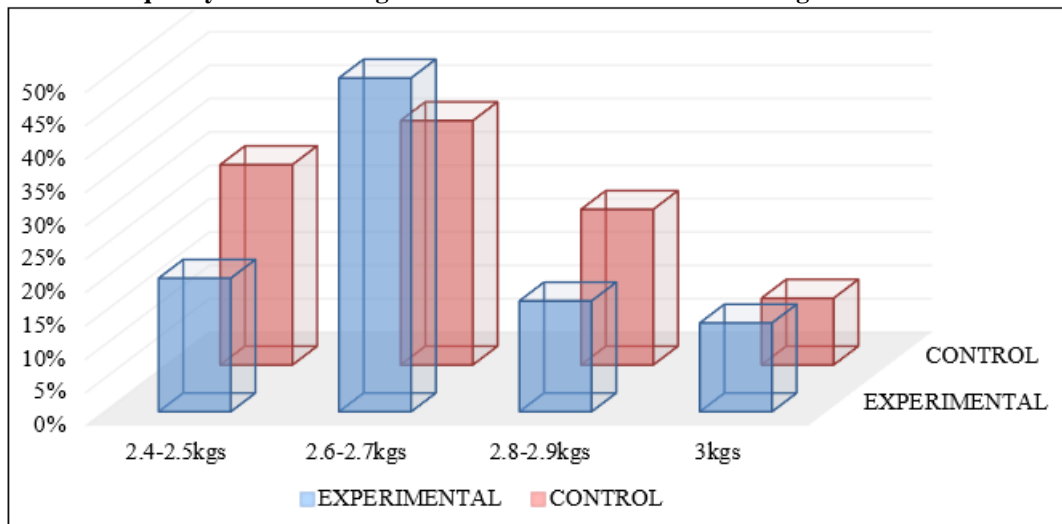
**Frequency and Percentage Distribution of Age of Newborns**



Frequency and Percentage Distribution of Mode of Delivery of Newborns



Frequency and Percentage Distribution of Mode of Birth Weight of Newborns



Section B

Table IV The distribution of hypothermia levels in the experimental group on days 1, 2, and 3 was as follows:

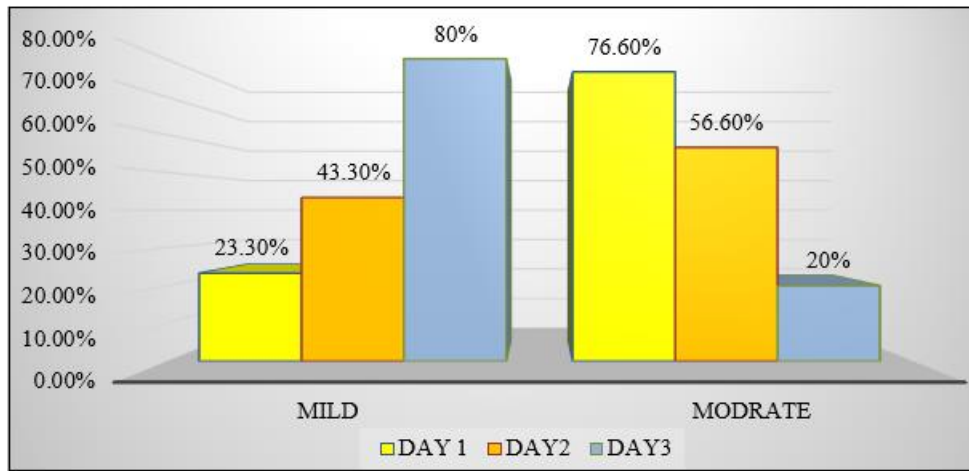
Hypothermia Levels	Experimental Group					
	Day 1		Day 2		Day 3	
	Frequency	%	Frequency	%	Frequency	%
Mild (35 - 36.5)	7	23.3%	13	43.3%	24	80%
Moderate (32 - 34.9)	23	76.6%	17	56.6%	6	20%
Severe (<32)	0	0%	0	0%	0	0%

Day 1: 76.6% moderate hypothermia, 23.3% mild hypothermia

Day 2: 56.6% moderate hypothermia, 43.3% mild hypothermia

Day 3: 20% moderate hypothermia, 80% mild hypothermia

This suggests that the proportion of newborns with moderate hypothermia decreased over time, while the proportion of newborns with mild hypothermia increased.



