**Original Article**

# The Effect of Neonatal Training Programs addressing Neonatal Hypothermia on NICU Nurses' Knowledge and Practice in the Military and Police Hospitals of Khartoum State, Sudan

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## Abstract

**Background:** Hypothermia in neonates is a life-threatening condition. It happens due to the extrinsic thermal variations that contrast the intrauterine area. Early detection methods such as increased awareness and good nursing care play an important role in the prevention of hypothermia in newborns and reduce the consequences and death resulting from it. This study aimed to evaluate the effect of training programs on nurses' knowledge and practice with respect to caring for neonates with hypothermia.

**Methods:** This quasi-experimental study was conducted in the military and police hospitals in Khartoum State, Sudan. A total of 47 nurses meeting the study inclusion criteria and agreeing to participate were included. The necessary research data were collected using a structured interview and a checklist pre and three months post intervention. Training program on neonatal hypothermia was offered to nurses which included the definition, causes, signs and symptoms, and treatment and prevention of neonatal hypothermia. Data were analyzed using the SPSS v.20; descriptive and inferential statistics (*t*-test and chi-squared test) were used with $p$-values $< 0.05$ considered as statistically significant.

**Results:** All participants were female nurses aged 20–30 years, with a mean age of $27.7 \pm 5.3$ years. A majority of them (40 [85.1%]) had a BSc degree in nursing. Their experiences were varied, but the most common was 1–5 years, followed by 6–10 years (15 [32%] and 14 [29.8%], respectively). Nurses' knowledge about observing and monitoring temperature pre intervention was 73%, which increased to 94.3% post intervention with a $P$-value = 0.03. Additionally, nurses' practice in cases of hypothermia pre intervention was 80.01%, which increased to 82.9% post intervention. Their pre intervention practice around placing the baby under radiant warmer was 72.3%, which changed to 93.6% post intervention with a $P$-value = 0.006.

**Conclusion:** Implementation of the training program on neonatal hypothermia was very effective and significantly increased nurses' level of knowledge and practices. We recommend similar training programs should be given to all nurses working in the neonatal intensive care units in Sudan.

# 1. Introduction

Hypothermia in neonates can occur at any time and is a crucial threat for newborn survival in the neonatal period, which is the period from 0 to up to 28 days of life [1]. Its incidence is higher in a period <24 hr of birth, and babies are more likely to die due to hypothermia as the neonate has at that moment to deal with the extrinsic thermal variations that contrast evidently the intrauterine area [2].

## 1.1. Problem statement

Worldwide neonatal deaths are unevenly dispensed around the world. Half of the world's newborns die at home, and >99% of all deaths occur in developing countries, where the average neonatal mortality rate is 33 per 1000, compared with 4 per 1000 in high-income countries. Since neonatal deaths account for >40% of under-5 mortalities, reaching the Millennium Development Goal (MDG) will require a substantial reduction in newborn mortality. Although addressing neonatal hypothermia might promote this goal, so far little attention has been paid to it. Maintaining a normal body temperature is a critical function for newborn survival [3].

## 1.2. Definition

Hypothermia is defined as a body core temperature of <35°C (95°F) in humans [4]. Symptoms depend on the temperature. In mild hypothermia, there is shivering and mental confusion. In moderate hypothermia, shivering stops and confusion increases [5]. In severe hypothermia, there may be paradoxical undressing, in which a person removes their clothing, as well as an increased risk of the heart stopping.

## 1.3. Causes

Premature birth and low birth weight. Low birth weights run a higher risk of hypothermia due to lack of insulating body fat, immature nervous system, inability to efficiently conduct heat, cold birth environment, hypoglycemia, and infection.

## 1.4. Signs and symptoms

Lethargy, poor feeding, cold extremities [6].

## 1.5. Management and Prevention

Hypothermia should be prevented through strict observance of chain of warmth including thermal control such as ensuring a warm area for delivery, keeping the baby warm and wrapping them in warm clothes, initiating early breastfeeding, delaying bathing, checking body temperature, and providing care during transport when returning back home or transferring the baby from one unit to another [7]. Hypothermia prevention in neonates is a key element to prevent child mortality as most of them are vulnerable to die within the neonatal period [8]. Another meaningful aspect of preventing neonatal hypothermia is keeping the baby and the mother together as the neonate body temperature depends significantly on the mother's temperature. However, babies delivered by caesarian section (C/S) do not benefit from the usual maternal bonding, because they are usually separated from the mother and cared apart making them prone to hypothermia [9]. Midwives in healthcare facilities strive to adhere to the WHO guidelines regarding the prevention of hypothermia in the neonates from the delivery room to the postpartum ward but the gaps are more observed when the baby is discharged from the hospital, running into the burden of the means of transport that are most of the time inadequate for the newborn baby [8].

