

Nurses` Knowledge and Practices regarding Hypothermia for Preterm Infants

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Abstract

Background: Hypothermia is a major factor in infant`s morbidity and mortality in developing countries. So, maintaining normal body temperature in preterm infants is crucial. **Aim of study:** The aim of this study was to assess nurses' knowledge and practices regarding hypothermia for preterm infants. **Design:** A descriptive design was utilized to conduct this study. **Settings:** This study was carried out in neonatal intensive care units of Benha University hospital, and Benha Specialized Pediatric Hospital at Benha city. **Sample:** A convenient sample of 150 nurses and 200 preterm infants were taken from the previous mentioned hospitals. **Tools of data collection:** Two tools were used: **tool (1):** Arabic structured interviewing questionnaire and **tool (2):** An observational check list. **Results:** Slightly more than one third of the studied nurses were in age groups less than 30 years with mean \pm SD (33.16 \pm 8.04) years old, two fifth of the studied nurses have diploma of technical institute of nursing and have experience equal 15 years or more. More than half of the studied nurses had average knowledge level regarding hypothermia and more than two thirds of them had poor practices. **Conclusion:** There was a highly statistically significant relation between total nurses` knowledge and practices regarding prevention of hypothermia with their characteristics. Again, there was a highly statistically significant positive correlation between the studied nurses` total knowledge scores and their total practices scores. **Recommendations:** The importance of developing periodical training programs for all nurses working at Neonatal Intensive Care Units regarding care of preterm infants with hypothermia to update their performance.

Key words: Hypothermia, Nurses` Knowledge, Practices, Preterm Infants.

Introduction

Infant born less than 37 weeks of gestational age are considered premature, Preterm birth has become a worldwide epidemic that is estimated at a global incidence of 15 million per year. It is a major cause of death and a significant cause of long-term human loss worldwide (Fadlamola & Elhusein, 2020). Infants born less than 32 weeks of gestation have immature thermoregulation which make them even more vulnerable to heat loss (Perry, et al., 2015).

World Health Organization (WHO) categorized hypothermia into three stages based on core temperature of preterm, mild

hypothermia (36.0 °C–36.4 °C), moderate hypothermia (32.0 °C–35.9 °C) and severe hypothermia (<32.0 °C). Hypothermia is a common cause of neonatal morbidity and mortality in developing countries, even in warmer tropical countries. Neonatal hypothermia is increasingly recognized as a risk factor for preterm survival (Smith, 2016).

Heat loss can occur even in normal newborn infants. However, it is more significant in preterm infants because of thin skin, superficial blood vessels and less of subcutaneous fat, especially brown fat. Normal newborn maintain heat by flexion of extremities but the limb extended body of the

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preterm promotes heat loss as it exposes large surface area. Term babies can increase metabolism to produce heat but preterm babies are less able to do so (**Ibrahim, et al., 2017**).

Premature infants loses heat through its skin and respiratory tract to the environment through radiation, conduction, convection, and evaporation, Fat under the skin acts as an insulator to prevent heat loss; however, the more prematurely an infant is born, the less fat insulation there will be. It's important to understand the mechanisms of heat loss to block the transfer of heat from infant to the environment (**Musabyemariya, et al., 2020**).

Body temperature will decrease or increase depending on the energy transferred through radiation,(when preterm infants are placed near cold walls or windows heat is lost by radiation), even preterm infants placed in incubators losses heat to the walls of incubator if it is cold. Conductive heat loss can occur through exposure to colder air, fluids, or solid surfaces. When heat is transferred from the skin to the environment through moving air or water it called convection. Heat loss from evaporation occurs when wet surfaces are exposed to the air (**Soares, et al., 2020**).

Premature infants typically rest with arms and legs extended and have large heads proportional to their bodies, these factors increase the surface area exposed to cold environmental temperatures, thereby increasing heat loss. Because premature infants are vulnerable to heat loss, care must be taken to protect infants from heat loss and maximize their ability to retain heat (**Mariye& Teklay, 2018**).

Hypothermia in preterm is detected through a number of objective signs resulting from the impact on multiple body systems; cardiopulmonary (bradycardia, tachypnea,

apnea); the central nervous system (lethargy, distress, poor feeding), and the vascular system (peripheral vasoconstriction, acrocyanosis, cold extremities), in severe cases, bleeding, and pulmonary hemorrhage may occur (**Choi, et al., 2018**).

