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The Effectiveness of Incubator Humidity Education on Nurse's Knowledge, Attitude, and Skills in Perinatology Room

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ABSTRACT

Newborns, especially premature infants, are at high risk of ineffective thermoregulation due to their less complex skin structure. Impaired thermoregulation experienced by premature infants can lead to hypothermia. Premature infants who experience hypothermia can cause complications that have the potential to cause disability and death. One of the efforts to prevent hypothermia is to place premature infants in an incubator that gives moisture so that moisture regulation is needed to help regulate the baby's temperature, especially in premature infants who experience ineffective thermoregulation. Humidity regulation is required for the incubator to prevent fluid loss through evaporation. This study aims to determine the effectiveness of providing incubator humidity education on nurses' knowledge, attitudes, and skills in the Perinatology room. The research design used a pre-experimental group without control with an accidental sampling technique; namely, there was a pre-test before and a post-test after treatment. Thus, the treatment results can be more accurate because they can be compared with the situation before treatment. This study involved 37 respondents in the perinatology room in one of the state hospitals using pre-and post-test questionnaires conducted from April to May 2022. The results showed that there were significant differences before and after education on knowledge (p=0.001), attitudes (p=0.001), and skills (p=0.001). The results of this study can used as a reference in developing standard procedures for incubator humidity to prevent ineffective thermoregulation in premature infants through cognitive improvement of nurses about incubators.

Keywords: attitude, knowledge, incubator humidity, skills

INTRODUCTION

Newborns, especially premature babies, are at high risk of experiencing ineffective thermoregulation because their skin structure is not yet complex (Samartharam et al., 2021). Premature babies are born before 37 weeks of pregnancy and less than 259 days from the first day of the last menstruation. (Bieleninik & Gold, 2014). Premature infants have a fragile epidermis, and it can take 2-4 weeks to develop a fully functional stratum corneum (Shaib et al., 2017).

Immature organ development in premature infants causes complications such as increased oxygen consumption, lactic acid production, apnea, decreased blood coagulation,

hypoglycemia, and decreased secretion and synthesis of surfactants as a cause of cold stress in infants (Fallon & Mychaliska, 2021). The infant's immature ability to produce heat makes the baby very vulnerable to thermoregulation disorders, namely hypothermia (Bayih et al., 2019).

The autonomic nervous system hypothalamus regulates body temperature. Body temperature regulation (thermoregulation) is the ability to balance heat production and loss to maintain an average body temperature (Ompusunggu & Rustina, 2021). Hypothermia in newborns is a condition where the body temperature is below average 36.5^0C due to imperfect regulation of the baby's body temperature. Based on data from Basic Health Research (2007), the prevalence of neonatal death in infants in Indonesia caused by hypothermia is 7% (Wildan & Febriana, 2017). This is also related to the most common cause of mortality in newborns, with the most common cause of death being due to conditions that occur in low birth weight newborns and premature (20.8%) (Kementerian Kesehatan RI, 2021).

Hypothermia is a process of heat loss that results in a decrease in body temperature. Therefore, controlling body temperature is crucial in infants, especially premature babies (Perez et al., 2019). Premature babies have a huge ratio of body surface area to volume, so if they are exposed to temperatures below a neutral thermal environment, they will lose heat and have difficulty maintaining body temperature (Knobel, 2014). A neutral thermal environment is the environment’s temperature in which the metabolic needs with caloric expenditure to maintain a non-average temperature of 36.5°C to 37.5°C. (Mccall et al., 2018).

One method to prevent hypothermia is through the process of evaporation. Evaporation occurs through the skin or respiratory tract when water is converted into gas, as much as 0.6 kcal for every 1 g of water lost from the body (Thakur, 2021). The prevention of evaporation can be achieved by adjusting the humidity level of the air entering the incubator, which can be formed by humidity (Doctor et al., 2017). Infants lose heat through their skin and respiratory tract to the environment through radiation, conduction, convection, and evaporation.

The skin creates a barrier between the body and the environment, especially in premature infants, to protect the body from mechanical damage, bacteria, and infections (Chandrasekaran et al., 2021). Fat under the skin is an insulator to prevent heat loss, but the more premature a baby is born, the less fat insulation (Mccall et al., 2018).

