







REPERCUSSIONS OF HYPOTHERMIA ON THE HEALTH OF SURGICAL NEWBORNS: NURSES' PERSPECTIVE

REPERCUSSÕES DA HIPOTERMIA NA SAÚDE DE RECÉM-NASCIDOS CIRÚRGICOS: PERSPECTIVA DAS ENFERMEIRAS

REPERCUSIONES DE LA HIPOTERMIA EN LA SALUD DE LOS RECIÉN NACIDOS QUIRÚRGICOS: DESDE LA PERSPECTIVA DE LAS ENFERMERAS

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ABSTRACT

Objective: to analyze the nurses' perspective on the repercussions of hypothermia on the health of surgical newborns. **Method:** descriptive, exploratory study with a qualitative approach. Developed from September 2020 to February 2021, with the participation of 13 nurses from a neonatal unit located in the capital of Bahia, Brazil. Data were collected through semi-structured interviews and investigated using thematic content analysis technique, in the light of environmental theory and current scientific evidence. **Results:** in the nurses' perception, hypothermia has systemic repercussions on the health of the neonate, due to the compensatory stress caused, thus interfering unfavorably in the preoperative, intraoperative period and in the delay and complication of surgical recovery; impacting, above all, on the morbidity and mortality of the surgical newborn. **Conclusion:** hypothermia in surgical newborns is characterized as a serious adverse event, as it presents risks, damages, and health problems, which favors an increase in neonatal morbidity and mortality rates. In addition, from the discussion of the results, it was possible to reflect on the importance of the applicability of the environmental theory in the management and assistance to the hypothermic condition.

Keywords: Infant, Newborn; Hipotermia; Surgical Procedures, Operative; Neonatal Nursing; Patient Safety.

RESUMO

Objetivo: analisar a perspectiva das enfermeiras sobre as repercussões da hipotermia na saúde de recém-nascidos cirúrgicos. **Método:** estudo descritivo, exploratório, com abordagem qualitativa. Desenvolvido no período de setembro de 2020 a fevereiro de 2021, tendo como participantes 13 enfermeiras assistenciais de uma unidade neonatal localizada na capital baiana. Os dados foram coletados por meio da entrevista semiestruturada e investigados pela técnica de análise de conteúdo temática, à luz da teoria ambientalista e evidências científicas atuais. **Resultados:** na percepção das enfermeiras, a hipotermia tem repercussões sistêmicas na saúde do neonato, devido ao estresse compensatório causado, interferindo, assim, desfavoravelmente no pré, no transoperatório e no retardo e complicação da recuperação cirúrgica; repercutindo, sobretudo, na morbimortalidade do recém-nascido cirúrgico. **Conclusão:** a hipotermia no recém-nascido cirúrgico se caracteriza como um evento adverso grave, por apresentar riscos, danos e agravos à saúde, o que favorece a elevação dos índices de morbimortalidade neonatal. Além disso, a partir da discussão dos resultados, foi possível refletir sobre a importância da aplicabilidade da teoria ambientalista no gerenciamento e na assistência ao quadro hipotérmico.

Palavras-chave: Recém-nascido; Hipotermia; Procedimentos Cirúrgicos Operatórios; Enfermagem Neonatal; Segurança do Paciente.

RESUMEN

Objetivo: analizar el punto de vista de las enfermeras sobre las repercusiones de la hipotermia en la salud de los recién nacidos quirúrgicos. **Método:** estudio descriptivo y exploratorio con un enfoque cualitativo. Desarrollado en el período de septiembre de 2020 a febrero de 2021, con la participación de 13 enfermeras de cuidados de una unidad neonatal, ubicada en la capital de Bahía. Los datos se recopilaron mediante una entrevista semiestructurada y se investigaron con la técnica de análisis del contenido temático a la luz de la teoría ambientalista y las pruebas científicas actuales. **Resultados:** según la percepción del personal de enfermería, la hipotermia tiene repercusiones sistémicas en la salud del recién nacido, debido al estrés compensatorio que provoca, interfiriendo desfavorablemente en los períodos preoperatorio y transoperatorio, y en el retraso y las complicaciones de la recuperación quirúrgica, afectando especialmente a la morbilidad y mortalidad de los recién nacidos quirúrgicos. **Conclusión:** la hipotermia en los recién nacidos quirúrgicos se caracteriza por ser un evento adverso grave, ya que supone riesgos, daños y empeoramiento de la salud, lo que favorece el aumento de las tasas de morbilidad y mortalidad neonatal. Además, a partir de la discusión de los resultados, se pudo reflexionar sobre la importancia de la aplicación de la teoría ambiental en el manejo y asistencia de la hipotermia.