Hypothermia occurred often for a long period in the first three hours after admission to the Neonatal Intensive Care Units. However, after adjustment for other risk factors both procedures (intubation and umbilical catheterization) were no longer significantly associated with the duration of hypothermia and whether hypothermia lasted longer than half an hour. In contrast, Hypothermia at admission appeared to be the largest risk factor for hypothermia later. Preterm infants who have a low temperature at birth need more time to reach a normal temperature in contrast to infants without hypothermia at admission (**Oatley, et al., 2016**).

Preventing hypothermia in the delivery room could lead to a significant reduction in hypothermia during admission. Moreover, interventions to minimize heat loss in preterm infants at birth including the use of plastic bags or plastic wrapping under a radiant heater, the plastic bags covering the trunk and extremities to reduce hypothermia, skin-to-skin care after birth, maintaining warm environmental temperature, and warming the objects that will touch an infant (**Mank, et al., 2016**).

Preterm who develop hypothermia because of exposure to cold weather or cold water are vulnerable to other cold-related injuries, including freezing of body tissues, decay, and death of tissue resulting from an interruption in blood flow (gangrene). Also, the infants may have low oxygen and positive

pressure requirements and there is a risk of over ventilation and hypocarbia. Hypothermia of preterm infants can lead to arrhythmia, thrombosis, sepsis, and intraventricular hemorrhage (Caldas, et al., 2018).

The nurses have important role to prevent hypothermia for infants admitted to NICU, through keeping the preterm infant out of drafts, maintaining warm environmental temperature, keeping the preterm infant in an incubator, incubators should be away from the walls and windows, warming the objects that will touch the preterm infant, and placing the infant against the mother's skin helps prevent conductive heat loss, keeping the infant dry as quickly as possible after birth and immediately after birth, neonatal nurses should observe signs and symptoms of hypothermia and be aware of complications of hypothermia (Astawegen, 2018).

Significance of the study:

Hypothermia is a serious but potentially preventable morbidity in preterm infants. Studies have shown that for each 1°C decrease in admission temperature below 36°C, there is an increase in mortality by 28% and in late-onset sepsis by 11%. The incidence of hypothermia is between 31% and 78% for those with birth weight less than 1500 g. Infants at less than 28 weeks' gestation have the highest incidence of hypothermia. The skin temperature of an exposed preterm infant will drop at a rate of approximately 0.5°C to 1.0°C per minute Dubos, et al., (2021).

Hypothermia in newborns is common with a global prevalence up to 85% in hospitals and up to 92% at home. "Normal" temperature at birth is between 36.5°C and 37.5°C with a tendency to lower values after cesarean delivery. Neonatal hypothermia is commonly defined as a core temperature below 36.5°C Chen, & Tsai., (2022).

According to Cordeiro, et al., (2021) that there is an inadequate knowledge among staff nurses regarding definition, clinical features, prevention, and management of neonatal hypothermia. So, awareness of nurses about how to prevent hypothermia of preterm infants is needed.

Thus, the researcher found urgent to conduct this study emphasizes on assessing nurses' knowledge and practices regarding hypothermia for preterm infants.

Aim of the study:

The study aimed to assess nurses' knowledge and practices regarding hypothermia for preterm infants.

Research questions

- What is the level of nurses' knowledge regarding hypothermia of preterm infants?
- What is the level of nurses' practice regarding hypothermia of preterm infants?
- Is there a relation between nurses' knowledge, practices regarding hypothermia of preterm infants?

Subjects and method:

Research design:

Descriptive research design was used in this study.

Settings:

This study was conducted in Neonatal Intensive Care Units (NICUs) at Benha University Hospital, and Benha Specialized Pediatric Hospital in Benha city. NICUs at Benha University Hospital located in the fourth floor and consist of one room had 22 incubators. NICUs at Benha Specialized Pediatric Hospital located on the third floor in building A and consist of two rooms with 25 incubator, and fifth floor in building B that had 20 incubators.

Sample:

A convenient sample of all available nurses (150) nurses from the previously mentioned

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settings were included in the study regardless their characteristics during the period of the study and were collected as the following, (53) nurses from Benha university hospital, and (97) nurses from Benha specialized pediatric hospital.