The occurrence of evaporation in premature infants requires efforts to protect the baby's temperature fluctuations until efficient thermoregulation. One effort to prevent evaporation through trans-epidermal is to use humidity (Selewski et al., 2020). Moisture helps reduce

invisible water loss and maintains skin integrity, and the baby's body temperature is stable. Usually, at two weeks, the baby's skin will function the same as a term baby's. Humidity can be formed by the humidity set in the premature baby incubator (Lapono, 2016).

Humidity can be administered safely and effectively through modern incubators without the risk of pseudomonal infection by adhering to guidelines that comply with the standards for using incubator humidity. Increasing humidity through humidification is very beneficial during the first few days or weeks of life. Temperature stability in the incubator generally uses a control mode, namely air circulation and the incubator heating power. The temperature of the baby's incubator is kept within normal limits of around 33°C to 35°C (Glass & Valdez, 2021). Prevention of heat loss in premature babies is to provide a warm and humid environment, one of which is by placing the baby in an incubator (Zaylaa et al., 2018).

Incubators have fans to circulate warm air and containers to add water to create a moist environment. However, incubators also increase the risk of infection from a warm and humid environment. Nurses, as health workers on the front line of service, require knowledge and attitudes that support implementing patient safety systems as a service process. Nurses can understand incubator humidity through knowledge about incubator humidity. Nurses with good knowledge and attitudes can also improve their caring behavior (Rahayu & Sulistiawati, 2019).

Based on the communication conducted by the researcher with several nurses in the Perinatology room, it was found that not all nurses knew about incubator humidity settings, which affected the nurses' attitudes and behavior in adjusting the humidity in the incubator, and not all babies also used incubators with controlled humidity. The absence of a standard operating procedure for incubator humidity settings that was used as a reference for humidity settings in the incubator was also an indication of this because the existing standard was a standard procedure for setting the incubator.

Based on the phenomena, incubator humidity control must be implemented in the Perinatology room, and nurses' knowledge, attitude, and skills influence this. This research is also rarely done, so researchers are interested in knowing the knowledge, attitudes, and skills of nurses in the perinatology room related to the guidelines for premature baby incubator humidity, which can be used as a standard in regulating incubator humidity. Therefore, the researcher was interested in knowing nurses' knowledge, attitudes, and skills in the perinatology room related to incubator humidity guidelines for premature babies that can be used as a standard in regulating incubator humidity. This study aimed to determine the effectiveness of education on incubator humidity control based on nurses' knowledge, attitudes, and skills in the Perinatology room.

METHODS

The research design used the pre-experimental method, one group without control. The population in this study consisted of neonate nurses in the perinatology room. The study population consisted of 106 Perinatology nurses. The statistics in this study are paired with numerical analytics, and the sample consisted of 37 respondents with various variations of their characteristics (Dahlan, 2014). All samples were identified according to the research objectives and met the inclusion criteria using the accidental sampling technique, namely, all samples that happened to be present or available and met the criteria in this study in one of the hospitals in Jakarta.

The inclusion criteria for the selection of this study were neonate nurses who were willing to become respondents. They had at least one year of experience in the Perinatology room, and the exclusion criteria were neonate nurses who were on leave and refused to be given educational materials. The data collection process was carried out from April to May 2022. This research has obtained ethical approval from the Faculty of Nursing, the University of Indonesia, with the Number KET139/UN2.F12. D1.2.1/PPM .00.0 2/2022.

The data collection tool in this study used a questionnaire containing the characteristics of the respondents and a questionnaire about the nurses' knowledge, attitudes, and skills about incubator humidity. The nurse's knowledge questionnaire about the incubator's humidity consisted of 20 questions, attitudes, and skills 15 statements, with a reliability test result of 0.682.

Researchers identify problems and phenomena in the Perinatology room and discuss with supervisors' mentors and the head of the installation regarding the phenomena carried out based on evidence-based nursing practice, conduct socialization of activity plans with room nurses, act based on informed consent with the consent of respondents, intervene by providing educational materials. The research subjects were first given an initial test (pre-test) to determine the extent of nurses' knowledge, attitudes, and skills regarding incubator humidity.