## 1.6. Justification

Neonatal hypothermia is a life-threatening disease, widespread especially in Africa, with a high mortality and morbidity rate. To reduce its incidence rate, safe care should be provided to neonates with hypothermia, and early detection methods such as increased awareness and good nursing care should be facilitated.

## 1.7. Objectives

### 1.7.1. General objective

To evaluate the effect of training programs on nurses' knowledge and practice with respect to the care of neonates with hypothermia in the obstetrics and gynecology hospitals in Khartoum State, Sudan (2019–2021).

### *1.7.2. Specific objectives*

(i) To assess nurses' knowledge regarding the various aspects of caring for neonates with hypothermia such as defining causes, signs and symptoms, and its management in the obstetrics and gynecology hospitals in Khartoum State, Sudan (2019–2021).

(ii) To monitor nurses' performance when caring for neonates with hypothermia in the obstetrics and gynecology hospitals in Khartoum State, Sudan (2019–2021).

(iii) To evaluate the effect of implemented training program on nurses' knowledge and practice when caring for neonates with hypothermia in selected areas for >1 year (2019–2021).

## 2. Materials and Methods

### 2.1. Study design

This interventional hospital-based study aimed at assessing the effect of the training programs on nurses' knowledge and practices regarding the nursing care of neonates with hypothermia in the obstetrics and gynecology hospitals in Khartoum State, Sudan.

### 2.2. Study area

This study was conducted in the neonatal units of the police and military hospitals in Khartoum State, Sudan. Police hospitals are located in Bor. The hospital was built in 1996 and receives patients from different areas of the locality. It includes a clinical reference department, a medical department, a radiolofy department, a blood bank, a kitchen, a security unit, a pediatric ward, an obstetrics and gynecology department, and two neonatal intensive care units (septic and aseptic units) that have 15 incubators and 4 radiant warmers. The per day delivery rate of the hospital is 50 babies; in a month, it admits about 35–50 babies, and 24 nurses work in different shifts.

### 2.3. Study population

The study included 47 nurses working in the neonatal intensive care units of the selected hospitals.

## 2.4. Data collection

A questionnaire was designed by the researcher in English language that included nurses' sociodemographic characteristics such as age, qualifications, years of experience, and information on nurses' knowledge and practice before and after the training program. An observational checklist was developed by the researcher to observe the actual performance of the nurses before and after the training program. It included all nursing care and procedures needed for the care of neonates with hypothermia.

## 2.5. Phases of the study: Phases of intervention

### 2.5.1. Pre intervention phase

- Permission was taken from managers and directors of the two hospitals for data collection through official letters.

- A questionnaire was distributed for each available nurse to be filled under the researchers' guidance.

- Each nurse was observed for her clinical skills when caring for neonates with hypothermia.

## 2.6. Program implementation

The program was designed and offered to equip nurses with essential information and practice regarding the care of neonates with hypothermia and included information about hypothermia such as its definition, causes, signs and symptoms, treatment, prevention and related procedures.

### 2.6.1. Post intervention program

A posttest was done using the same questionnaire and a checklist was used to evaluate the effect of program on nurses' knowledge and skills. All nurses were observed by the researchers during their shift. A certificate and copies of the program was given to all participants.