A convenient sample of preterm infants (200) from NICUs at the previously mentioned settings regardless of their characteristics during the period of the study and were distributed as the following (80) preterm infants at Benha University Hospital, and (120) preterm infants at Benha Specialized Pediatric Hospital.

Tools of data collection: Data was collected through the following tools:

Tool (I): Arabic structured interviewing questionnaire: It was developed by the researcher based on a review of the current, relevant researches and literature, it consisted of four parts:

Part (1): Characteristics of studied nurses: This includes age, gender, educational level, nurses' position, years of experience, and previous training or courses about prevention of hypothermia of preterm infants.

Part (2): Characteristics preterm infants: This involved gestational age, gender, weight at birth, and current weight.

Part (3): Medical history of preterm infant: This includes medical diagnosis, past history of preterm infants and vital signs of preterm infants.

Part (4): Nurses` knowledge assessment: It was designed by the researcher under supervision of supervisor after reviewing the recent literatures to assess nurses` knowledge related to care of preterm infants with hypothermia, it includes 23 multiple choice questions related to knowledge of normal body temperature (3 questions), knowledge of hypothermia (3 questions), signs & symptoms (3 questions), causes (1 questions), ways of heat loss (1 question), reasons of increase hypothermia of

preterm infants(1 question), complications (1 questions), and nursing management (10 questions).

Scoring system for knowledge:-

The studied nurses` answers were compared with a model key answer, correct answer was scored (1), and wrong answer or don`t know was scored (0). Total scores of knowledge were ranged from 0-23 degree. The level of nursing knowledge was calculated and classified into three levels as following:-

- Less than 60% (> 90) was considered poor level of knowledge.
- 60% - > 85% (90 - >127) was considered average level of knowledge.
- ≤ 85% (≤ 127) was considered good level of knowledge.

Tool (II): An observational check list: It was designed by researcher from **Ibrahim et al., (2017)** to assess nurses` practices regarding hypothermia of preterm infants and methods of heat loss, it included 44 statements grouped under 3 main domains:

Domain 1: Prevention of hypothermia during admission of preterm infants, It included (17) items.

Domain 2: Environmental prevention of hypothermia and maintaining normal body temperature, including 21 statements grouped under four subdomains, radiation, conduction, evaporation, and convection.

Domain 3: Prevention of hypothermia during different procedures: including (6) items.

Scoring system for nurse` practice scored as the following: -

The score system of nurses` practices was classified in to 2 points. Done scored (1), not done scored (0). The total scores of practices were ranged from 0 - 44 degree. The level of nurses` practices was categorized and classified into three levels as following: -

- Less than 60% (> 90) was considered poor level of practices.

- 60% - >85% (90 - >127) was considered average level of practices.
- ≤ 85% (≤ 127) was considered good level of practices.

Tools validity & reliability

Content validity: Tools of data collection were investigated for their content validity by three experts in Pediatric Nursing from the Faculty of Nursing of Benha University to test the content validity of the instruments and to judge its clarity, comprehensions, relevance, simplicity, and accuracy. All of their remarks were taken into consideration. Some items were rephrased to arrive the final version of the tools. The tools were regarded as valid from the expert's point of view.

Testing reliability: Reliability for tools was applied by the researcher for testing the internal consistency of the tools by administrating of the same tool to the same subjects under similar condition. Internal consistency reliability of all items of tools was assessed using Cornbrash's alpha coefficient. Answer from repeated testing was compared (test-re-test reliability). It was (0.976) for Arabic structured interview questionnaire and (0.974) for an observational checklist, this indicate high degree of reliability for the study tools.

Ethical and legal consideration:

Written approval was obtained from the ethical committee at the faculty of Nursing Benha University. The researcher clarified the aim of the study and expected outcomes to all nurses participated in the study. Verbal approval was prerequisite to participate in the study. The studied nurses assured that all gathered data were used in research purpose only and the study was harmless. Additionally, the studied nurses were allowed to withdraw from the study at any time without giving the reason. Confidentiality and anonymity of the gathered data and results were secured.