After being given a pre-test, nurses were given treatment, namely incubator humidity education, to all nurses who were respondents and then given a final test (post-test post-test) to determine the extent of the increase in nurses' knowledge, attitudes, and skills regarding incubator humidity. Implementation is expected to provide changes in nurses' knowledge, attitudes, and skills in regulating humidity in premature babies, and the output results can be used as a draft of standard operating procedures for incubator humidity.

RESULTS

The results of this study are described by the research objectives, namely to determine the characteristics of respondents, knowledge, attitudes, and skills of nurses regarding incubator humidity control. Characteristics of respondents in this study include age, education level, length of work, and clinical nurse competency (NC), as well as a description of knowledge, attitudes, and skills before and after being given the incubator humidity education material.

Based on Table 1, the average respondent is in the productive age range, with a percentage of 62.2%. Their average education is Associate Expert (D3), but they already have much experience in the field of nursing, as evidenced by the average length of work >4 years (81.1%), and experience as a clinical nurse competency is on grade (NC 3) (70.3%).

Table 1. Distribution of Respondents based on Age, Education, Length of Work, and Clinical Nurse Competency (NC) in the Perinatology Room

Variable	Frequency (f)	Percentage (%)
Age		
17-25 years	1	2.7
26-35 years	13	35.1
36-45 years	23	62.2
46-55 years		
>55 years		
Education		
D3	31	83.8
S1	2	5.4
Ners	4	10.8
S2		
S2 Specialist		
Length of work		
One year	1	2.1
>1-3 years	4	10.8
>3-4 years	2	5.4
>4 years	30	81.1
Clinical Nursing Competency		
NC 1	1	2.7
NC 2	10	27
NC 3	26	70.3
NC ≥4	0	0

The results of the distribution of respondents' knowledge, attitudes, and skills about incubator humidity in Perinatology are shown in Table 2. Table 2 presents data on respondents' knowledge levels before and after being given educational material on incubator humidity and shows an increase in knowledge after being given education, with a difference of 35.1% and a score of

>70. Respondents' attitudes towards incubator humidity problems showed an increase towards a good attitude with a difference of 21.6%. This shows that after being given education about incubator humidity, respondents have a sense of curiosity and a positive attitude towards regulating incubator humidity, as evidenced by an increase in attitude scores after education and no very bad attitude scores. Respondents' skills regarding incubator humidity also show increased skills in regulating incubator humidity. This is shown by the difference in percentage before and after being given educational material of 5.4%.

Table 2. Distribution Table of Respondents' Knowledge Level about Incubator Humidity in the Perinatology Room

Level	Frequency (f)	Percentage (%)
Knowledge		
Before education		
Less	13	35.1
Good	24	64.9
After education		
Less	0	0
Good	37	100
Attitude		
Before education		
Extremely bad	7	24.3
Bad	21	56,8
Good	9	18.9
Excellent	0	0
After education		
Extremely bad	0	0
Bad	15	59,5
Good	22	40,5
Excellent	0	0
Skills		
Before education		
Skills	35	94.6
No Skills	2	5.4
After education		
Skills	37	100
No Skills	0	0

Bivariate analysis determines the significant relationship between two or more variables. This data is presented in the form of a table of the results of the analysis of nurses' knowledge, attitudes, and skills before and after being given educational materials about incubator humidity. The researcher used the Wilcoxon test to analyze whether there was a significant difference before and after being given education about the incubator's humidity. This shows that after being given education about the humidity of the incubator, the respondents have curiosity and a positive attitude towards humidity, as evidenced by the increase in the value of the attitude after

being given education, none of which is very bad.

Table 3. The Relationship Between Knowledge, Attitudes, and Skills on Incubator Humidity Before and After Giving Educational Materials

Variable	n	*p-value*
Relationship between knowledge of respondents before and after the intervention	37	0.001
Relationship between respondents' attitudes before and after the intervention	37	0.001
Relationship between respondents' skills before and after the intervention	37	0.001

From Table 3, bivariate analysis shows a significant difference in respondents' knowledge, attitude, and skills before and after being given educational material about incubator humidity with a p-value of 0.001, which is smaller than <0.05. Based on the table, it is obtained that there is a significant difference in the level of knowledge of respondents before and after being given educational material about incubator humidity with a p-value of <0.001. There is a significant difference in respondents' attitudes before and after being given educational material about incubator humidity with a p-value of 0.001, which is smaller than the significance level of p-value <0.05. There is a significant difference in the skills of respondents before and after being given educational material about incubator humidity with a p-value of 0.001, which is smaller than <0.05.

