Physiological response of premature infants due to the administration of pseudostem banana nest innovation to the incubator

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Abstract: In this study, innovation of banana pseudostem nest was conducted to assess the physiological response of premature infants due to the provision of pseudostem banana nest innovation in the incubator. This innovation is needed because premature babies need conditions that promote physiological response functions to increase body temperature, gain weight and assess changes in oxygen saturation. Unfortunately, so far there is no temperature stabilizer in the incubator, the incubator is made of electric and heating elements only so that some physical parameters cannot be accommodated with the incubator. Therefore, this paper proposes the innovation of pseudostem banana nest because it has a 400% water absorption level, a higher temperature stabilization on the fibers in commonly used materials. This study measures physiological responses. The research procedure begins with the manufacture of dried banana pseudostem ingredients, making pseudostem banana nest from banana midribs and coated with a cloth shaped like a hand containment. This research uses a quasi-experimental design method with pre-post test control group design. The sampling technique used was nonprobability sampling by consecutive sampling. A sample of 30 preterm infants was divided into 15 control group samples, 15 intervention group samples. Action procedure, the researcher treated the intervention group by placing nest pseudostem banana in the incubator until it surrounded the premature baby for three consecutive days. Measurements were made on parameters of body temperature, weight, oxygen saturation before and after intervention in the control group and intervention group for three consecutive days. The results of this study were obtained significant differences in body temperature, oxygen saturation before and after given nest pseudostem banana with a p-value of 0.001; 0.003. In this study, there were no significant differences in body weight before and after being given nest pseudostem banana with a p-value of 0.837.

1. Introduction

The incidence of premature infants is estimated at 11.4% of live births and is the cause of most infant deaths because premature babies have several problems, including hypothermia, weak reflexes, susceptibility to infection, respiratory distress syndrome, jaundice, intraventricular hemorrhage,
necrotizing enterocolitis, retinopathy prematurity, anemia prematurity, hyperbilirubinemia[1-10]. The closed incubator is one of the tools used to treat premature babies medically, functioning to warm the baby and keep the baby from germs.

In the baby incubator there is a heater, a fan to circulate the heated air, a container for water to add moisture, a control valve for adding oxygen, and an access port for treatment, but in using it to be more careful because it can cause death and injury to babies due to failure a thermostat that causes the incubator to overheat, causes a hyperthermia baby, and design damage or defects that result in fires and electric shocks. Inadequate control of the amount of oxygen delivered in the incubator can cause hyperoxia or hypoxia. This tool is to be operated with a stable power source[11].

Babies placed in the incubator are at risk of experiencing volatile temperature stability and potentially endanger the baby because they use electrical and heating elements[12-14]. Older model incubators make babies too hot and cause serious burns beside staphylococcal bacteria found in incubators with low temperature and humidity[15, 16]. Efforts to help premature infants with incubators are also hampered by the high cost of NICU (Neonatal Intensive Care Unit) care in hospitals[10].

The research conducted by Comaru in 2009 on a sample of 47 preterm infants with gestational age ≤35 weeks stated that nest in postural support can promote physiological stabilization (hearth rate, oxygen saturation, and pain score) and behavior in premature infants[17]. Stabilization of baby's physiology and behavior, one of them is by using a hand containment position by placing hands on the baby's head and around their feet to give comfort or use restrictions (such as rolled towels or placement aids, to make "nest")[18, 19].

Based on the many problems found in the incubator, in this paper, an analysis was conducted to examine the impact of banana pseudostem innovation on the physiological response of premature infants (temperature, weight, oxygen saturation).

2. Metode

This research starts with providing nest material by choosing the type of banana. The types of banana plants used for nest are *Musa acuminatabalbisiana* Colla and *Musa textiles*. The cutting process uses a sharp and clean blade. Pseudostem is peeled off each layer and drying is carried out on dry soil, cement or sand floors approximately seven days. The next stage is that the material is divided into several sizes as desired (*ayaran*) until it becomes a slap rope after which weaving process is carried out until it is finished followed by cutting the remaining plait, cleaning, lining pseudostem banana nest with hand containment cloth so that innovation of nest is ready for use. Design innovation of Nest Pseudostem Banana can be seen in Figure 1.

![Figure 1](image1.png)

Figure 1. The figure of Innovation of nest pseudostem banana

Nest that is placed in an incubator scientifically adheres to the law of 2 (two) thermodynamics, where spontaneously the heat transfer occurs from a high-temperature place to a low-temperature place other than that the mechanism of heat transfer from one state to another can be carried out by particles of liquid or gas (convection), then nest acts as a hot dumper so that the heat does not occur [20].
The action procedures in the control and intervention groups in this study included researchers measuring body temperature using a digital thermometer, weight using a baby scale and oxygen saturation using oxymetry before the intervention was done in the control group and intervention group. Researchers treated the intervention group by placing nest pseudostem banana innovations in the incubator to surround the premature baby for three consecutive days. Researchers measured temperature, weight, oxygen saturation, and jaundice at the same time every day for 3 (three) days. The researcher records the data on the observation sheet every day for 3 (three) days. This study uses a quantitative method using a quasi-experimental design with pre-post test control group design. The samples in this study were stable preterm infants who were treated at the NICU. The sampling technique is nonprobability sampling by consecutive sampling. the sample size of this study 30 with the sample details of each group was 15 for the control group and 15 for the intervention. This study uses the Wilcoxon test for the non-parametric test due to abnormal data distribution before the normality test was carried out by the Shapiro-Wilk test due to the small number of samples (30 samples).