Pilot study:

A pilot study was conducted to test the clearness and applicability of the study tools and to estimate the time needed for each tool, it was done on 10% of the total sample size (15 nurses) from the previously mentioned setting. In the light of pilot study analysis, no modification was done, and nurses were included to the total sample of the study.

Field work:

Data collection was carried out in the period from the beginning of April (2021) to the end of September (2021) covering 6 months. The researcher was available in the study settings two days per week (Sunday and Wednesday) in Benha University Hospital, and (Monday and Tuesday) in Benha Specialized Pediatric Hospital to implement this study and collect data, in the morning shift from 9 A.M to 2 P.M. The average numbers of interviewed nurses were 3-4 nurses per day. At the beginning of interview; the researcher introduced herself to the nurses and welcomed each nurse. The title, objectives, tools and the study technique were illustrated for each nurse to obtain their approval and cooperation which is needed for conducting this study.

Each nurse was individually interviewed using Arabic structured interviewing questionnaire. The time needed for filling the knowledge questionnaire ranged from 10-15 minutes, then each nurse was observed by using observational checklist three times and the researcher take the average of the observational checklist. The time needed for filling the observation checklist ranged from 15-25 minutes. Precautionary measures are taken into consideration during data collection including; personnel protective materials such as, face mask, gloves, antiseptic solution for hand hygiene. Also, personal distancing to maintain a minimum 1.5 M distance, avoiding shaking hands or hugging, always cover the mouth while sneezing or coughing to prevent

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droplet transmission, avoid touching one`s mouth, nose or eyes to prevent the spread of infection. The researcher motivates the nurses and giving them notes and pens. All necessary data was collected from the previously mentioned setting until the completion.

Statistical analysis:

The collected data were organized, categorized, analyzed and tabulated by using the Statistical Package for Social Science (SPSS) version 20. Quantitative data was expressed as; mean scores and standard deviation. While Qualitative data was expressed as frequencies and percentages. Test of significance, Chi-square test this test used to measure significant of qualitative variables and correlation coefficient (r) used for quantitative variables that were normally distributed or when one of the variables is qualitative. Reliability of the study tools was done using Cronbach`s Alpha. A highly significant level value was considered when $p < 0.001$. No statistical significance difference was considered when $p > 0.05$.

Results:

Table (1) reveals that, slightly more than one third (34%) of the studied nurses are in age groups less than 30 years with mean \pm SD (33.16 \pm 8.04) years old. As regards educational level, it is found that, more than two fifth (42%) of the studied nurses have diploma of technical institute of nursing. Also, two fifth (40.0%) of them have experience 15 years or more with mean \pm SD (12.56 \pm 9.04) years. Also, more than three quarters (76%) of studied nurses are females. As regards previous training, the majority (86%) of the studied nurses attend training courses regarding hypothermia of preterm infants.

Table (2) displays that, more than half (59.5%) of preterm infants are in gestational age $>$ 32weeks, with Mean \pm SD (30.94 \pm 2.54) weeks. Also, less than half (47.5%) of preterm infants are weighted 1500 $>$ 2000 gram at

birth, and also less than half (49.5%) of them have current weight 1500 $>$ 2000 gram. Concerning the gender, slightly less than two thirds (66.0%) of studied preterm infants are females.

Table (3) indicates that more than half (51.0% & 56.5% & 58.0%) don`t have genetic problems, infant problems during birth, and infant problems after birth respectively. Also, more than two third (89.5%) don`t have suffocation during infant birth. While, (10.5%) of preterm infants are suffocated during birth. As regard medical diagnosis, the current study shows that, slightly less than half (49.0%) of studied preterm infants have respiratory distresses. While less than one third (32.5%) of them have congenital pneumonia, and only (18.5%) of them have jaundice.

Table (4) reveals that, more than two thirds (68.5% & 68.5% & 66.5%) of studied preterm infants have (hypothermia, bradycardia, and bradypnea) on admission respectively. While, more than two fifth (43.5% & 43.5% & 43.5%) of preterm infants have normal vital signs during hospitalization respectively.

Figure (1) illustrates that, more than half (56.6%) of studied nurses have average knowledge about hypothermia of preterm infants, slightly less than one third (32.7%) of them have good knowledge, and only (10.7%) of them have poor knowledge.

