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Infant Safety In Incubator Care In The Perinatology Room

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ABSTRACT

The safety of premature and high-risk infants in the perinatology ward is a top priority in neonatal health care. The use of incubators as a thermoregulation aid and environmental protection plays a crucial role in maintaining the infant's physiological stability. However, improper use of incubators can lead to risks such as hyperthermia, hypothermia, infection, and respiratory distress. This study aims to analyze the safety aspects of infants in incubator care in the perinatology ward. The study used a descriptive analytical design with an observational approach. The study sample consisted of 50 infants treated using incubators. Data were collected through observation of care procedures, monitoring of physiological parameters, and evaluation of health workers' compliance with standard operating procedures (SOPs). The results showed that the majority of incubator care met standards, but several safety risks were still found related to temperature regulation and sterilization procedures. It was concluded that the implementation of SOPs and strict monitoring significantly influenced the safety of infants in incubator care.

Keywords: Infant Safety, Incubator, Perinatology, Neonatal Patient Safety

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1. Introduction

Premature and low birth weight (LBW) infants are at high risk of experiencing physiological instability due to immaturity of body systems, particularly the thermoregulatory, respiratory, and immune systems. An incubator is a medical device designed to create a stable and controlled thermal environment to support the infant's adaptation to the extrauterine environment.

While incubators offer significant benefits in maintaining body temperature and reducing heat loss, their use also carries potential risks if not properly managed. Improper temperature control can lead to hyperthermia or hypothermia, while suboptimal sterilization procedures can increase the risk of nosocomial infections.

Patient safety patient Safety in the neonatal context requires the implementation of strict standard operating procedures, continuous monitoring, and the competence of healthcare workers in operating medical equipment. Therefore, identifying factors that influence infant safety in incubator care is crucial for improving the quality of care in the perinatology ward.

This study aims to analyze infant safety in incubator care in the perinatology room as part of efforts to improve the quality of neonatal services.

2. Research Methods

This research is a descriptive analytical study with an observational approach. The research was conducted in the perinatology ward of Hospital X during the period January-March 2025.

a. Population and Sample

The study population was all infants treated using incubators. The study sample consisted of 50 infants, selected using total sampling techniques.

b. Inclusion Criteria

1) Premature babies or LBW
2) Treated using an incubator for at least 48 hours

c. Exclusion Criteria

1) Babies with severe congenital abnormalities
2) Baby in critical condition on mechanical ventilator

d. Research Variables

1) Main variable: Infant safety in incubator care
2) Safety indicators:
   - Body temperature stability
   - Stability of respiratory rate
   - Heart rate
   - Oxygen saturation

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- Compliance with SOPs

e. Research Instruments

1) Observation sheet for compliance with SOP for incubator use
2) Baby physiological parameter monitoring sheet
3) Check incubator sterilization and cleanliness list

f. Data analysis

Data were analyzed descriptively using frequency distribution and percentages.

g. Research Ethics

The research was conducted with the permission of the hospital and maintaining the confidentiality of patient identities.

3. Research Results And Discussion

a. Research Result

The study involved 50 premature and low birth weight babies who were cared for using incubators for at least 48 hours.

1) Baby Characteristics

Characteristics	n	%
Gestational age <32 weeks	20	40
Gestational age 32–36 weeks	30	60
Body weight <1500 grams	18	36
Body weight ≥1500 grams	32	64
Treatment duration >5 days	28	56

Most babies are 32–36 weeks gestational age, but are still premature and require intensive thermal support.

2) Stability of Physiological Parameters During Incubator Treatment

a) Body Temperature

Temperature Conditions	n	%
Normothermia (36.5–37.5°C)	42	84
Mild hypothermia	5	10
Mild hyperthermia	3	6

The majority of infants were successfully maintained in normothermia, demonstrating the effectiveness of incubators in maintaining thermoregulation.

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b) Breathing Frequency

Condition	n	%
Normal (30–60x/minute)	44	88
Mild tachypnea	6	12

c) Heart rate

Condition	n	%
Normal (120–160x/minute)	46	92
Mild tachycardia	4	8

d) Oxygen Saturation

Condition	n	%
≥94%	45	90
90–93%	5	10

In general, the physiological stability of babies during incubator care is within normal limits.