## 2.7. Data analysis

Data were coded, entered, and analyzed using the statistical package for social science (SPSS) to show the results of the hypothesis of the study by using frequencies and percentages in tables and figures, and a suitable statistical method was used (descriptive and inferential). *P*-value, for statically significant
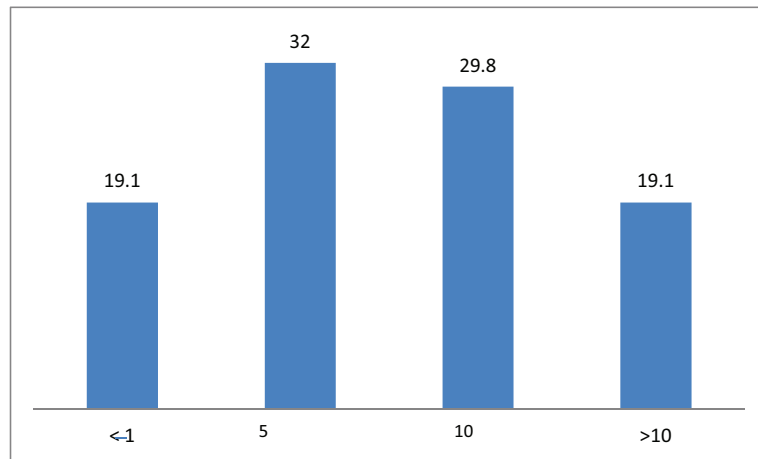
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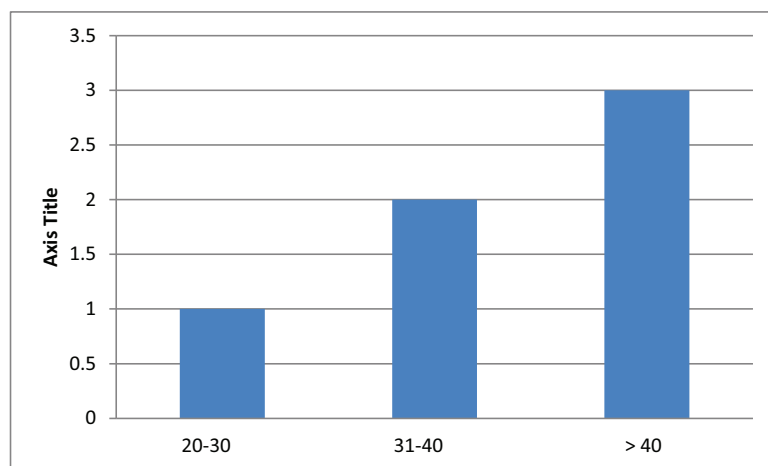


**Figure 1**: Distribution of the study sample according to their age (yr), *N* = 47.

Figure **1** shows that the majority of our study participants were in the age group 20–30 years.
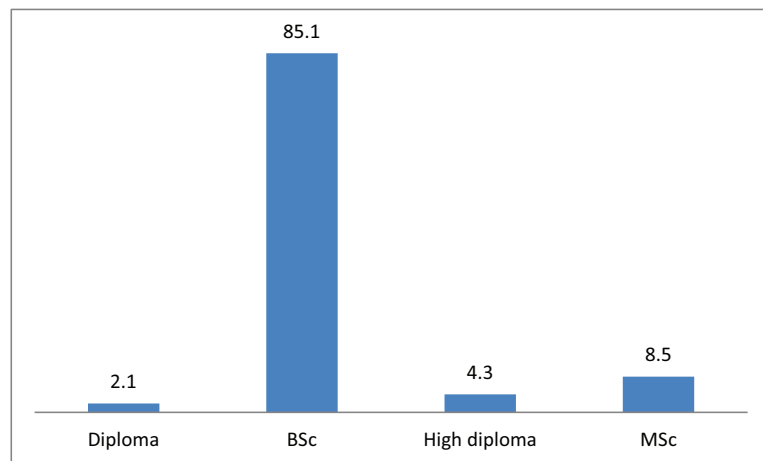


**Figure 2**: Distribution of the study sample according to education, *N* = 47.

As seen in Figure **2**, a majority of our participants (85.1%) had a bachelor's degree in nursing.

**Figure 3**: Distribution of the study sample according to the years of experience, *N* = 47.

TABLE 1: Nurses' knowledge about hypothermia (*n* = 47).

| | Pre training | | Post training | | *P*-value |
|---|---|---|---|---|---|
| | **F** | **%** | **F** | **%** | |
| Nurses' knowledge about monitoring of temperature | 37 | 78.7 | 43 | 91.5 | 0.031 |
| Nurses' knowledge about monitoring of neutral thermal environment | 35 | 74.5 | 45 | 95.7 | 0.008 |
| Nurses' knowledge about incubator care | 31 | 66.0 | 45 | 95.7 | 0.001 |
| Average | | 73% | | 94.3% | 0.013 |

Furthermore, Figure **3** shows that a majority of the study samples (32%) had one to five years of experience.
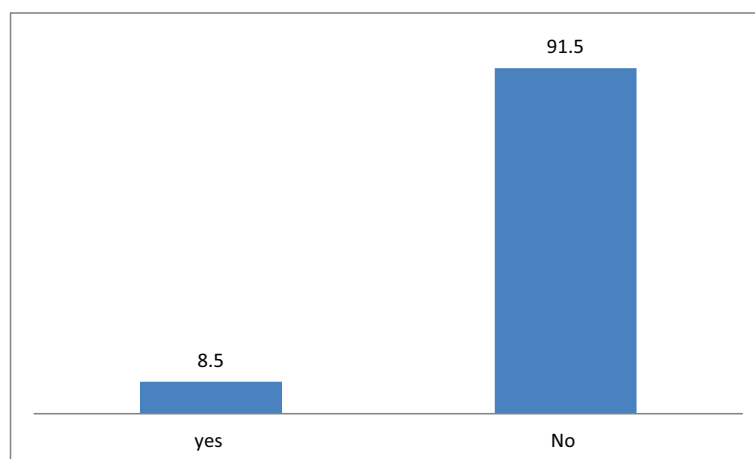


**Figure 4**: Distribution of the study sample according to their attendance of a similar training program prior to previously.