Figure (2) illustrates that, more than two thirds (69.3%) of studied nurses have poor practices regarding care of preterm infants with hypothermia, while (19.4%) of them have average practices, and only (11.3%) of them have good practices.

Table (5) illustrates that there is a highly statistical significance positive correlation between nurses` total knowledge scores and total practices scores ($r=0.695$ & $p= 0.000$) .

Table (1): Percentage distribution of the studied nurses regarding their characteristics (no=150).

Nurses` characteristics		No	%
Age in years	< 30	51	34.0
	30 < 35	42	28.0
	35 < 40	33	22.0
	≥ 40	24	16.0
	Min- Max	22-55	
	Mean ±SD	33.16±8.04	
Educational level	Diploma of secondary technical nursing school	45	30.0
	Diploma of technical institute of nursing	63	42.0
	Bachelor in nursing sciences	42	28.0
Years of experience	< 5 years	39	26.0
	5 > 10 years	27	18.0
	10 > 15 years	24	16.0
	≥ 15 years	60	40.0
	Min - Max	32-37	
	Mean ± SD	12.56±9.04	
Gender	Male	36	24.0
	Female	114	76.0
Previous training or courses	Attend training courses	129	86.0
	Not attend training courses	21	14.0

Table (2): Percentage distribution of the studied preterm infants regarding their characteristics (no=200).

Preterm infant`s characteristics	No	%
Gestational age in weeks		
>32	119	59.5
32 > 34	56	28.0
34 < 36	25	12.5
Min - Max	28-36	
Mean ±SD	30.94±2.54	
Weight at birth in grams		
1000 >1500.	59	29.5
1500 > 2000.	95	47.5
> 2000.	46	23.0
Current weight in grams		
1000 >1500.	65	32.5
1500 >2000.	98	49.0
2000 >2500.	37	18.5
Gender of preterm		
Female	132	66.0
Male	68	34.0

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Table (3): Percentage distribution of the studied preterm infants according to their medical history (no=200).

Items	No	%
Presence of genetic problems		
Yes	98	49.0
No	102	51.0
Types of genetic problems		
Congenital heart defects	45	22.5
Cystic fibrosis	11	5.5
Congenital diaphragmatic hernia	15	7.5
Diabetes mellitus	27	13.5
Infant problems during birth		
Yes	87	43.5
No	113	56.5
Types of problems		
Birth injuries	10	5.0
Abdominal distension	24	12.0
Apnea	53	26.5
Infant problems after birth		
Yes	84	42.0
No	116	58.0
Types of problems		
Neonatal sepsis	30	15.0
Jaundice	54	27.0
Presence of suffocation during infant birth		
Yes	21	10.5
No	179	89.5
Medical diagnosis		
Respiratory distress	98	49.0
Congenital pneumonia	65	32.5
Jaundice	37	18.5

Table (4): Percentage distribution of the studied preterm infants regarding their vital signs (no=200).

Vital signs of preterm infants	On admission		During hospitalization	
	No	%	No	%
Temperature				
Normal	44	22.0	87	43.5
Hypothermia	137	68.5	63	31.5
Hyperthermia	25	12.5	50	25.0
Pulse				
Normal	38	19.0	87	43.5
Bradycardia	137	68.5	63	31.5
Tachycardia	25	12.5	50	25.0
Respiration				
Normal	41	20.5	87	43.5
Bradypnea	133	66.5	40	31.5
Tachypnea	26	13.0	73	25.0