DISCUSSION

The results showed that the respondents are in the productive age range, and almost all nurses who were respondents in this study had attended training in the Perinatology training in the Perinatology room. Training is one way to improve nurses' knowledge and skills. Knowledge is obtained in different ways and is influenced by several factors, including age, education, experience, information, and socio-culture. The results of this study align with those of Biresaw et al. (2020), who conducted cross-sectional research involving nurses and concluded that age, level of education, length of work experience, training, and information obtained significantly affect nurses' knowledge.

The results also indicated that there was an increase in knowledge before and after being given educational material on moisture incubators by 35.1%. This proves that learning can increase if there is information provision. Research conducted by Purnamasari et al. (2017) in the results of his research on Neonatal Intensive Care Unit (NICU) nurses also explained that there was a significant increase in the difference in knowledge before and after being given educational

interventions. This result also aligns with research conducted by Philip et al. (2019), which showed increased knowledge after being given structured education about thermoregulation in neonates.

The gap in knowledge regarding thermoregulation and incubator humidity management impacts the need for increased supervision and compliance with the guidelines for premature infant care practices regarding humidity control in incubators. Based on this, it is necessary to have a picture of nurses' knowledge about incubator humidity control so that an initiative is needed for the education and training division for perinatology nurses to strengthen their understanding of the importance of nursing care for neonates to reduce the risk of thermoregulatory disorders, especially those related to the mechanism of evaporation through humidity.

Nurses with less knowledge tend to have better attitudes than nurses with good knowledge. A person's philosophy is also influenced by experience. Nurses with experience tend to have positive perceptions compared to less experienced nurses (Browning et al., 2020). Based on the results of the study, it was found that there was a significant difference in nurses' attitudes towards incubator humidity before and after being given education with a p-value <0.05 ($p = 0.001$).

This is in line with the research of Purnamasari et al. (2017), which shows a significant difference in the average score of knowledge and behavior of nurses before and after being given educational intervention. Individual attitudes also influence skills. Each person's skills can always be trained and developed so that the individual can become an expert or professional in a field. The results of this study are on the theory of the relationship between knowledge and attitude. Knowledge is one of the factors that influences the formation of other people's attitudes. Based on experience and research, if someone has good knowledge, they will also have good behavior. Knowledge is the result of a learning process that can be obtained formally and informally and culminates in theoretical and practical understanding in individuals.

The formation of individual behavior is also believed to be closely related to their knowledge level. Individual attitudes also influence skills. Each person's skills can always be trained and developed so that the individual can become an expert or professional in a field. This ability can develop through continuous learning and training to be implemented in every activity and practiced in individual work. Based on the results of the study, it was found that there was a significant difference in nurses' attitudes towards incubator humidity before and after being given education. The research found significant differences before and after receiving education and training in the comprehensive nursing education assessment (Kartikasari et al., 2020).

CONCLUSION

Humidity control in incubators can help regulate the baby's body temperature, especially in premature babies who experience ineffective thermoregulation. Based on research that has been conducted on incubator humidity control, there is an increase in knowledge, attitudes, and skills of nurses before and after being given education, so it is necessary to provide regular education to all nurses in the Perinatology room so that they have the same insight and information regarding incubator humidity control. Incubator humidity control training can also be used as an alternative to improve nurses' understanding of incubator humidity. In addition, the study's results can describe the nurses' knowledge of incubator humidity control, which can affect nurses' attitudes and behavior in providing health services to premature babies. This study can also be an alternative support for formulating standard procedures for incubator humidity control in the Perinatology room. Further research is recommended to investigate and explore the long-term impact of increasing incubator humidity control on premature babies.

LIMITATION

This study has been attempted and carried out using scientific procedures. However, it still has limitations. This study only uses one questionnaire during the pre-test and post-test; this can cause biased data because there is a possibility that respondents only memorize the answers from the previous test, and sometimes the answers given by respondents do not show the actual situation or knowledge of the respondent. In addition, the respondents' time spent answering questions on the questionnaire differed from one respondent to another due to work factors or other activities while working shifts.

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