Figure **4** shows that 91.5% of our study participants had not attended any training programs regarding neonatal hypothermia.

TABLE 2: Nurses' practice of hypothermia management (*n* = 47).

|  | Pre intervention | | Post intervention | | *P*-value |
|---|---|---|---|---|---|
|  | **F** | **%** | **F** | **%** |  |
| Nurses' practice on observing signs of hypothermia such as shivering, slow breathing, confusion, acrocyanosis | 42 | 89.4 | 44 | 93.6 | 0.46 |
| Nurses' practice on covering head, hands, legs, and avoiding undressing the infant | 37 | 78.7 | 39 | 83 | 0.60 |
| Nurses' practice on placing the baby under a radiant warmer or incubator | 34 | 72.3 | 44 | 93.6 | 0.006 |
| Average |  | 80.01% |  | 82.97% |  |

# 4. Discussion

The majority of our participants (74.5%) were aged 20–30 years. Similar findings were reported by another Sudanese study which showed that the majority of NICU nurses (60%) were in the similar age group [10]. All participants in this study were female which is similar to the findings of another study in Sudan which showed that all pediatric nurses (100%) in the NICU were female. This can be attributed to hospital polices [11]. Our finding is also similar to the findings of another study on "nursing care for newborn infant with jaundice in a maternity hospital in Brazil," which reported that all nurses included in the study were aged 25–35 years [12]. The study revealed that more than two-third (85.1%) nurses had a BSc degree in nursing science. However, this finding is in contrast to the findings of another study conducted to observe the effect of a designed nursing care protocol on the clinical outcomes of neonates with hyperbilirubinemia in NICU in Shebin–Elkom Teaching Hospital which found that half of the nurses in their study were qualified by only a diploma in nursing [13]. Similarly, another study conducted in Yemen showed that about 83% of their study participants had a nursing diploma and no degree; this is a serious indicator for Yemen which shows that the majority of their nurses are academically not qualified enough to bear their responsibilities [14]. Moreover, one-third (32%) of the study participants had about one to five years of experience. This is in contrast to the results of a study conducted to verify the seriousness of nursing and find an association with respect to nursing care (age, nursing education, and experience in intensive care unit) that show the majority of samples in years of experience group to the study sample where within (under 2 years) and (2–5 years) were 50% and 40%, respectively [15]. Moreover, it was found that 91.5% of the nurses had never undertaken a training course in neonatal care. This is similar to the result of another Sudanese study in which 56% of the nurses had never taken a course in neonatal care [16]. Moreover, in our study, nurses' knowledge regarding neonatal hypothermia improved from 73%

pre intervention to 94.3% post intervention with a *p*-value of 0.013. However, this is in disagreement with another study that found 57.5% of their respondents had adequate knowledge about risk factors and causes of neonatal hypothermia. The study also revealed that 89.4% and 93.6% of the study sample responded with correct answers regarding the warning signs of hypothermia pre and post intervention, respectively [17]. Nevertheless, the finding of the present study is better than the findings of an Egyptian research that showed most of the nurses (96.7%) at pretest had inadequate knowledge about preventing hypothermia in preterm infants, while in the posttest a majority (85%) had gained adequate knowledge [18]. Overall, nurses' practice with respect to managing neonatal hypothermia had a little improvement – pre 80.01% and post 82.9%.

## 5. Conclusion

The findings of the current study proved that training programs are effective and significantly increase the knowledge and improve the practice of the nurses with respect to neonatal hypothermia.

## Limitations

The study had a few limitations such as lack of financial support to implement the intervention programs to cover all nurses in Khartoum state and low sample of nurses.

## Recommendations

1. Contentious educational programs for nurses to improve their performance in ICUs.

2. Further studies to assess nurses' knowledge and practice in the management of neonates with hypothermia in other healthcare settings in Sudan and application of their recommendations into practice.

## Ethical Considerations

Permission from managers, matrons, and head nurses of police and military hospitals was taken through official letters and verbal acceptance was obtained after explaining to them the purpose of the study. Participants had the right to withdraw at any time. Privacy and confidentiality was ensured by using coded questionnaire.

## Competing Interests

None.

## Availability of Data and Material

All relevant data of this study are available to any interested researchers upon reasonable request to the corresponding author.

## Funding

None.

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