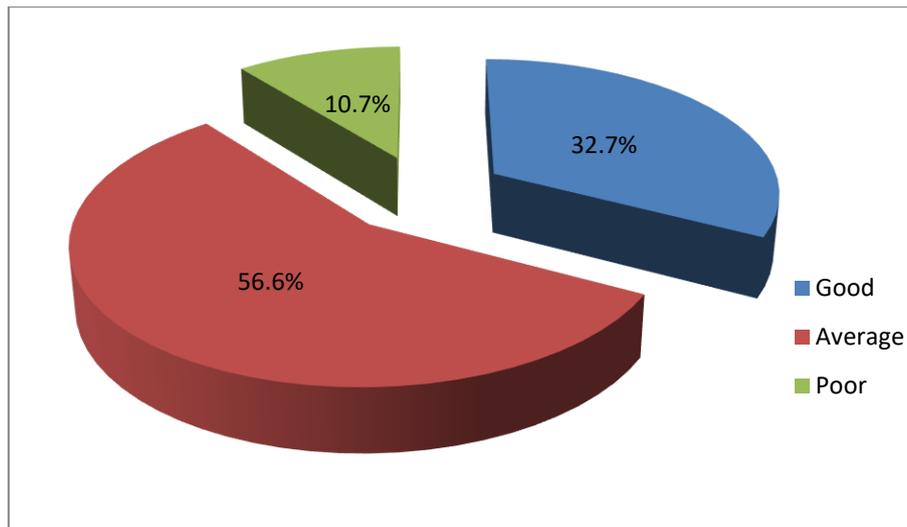


Figure (1): Total nurses' knowledge level about hypothermia of preterm infants (n=150).

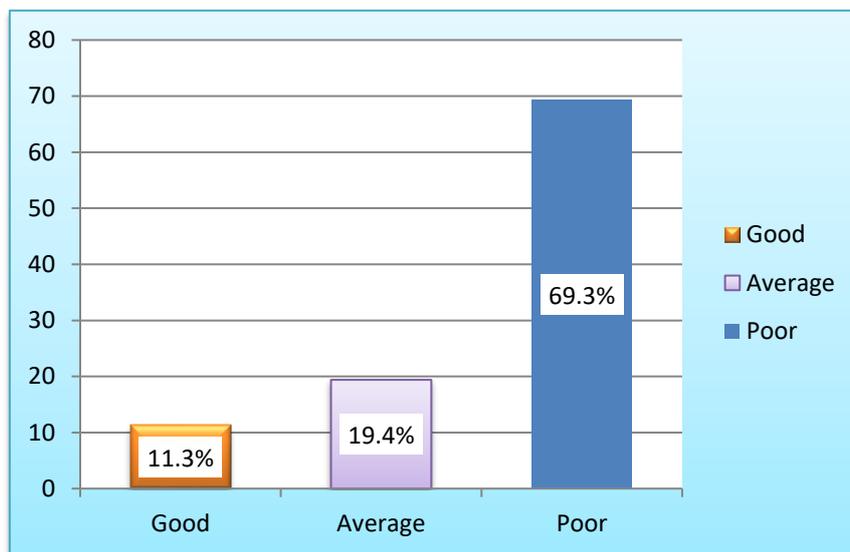


Figure (2): Total nurses' practices level to prevent hypothermia of preterm infants (no=150)

Table (5): Correlation between studied nurses total knowledge and total practices scores regarding hypothermia of preterm infants (n=150).

Variable	Total knowledge score	
	r	P value
Total practices	0.695	0.000**

Discussion:

Preterm infants refer to infant born before 37 weeks of pregnancy, which have great risk for mortality and variety of health and developmental problems. Preterm infant

become epidemic that is estimated at a global incidence of 15 million per year. Also, infants born less than 32 weeks gestation have immature thermoregulation which makes

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them even more vulnerable to heat loss (Ahmad, 2020).

Hypothermia in preterm infants can occur at any time and is a crucial threat for infant survival in the neonatal period. The incidence is higher in a period <24 hours of birth. So, thermal stability for preterm infants in the neonatal unit continues to be problems that require constant attention. Researchers continue to search for optimal thermal practices to prevent cold stress, ensure thermal stability, and minimize energy expenditures in the preterm infant. However, there are very few evidenced based standards to use as guidelines for nurses caring for infants in the NICU (Kamati, 2020).

Therefore, this study aimed to assess nurses' knowledge and practices regarding hypothermia for preterm infants.

Concerning nurses' characteristics, the finding of the present study revealed that, slightly more than one third of studied nurses aged less than 30 years with mean age (33.16±8.04) years old. This finding was on the same context with Maheswary, (2021), who conducted a study of "A descriptive study to assess the knowledge regarding essential new born care among the nurses of selected colleges in Jalandhar" and found that less than two thirds of staff nurses were in age less than 30 years old. From the researcher point of view, the policy of hospital that entering new appointment to the neonatal intensive care unit for taking experiences and learned from old team members to maintain good level of practices and maintain health care of preterm infants.