Palabras clave: Recién Nacido; Hipotermia; Procedimientos Quirúrgicos Operativos; Enfermería Neonatal; Seguridad del Paciente.

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INTRODUCTION

The neonatal period, the first 28 days of a child's life, represents a phase of intense anatomic-physiological transformation to extrauterine life, configuring a moment of vulnerability that can bring harm, due to adaptation to the new environment.¹ This neonatal vulnerability is revealed by mortality indicators in Brazil, since, in the period from 2016 to 2020, the number of deaths of children under 1 year of age was 175,169, and 70.2% of these deaths occurred in newborns (NB). This data highlights, therefore, neonatal morbidity and mortality as a public health problem.²

One of the factors that may favor the increase in neonatal morbidity and mortality is ineffective thermoregulation, since the unstable temperature modifies the NB's hemodynamics, impacting the prognosis.^{3,4} This thermal change is one of the main complications that affect the NB, because it loses heat easily as a result of the evaporation of the temperature of the external environment.⁵

The reduction of body temperature in the NB to values below 36.5 °C is called hypothermia, being characterized by the imbalance between heat loss and production, in which the elimination becomes greater than the production, which can have an impact on health.³ The World Organization of Health classifies temperature between 36.0 and 36.4 °C as mild hypothermia, between 32.0 and 35.9 °C as moderate hypothermia and temperature < 32 °C as severe hypothermia.⁶

Although hypothermia has greater aggravations in premature and low birth weight neonates⁷, the stress caused by exposure to cold can lead to metabolic and physiological complications in all newborns, regardless of gestational age or conditions such as respiratory distress, acid-metabolic disharmony, hemorrhage intra-periventricular, necrotizing enterocolitis, in addition to risk for infection at the surgical site. In the absence of treatment, it can lead to death.^{5,8}

Thus, unintentional hypothermia is a condition that affects most patients undergoing surgery, becoming more severe in children than in adults, and may lead to longer recovery times, longer hospital stays, and higher costs (due to factors such as the cold environment of the operating room, time, and type of surgery) and anesthetic effects that induce a metabolic reduction of heat.⁹

On the other hand, seeking to reduce errors and improve the quality of care provided to patients, in 2013, the Ministry of Health established the National Patient Safety Program (PNSP, Programa Nacional de Segurança do Paciente), guided by seven international goals,

including the promotion of actions in areas of surgical procedures.¹⁰ Thus, the PNSP ensures quality health care in order to avoid adverse events (AE) that harm the patient.

From this perspective, considering neonatal hypothermia (non-therapeutic) as a preventable AE, it is necessary that all professionals involved in the care of surgical NBs be attentive to the prevention and reduction of perioperative hypothermia, especially the Nursing team.^{9,10} This is because Nursing care is directly related to patient safety, and should minimize the adverse events of the care provided.⁴

Given the above, it is factual that neonatal thermoregulation is influenced by environmental factors. Therefore, it would be imperative for Nursing to direct its gaze to the context of care for surgical NBs in the perspective of basing its actions on the Environmental Theory. Nurse Florence Nightingale addresses the influence of the environment in the establishment of the health-disease process of the individual, stating that extrinsic conditions influence the life and development of the organism, being feasible to prevent, eliminate or even contribute to health, illness, and death.¹¹

Thus, the importance of the environmentalist approach of nurses in providing a thermoneutral environment for the surgical NB is confirmed, in order to guarantee safe and quality care, away from risks, damages and harm to the health of the neonate, favoring the reduction of neonatal morbidity and mortality rates. Thus, the scientific relevance of this study is highlighted, given the lack of publications on the repercussion of hypothermia in surgical NBs, as well as research recommendations that address the issue of neonatal hypothermia.⁴

In view of this, the following objective was outlined: to analyze the nurses' perspective on the repercussions of hypothermia on the health of surgical newborns.