3) Compliance of Health Workers with SOPs

SOP Components	In accordance (%)	It is not in accordance with (%)
Initial temperature setting	88	12
monitoring every 3 hours	80	20
Medical record keeping	78	22
Incubator sterilization	84	16

Non-conformities were mainly found in the aspects of documentation and monitoring consistency.

4) Near Miss

Type of Event	Amount
Temperature fluctuation >1°C	6
Incubator alarm not acted upon immediately	3
monitoring recording	5

No serious injuries or complications were observed during the study.

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b. Discussion

Research results show that the use of incubators has generally supported infant safety in perinatology wards, particularly in maintaining stable body temperature. Incubators create a neutral thermal environment, which is essential for premature infants who are unable to regulate their own body temperature.

Good temperature stability in 84% of infants indicates that incubator temperature regulation is relatively effective. However, cases of mild hypothermia and hyperthermia indicate that temperature fluctuations may still occur, especially in very low birth weight infants. This is consistent with the theory that premature infants have minimal subcutaneous fat reserves and an immature thermoregulatory system.

The majority of infants demonstrated stable breathing and heart rates. This stability indicates that the incubator environment helps reduce metabolic stress and excessive energy demand. Optimal thermal conditions reduce oxygen consumption and help maintain oxygen saturation within normal limits.

Safety aspects depend not only on incubator technology, but also on human factors. Non-conformity of SOPs in monitoring and documentation indicates the potential for latent risks. In the concept of patient Safety, documentation errors and delayed response to alarms can trigger unexpected events.

Near incidents the misses found, such as temperature fluctuations and delays in alarm response, demonstrate the importance of a double -check monitoring system. system). This supports the Swiss Cheese Model theory in patient safety, where repeated small failures can lead to incidents if not corrected promptly.

Inconsistent incubator sterilization also increases the risk of nosocomial infections. Premature babies have immature immune systems, making them highly susceptible to microbial contamination.

Overall, this study shows that infant safety in incubator care is a combination of:

- Reliability of technology
- Compliance with SOPs
- Competence of health workers
- Continuous monitoring

Systemic approach to neonatal safety needs to be continuously strengthened through routine training, safety audits, and a safety culture. culture in the perinatology room.

➢ **Clinical Implications**

1) Monitoring of temperature and vital parameters should be done more consistently and well documented.
2) The incubator alarm system must be acted upon immediately.

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3) Incubator safety audits need to be carried out periodically.
4) Neonatal safety training needs to be improved.

4. Conclusion And Suggestions

a. Conclusion

Based on the research results, it can be concluded that infant care using an incubator in the perinatology ward generally supports infant safety by maintaining optimal physiological stability. Most infants maintained normothermia, with stable respiratory rate, heart rate, and oxygen saturation within normal limits throughout the treatment period.

The use of incubators has proven effective in helping premature and low-birth-weight infants maintain body temperature and reduce metabolic stress. However, several incidents of mild temperature fluctuations, delays in monitoring documentation, and inconsistencies in the implementation of standard operating procedures (SOPs) were still found. This indicates that infant safety depends not only on incubator technology, but also on human factors, adherence to procedures, and ongoing monitoring systems.

Compliance with SOPs, consistent monitoring of physiological parameters, and accurate response to incubator alarms are important factors in preventing adverse events. Thus, infant safety in incubator care is the result of the integration of the quality of medical equipment, the competence of health workers, and the safety culture in the perinatology room.

b. Suggestion

1) For Hospital Management

Hospital management needs to:

- Conduct periodic audits of incubator use and sterilization
- Provide regular training related to neonatal patient safety
- Ensure the availability of incubators in good condition and regularly calibrated.

2) For Health Workers

Health workers in the perinatology room are expected to:

- Improving compliance with SOPs for incubator use
- Conduct consistent and documented monitoring of physiological parameters
- Respond to incubator alarms quickly and accurately
- Developing a safety culture culture) in daily practice

3) For Infection Prevention and Control (IPC) Programs

The PPI team needs to:

- Strengthening supervision of incubator sterilization and perinatology environments
- Integrating neonatal safety monitoring into patient safety programs

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- Conduct routine evaluations of the potential risk of nosocomial infections

4) For Further Researchers

Further research is recommended to:

- Using analytical or cohort designs to assess safety risk factors in more depth.
- Examining the relationship between SOP compliance and temperature fluctuation events.
- Examining the aspects of safety culture and health worker workload on the quality of incubator care.

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