Regarding educational level of the studied nurses, the present study clarified that, more than two fifth of the studied nurses had diploma of technical institute of nursing. This finding was compatible with Shekar & Williams (2018), who carried out a study of "Assess the knowledge and practice of staff

nurses regarding thermoregulation of neonates" and found that less than half of the studied nurses had diploma of technical institute of nursing. From the researcher point of view, this might due to presence of nursing technical institute inside the university and all graduates of the institute are appointed to Benha university hospital.

Relating to years of experience, the current study portrayed that, two fifth of the studied nurses had experience in neonatal intensive care unit about 15 years or more. This might be because working in the neonatal intensive care unit needs accurate and precise work that can be acquired from experience. This result disagreed with Mokhtar & Suliman (2019), who conducted a study to assess "Nurses knowledge and practice regarding neonatal hypothermia in khartoum state hospitals" and found that, more than two fifth of the studied nurses had 8-10 years of experience in neonatal intensive care unit.

The present study showed that, the majority of the studied nurses had previous training courses regarding hypothermia of preterm infants. This finding could be explained by the hospital made updating nurses' knowledge through continuous training courses and evaluated them continuously. This finding was supported by Mttal, (2020), who conducted a study to assess "The effect of health teaching on knowledge regarding prevention of hypothermia in neonates among nurses" and found that, the majority of the studied nurses had previous training courses regarding hypothermia of preterm infants.

On other hand this study contradicted by Philip et al.(2020), who conducted a study to evaluate "The effectiveness of structured teaching program regarding thermoregulation in neonates in terms of knowledge of nursing" and showed that, exactly one quarter of staff nurses had participated in training courses

regarding hypothermia of preterm infants. The researcher believed that attending training programs by nurses working at the Neonatal Intensive Care Units especially, programs related to prevention of hypothermia, is crucial to provide quality of nursing care for preterm infants and reducing nurses malpractices.

As for the studied preterm infants` characteristics, the findings of the present study revealed that, more than half of preterm infants were in gestational age less than 32weeks, and less than half of them were weighted 1500->2000gm. This result might be due to preterm labour, multiple pregnancies, infections and chronic conditions such as diabetes and high blood pressure. These findings were supported by **Abdallah, (2019)**, who conducted a study to assess "Nurses knowledge regarding care of preterm babies" and found that 64.0% of preterm infants were in gestational age less than 32weeks, and about 45.0% of them were weighted 1500->2000gm.

The present study illustrated that, slightly less than two thirds of the studied preterm infants were females. This result goes on the same line with **Shrestha, (2019)**, who conducted a study to assess "Incidence of neonatal hypothermia and its association with low birth weight, preterm delivery, APGAR score and nursing care" and found that, less than two thirds of studied preterm infants were females. This could be attributed to the fact that majority of preterm infants who admitted to neonatal intensive care were females.

As regards the medical history of preterm infants, the current study mentioned that more than half of the studied preterm infants didn`t have genetic problems. This result might be due to the mothers had screening before and during pregnancy, and take folic acid early during pregnancy. This finding was supported by **Lademann et al., (2021)**, who conducted

a study to assess "Long-term outcome after asphyxia and therapeutic hypothermia in late preterm infants" and found that, half of the studied preterm infants didn`t have genetic problems.

In respect of the medical history of preterm infants, the current study mentioned that, more than half of the studied preterm infants didn`t have problems during and after birth. This result might be due to good handling and good monitoring of infant from doctors and nurses during birth. This finding was supported by **Cao et al., (2021)**, who conducted a study to assess " Assessment of neonatal intensive care unit practices, morbidity, and mortality among very preterm infants in China." and found that, half of the studied preterm infants didn`t have problems during and after birth.

Regarding the vital signs of studied preterm infants, the ongoing study concluded that, more than two thirds of studied preterm infants had hypothermia on admission. This result might be due to nurses` malpractices of keeping the infant dry as quickly as possible after birth and also exposure the infant to cold environments. This finding was in agreement with **Sprecher et al., (2021)**, who conducted a study to assess "Quality improvement approach to reducing admission hypothermia among preterm and term infants" and found that, the majority of studied preterm infants had hypothermia on admission.