Graphical presentation of Frequency and percentage distribution of hypothermia score in the experimental group

**Frequency and percentage distribution of sleep pattern score in the experimental group**

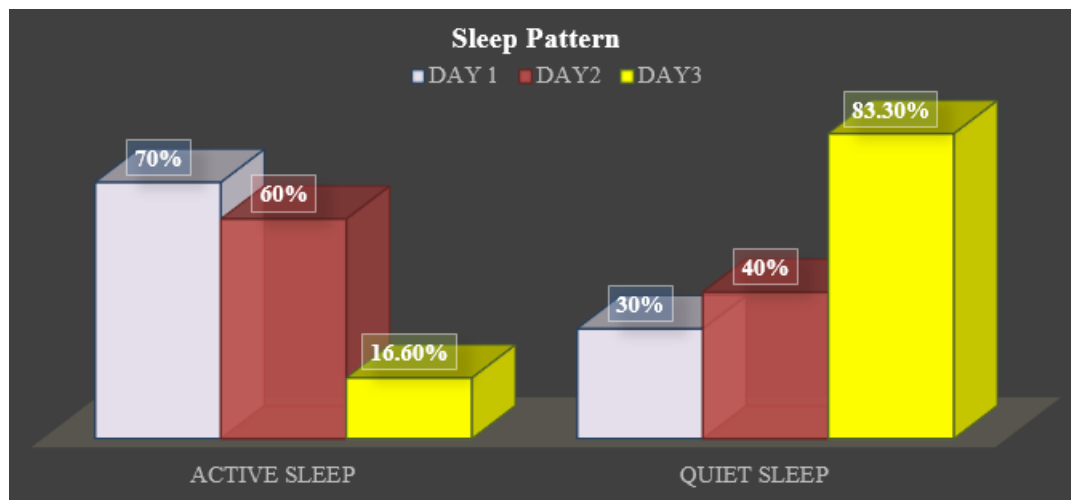
**Table V:** Reveals the distribution of the sleep patterns on day 1, 2, and 3 in the experimental group.

Sleep Pattern	Experimental Group					
	Day 1		Day 2		Day 3	
	Frequency	%	Frequency	%	Frequency	%
Active Sleep (REM)	21	70%	18	60%	5	16.6%
Quiet Sleep (NREM)	9	30%	12	40%	25	83.3%

On day 1 there were 70% of newborns with active sleep, and 30% of newborns were having quiet sleep (NREM)

On day 2 there were 60% of newborns with active sleep, and 40% of newborns were having quiet sleep (NREM)

On day 3 there were 16.6% of newborns with active sleep, and 83.3% of newborns were having quiet sleep (NREM)



Graphical presentation of Frequency and percentage distribution of sleep pattern in the experimental group

**Table VI:** Shows Mean, Mean Difference, Standard Deviation (SD), and Paired t - value of pre and post - test scores of the Control group, N=30

Hypothermia & Sleep Pattern	Mean	Mean Difference	SD	Un Paired T - Test	Table Value	P Value	Significance
Temperature (°C)	Pre - test	0.01	1.21	0.29	2.05	0.06	No Significance
	Post - test		1.27				
Sleep Pattern	Pre - test	0.8	76.06	1.85	2.05	0.03	No Significance
	Post - test		579.1				

Table VI shows the mean pre - test and post - test of temperature and sleep pattern. The mean post - test scores are –

- Temp. (°C) – 34.
- Sleep pattern – 579.1

The mean pre - test scores are:

- **Temp. (°C)** – 34.8
- **Sleep pattern** – 579.9

The calculated t test values for temperature (°C) is 0.29 and calculated t value for sleep pattern is 1.85, table value at Df=29 and level of significance 0.05 is 2.05 hence insignificant changes are in control group

**Table VII:** Showing Mean, Mean Difference, Standard Deviation (SD), and Unpaired t - value of pre and post - test scores of Experimental and Control groups

Hypothermia & Sleep Pattern	Mean		Mean Difference	SD	Un Paired T - Test	Table Value	P Value	Significance
Temperature (°C)	Pre - test	35.06	0.97	1.14	3.73	2.05	0.0000002*	Significant
	Post - test	36.03		1.11				
Sleep Pattern	Pre - test	660.06	3.02	80.8	4.16	2.05	0.0009*	Significant
	Post - test	663.08		80.5				

Df= 28, ‘t’ tabulated value 2.05 at 0.05 level of significance (P<0.05)

**Table VIII** the table shows that the mean pre - test temperature score in the experimental group (35.06 °C) was lower than the mean post - test temperature score (36.03 °C). This difference was statistically significant (paired t - test, t = 17.6, df = 29, p < 0.001). The unpaired t - test between the control and experimental groups also showed a statistically

significant difference in mean temperature scores (t = 3.37, df = 28, p < 0.001).

In other words, the experimental group had a significant increase in temperature after the intervention, and the experimental group had a significantly higher temperature than the control group.

**Table IX:** Chi square value showing association with selected demographic variables

Demographic Variables	32 - 34.9	35 - 35.9	36 - 36.4	P value	df	Table value	Chi - square value	Significant/ Non significant
<b>Gestational age of the baby</b>				<b>0.03</b>	<b>4</b>	<b>9.48</b>	<b>1.3</b>	<b>NS</b>
a) 37weeks	3	1	2					
b) 38weeks	5	4	1					
c) 39weeks	2	8	4					
<b>Sex of the baby</b>				<b>0.28</b>	2	5.9	2.5	<b>NS</b>
a) Male	6	4	2					
b) Female	4	9	5					
<b>Age of baby in (days)</b>				0.49	4	9.4	3.4	<b>NS</b>
a) 1day	7	6	6					
b) 2day	3	5	1					
c) 3day	0	2	0					
<b>Mode of delivery</b>				0.9	2	5.9	0.1	<b>NS</b>
a) Normal Delivery	2	4	2					
b) LSCS	8	2	5					
<b>Birth weight</b>				0.03	6	12.5	13.6	<b>S</b>
a) 2.4 - 2.5kgs	4	2	0					
b) 2.6 - 2.7kgs	6	6	3					
c) 2.8 - 2.9kgs	0	4	1					
d) 3kgs	0	1	3					

**Table IX** shows the relationship between demographic variables and pre - test hypothermia levels.

The relationship between hypothermia levels and gestational age was statistically significant ( $\chi^2 = 1.3$ , p = 0.05). The relationship between hypothermia levels and sex was also statistically significant ( $\chi^2 = 2.5$ , p = 0.05). However, the relationships between hypothermia levels and age in days, mode of delivery, and birth weight were not statistically significant ( $\chi^2 = 3.4$ , p = 0.05;  $\chi^2 = 0.1$ , p = 0.05;  $\chi^2 = 13.6$ , p = 0.05, respectively).

In other words, the only demographic variable that was significantly associated with hypothermia levels was birth weight. Newborns with a lower birth weight were more likely to have hypothermia.

## 5. Summary

This chapter has presented the findings of the study, which were analyzed using both descriptive and inferential statistics. The data were displayed in tables and diagrams to facilitate interpretation

## 6. Conclusion

The result of the study depicts that foot cover lappet has an effective result on the level of hypothermia and sleep pattern and it could be used for the same purpose for the well being of newborns with hypothermia and sleep pattern disruption due to it.

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