3. Result and Discussion

3.1. Results of Analysis Based on Increased Daily Body Temperature and Differences in Body Temperature Before and After Using Pseudostem Banana Nest in Intervention and Control Groups.

The day I in the intervention group showed that the average body temperature of preterm infants was 36.55 °C higher than 0.15 °C when compared to the control group, which was 36.40 °C. Day II in the intervention group showed that the average body temperature of preterm infants was 36.7 °C, 0.31 °C higher than the control group, which was 36.39 °C. Day III in the intervention group showed that the average body temperature of preterm infants was 36.86 °C higher than 0.57 °C when compared to the control group, which was 36.29 °C. The results of statistical tests with Wilcoxon shown that there are significant differences in body temperature of premature infants before and after being given pseudostem banana nest between the control group and the intervention group. This is evidenced by looking at p-value<α (0.05) which is 0.001. Nest pseudostem banana can prevent heat loss due to keeping premature babies in a flexed position that will reduce the exposure of the body's surface to ambient temperature and can save heat due to changes in premature baby's posture that changes drastically so that it expends energy[18][21, 22].

Figure 4 Graph of mean daily body temperature in the intervention and control groups
3.2. Results of Analysis of Daily Body Weight Addition and Differences in Body Weight Before and After Using Pseudostem Banana Nest in Intervention and Control Groups.

The day I in the intervention group showed that the average body weight of premature babies was 1864.6 grams heavier 37.9 grams when compared to the control group, which was 1826.7 grams. Day II in the intervention group showed that the average body weight of premature babies was 1884.3 grams weighing 98 grams when compared to the control group which was 1786.3 grams. Day III in the intervention group showed that the average body weight of premature infants was 1906 grams heavier 120 grams when compared to the control group, which was 1786 grams. The results of statistical tests with Wilcoxon shown that there were no significant differences in the weight of preterm infants before and after being given pseudostem banana nest between the control group and the intervention group. This is evidenced by looking at the p-value<α (0.05) which is 0.837.

![Figure 5. Graph of mean daily weight in the intervention and control groups](image)

Newborns will experience weight gain again about 30 grams/day during the first month of birth at 2 weeks of age [23]. The insignificant weight gain of premature babies is affected by the physiological digestive organs of premature babies that have not been fully developed. Premature babies have smaller muscle tone in the lower esophageal sphincter area, small stomach capacity, sucking and swallowing abilities exist before the baby is born but coordination ability is not perfect. Premature babies also spend 70% or more of their time sleeping active[18, 24-27]. The results of this study are in accordance with the theory which states that premature babies will experience physiological weight loss on the first day of life that is as much as 6-8% of their birth weight. Weight gain of healthy premature babies ranges from 15-20 grams per day in the first days of life [28].

3.3. Results of Analysis of Changes in Daily Oxygen Saturation Value and Differences in Oxygen Saturation Before and After Using Pseudostem Banana Nest in Intervention and Control Groups.

The day I in the intervention group showed that the average premature oxygen saturation was 97.07% lower by 1.53% when compared to the control group, which was 98.60%. Day II in the intervention group showed that the average oxygen saturation of preterm infants was 97.87% lower by 0.93% when compared with the control group, which was 98.80%. Day III in the intervention group showed that the average oxygen saturation of preterm infants was 97.13% 1.47% lower than that in the 98.60% group. The results of statistical tests with Wilcoxon shown that there is a significant difference between the oxygen saturation of preterm infants before and after being given pseudostem banana nest between the control group and the intervention group. This is evidenced by looking at p-value<α (0.05) which is 0.003.
Earth's gravity will affect the position of the baby who is upright if the baby is given a pseudostem banana nest so that it has a positive impact and has an effect on ventilation and perfusion. Optimal respiration function occurs when the premature baby is in an upright position[29]. The results of this study are in line with the results of a study which states that nest with prone position can increase oxygen saturation in 34 preterm infants performed in the NICU room with nest intervention in the prone position for 30 minutes with a 10 minute observation of oxygen saturation with a p-value of 0.001[30]. Another study states that there is a significant difference with p-value 0.0016 between the nest and the position of prone to oxygen saturation[31]. Oxygen saturation is affected by hemoglobin levels in the blood. Hemoglobin of newborns reaches an average level of 11 to 17 g / dl at the end of the first month of life is lower than when newborns range from 14.5 to 22.5 g / dl[21].

4. Conclusion
Incubators with pseudostem banana nest have a positive impact on premature babies. From the results of the study, there were significant differences in body temperature and oxygen saturation before and after given nest pseudostem banana with an increase in body temperature up to 0.15 \(^{\circ}C\) and changes in oxygen saturation with a range of 1.53\% with a p-value of 0.001; 0.003. There were no significant differences in body weight before and after being given nest pseudostem banana with a p-value of 0.837.

5. References
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