According nurses` total knowledge level regarding hypothermia of preterm infants, the current study showed that, more than half of studied nurses had average knowledge, and slightly less than one third of them have good knowledge. This finding might be because of insufficient training programs regarding hypothermia of preterm infants. This finding was sustained by **Diggikar et al., (2021)**, who conducted a study to assess " Hypothermia reduction during neonatal transport in a

tertiary care center in South India" and found that, more than half of studied nurses had average knowledge, and slightly less than one third of them had good knowledge.

As regard to total level of studied nurses` practices about hypothermia of preterm infants, the present study illustrated that, more than two thirds of studied nurses had poor practices regarding care of preterm infants with hypothermia, This finding was disagreed with **Cavallin, et al, (2021)**, who conducted a study to assess " Thermal management with and without servo-controlled system in preterm infants immediately after birth " and found that, more than two thirds of studied nurses had poor practices regarding care of preterm infants with hypothermia.

Concerning correlation between total nurses` knowledge and total` nurses practices regarding hypothermia of preterm infants, the present study illustrated that there was a highly statistical significance positive correlation between nurses` total knowledge and total practices. This might be related to the theoretical and practical knowledge were depended on each other. This result was consistent with **Kustina (2021)**, who conducted a study to assess "Correlation knowledge to hypothermic handling practices in nurses" and found that, there was significance positive correlation between nurses` total knowledge and total practices.

Conclusion

More than half of studied nurses had average knowledge regarding hypothermia and more than two thirds of them had poor practices regarding care of preterm infant with hypothermia. Moreover, there were a highly statistical significant relation between total nurses` knowledge and practices regarding prevention of hypothermia with their characteristics. Again, there was a highly statistical significant positive correlation

between the studied nurses` total knowledge scores and their total practices scores.

Recommendations:

- Developing periodical training programs for all nurses working at NICU regarding care of preterm infants with hypothermia to update their performance.
- Guideline standards of care must be available for nursing staff working at neonatal intensive care unit in the hospital, to help them to improve their performance.
- Continuous evaluation for nurse`s performance during care of preterm infants with hypothermia and provides them with the new evidence based in the care of these infants.

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معلومات وممارسات الممرضين تجاه إنخفاض درجة الحرارة لدى الأطفال المبتسرين

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يحدث انخفاض حرارة الأطفال المبتسرين عندما تقل درجة حرارة جسم الطفل إلى أقل من 36.5 درجة مئوية ، وهو عامل رئيسي في ارتفاع معدلات الامراض والوفيات عند هؤلاء الأطفال خاصة في البلدان النامية . ويمكن أن يحدث فقدان الحرارة بشكل أكبر عند المبتسرين بسبب الجلد الرقيق والأوعية الدموية السطحية، قلة الدهون تحت الجلد ، وخاصة الدهون البنية. يمكن أن يحدث فقدان الحرارة عن طريق التوصيل والحمل الحراري والتبخر والإشعاع. كما يمكن أن يؤدي انخفاض حرارة الجسم إلى مجموعة متنوعة من العواقب السلبية مثل ضيق التنفس ونقص الأكسجين ونقص السكر في الدم وأحيانا يؤدي الى الوفاة. لذا هدفت هذه الدراسة الى تقييم معلومات وممارسات الممرضات تجاه إنخفاض درجة الحرارة لدى الأطفال المبتسرين. وقد اجريت هذه الدراسة في وحدات العناية المركزة للأطفال حديثي الولادة في مستشفى بنها الجامعي ، ومستشفى بنها التخصصي للأطفال في مدينة بنها. وقد اشتملت العينة على 150 ممرضا (منهم 53 ممرضا بجامعة بنها ، و 97 ممرضا بمستشفى بنها التخصصي للأطفال). وكذلك 200 طفل تم دخولهم الى وحدات العناية المركزة لحديثي الولادة في الأماكن المذكورة سابقا خلال فترة الدراسة. واطهرت النتائج أن أكثر من نصف الممرضين كان لديهم مستوى متوسط من المعلومات فيما يتعلق بانخفاض درجة حرارة الجسم عند الأطفال المبتسرين ، كما أن أكثر من ثلثي الممرضين لديهم ممارسات غير كفؤ فيما يتعلق برعاية الأطفال المبتسرين المصابين بانخفاض حرارة الجسم. كان هناك ارتباط إيجابي بين معلومات للممرضين وممارساتهم.