METHOD

This is a descriptive, exploratory study with a qualitative approach, discussed in light of the Environmental Theory proposed by Florence Nightingale. In this theory, the relationship of the human being with the environment is approached, that is, as the individual who integrates nature. Therefore, their natural defenses suffer interference from a healthy or unhealthy environment.¹²

Data collection was carried out from September 2020 to February 2021, taking place in a Neonatal Intensive Care Unit (NICU) of a private hospital, located in the city of Salvador - BA, Brazil. This institution was chosen because it is a reference unit in neonatal surgeries, especially because

it follows safety and quality care standards, having won a national and international accreditation seal.

The approach with the participants took place through an individual invitation to present the research project via a virtual group formed on the Google Meet platform. After the presentation of the project, the invitation was made and, according to the acceptance, the interview was scheduled.

The participants were 13 nurses out of a total of 20 who worked in the care of the NB undergoing a surgical procedure. They were selected based on the following inclusion criteria: having a specialization in neonatology; be active during the data collection period; and work in the service for at least two years. As exclusion criteria, the following were established: not attending the interview room up to three times on the scheduled day and time and without the possibility of rescheduling; a health problem arises that made it impossible for her to participate in the study; and not having provided assistance to the surgical neonate.

Data collection took place through a semi-structured interview, using as the main research question: What are the repercussions of hypothermia on the health of surgical newborns? Thus, the interview took place in a virtual and individual way through the Skype application, guaranteeing the interviewee's privacy. The call was recorded to ensure reliability and data storage, with an average duration of 18 minutes.

After the end of the interviews, the information was transcribed into a Word 2016 document. Subsequently, this material was sent, via email, to the participants, in order to obtain the validation (agreeing or disagreeing) of the information, with few suggestions for changes.

Regarding data analysis, the thematic content analysis proposed by Bardin¹³ was used, starting with the transcription of the interviews and their skimming, in order to organize and familiarize with the material. Soon after, the coding and categorization steps were carried out to obtain the central ideas of the interviews, emerging four thematic categories. Finally, the analysis and discussion was carried out based on a dialogue between the scientific evidence (national and international) the environmental theory and the speeches of the participants.

Ethical precepts were respected, and the project was submitted and approved by an Ethics Committee in Research with Human Beings, under CAAE No. 26195819.0.0000.5029. The guidelines of the virtual steps of circular letter No. 1/2021-CONEP were complied with and, to ensure the confidentiality and anonymity of the

information, the participants were coded by the acronym "Enf", followed by the number related to the sequence in which they were performed. The construction of this article was based on the Consolidated Criteria for Qualitative Research Reports (COREQ).

RESULTS

Study participants are characterized by being female, married (7) and Catholic (7). Regarding race/color: 5 consider themselves brown, 5 white and 3 black; and the mean age group was 35 years, ranging from 27 to 45 years. As for the degree, all had specialization in neonatal and/or pediatric ICU. The time of professional work of nurses in neonatology ranged from 2 to 18 years, with a minimum time of work in the institution of 2 years and a maximum of 11 years.

The thematic categories that emerged in the analysis are: i) systemic repercussions on the health of the newborn; ii) pre- and intraoperative repercussions for the newborn; iii) repercussions on the newborn's surgical recovery; and iv) repercussions on the morbidity and mortality of surgical newborns.

Systemic repercussions on the health of the newborn

Undoubtedly, vital signs are basic measurable measures of the human body, being essential to identify how the NB's clinical condition is in the health-disease process. It is important for the Nursing team to monitor these signs, because with this monitoring, changes can be perceived, and possible hemodynamic and clinical complications can be prevented.

We soon see that this NB has hypothermia due to changes in vital signs, mainly causing bradycardia [...] Apart from that there is a risk of changes in general, in the neurological part as well [...]. (Enf13)

It can generate hypoglycemia, cardiac alterations, even convulsions, [...] increases the caloric need, can cause hypoxia and hypoglycemia. If the NB has tachypnea, it can worsen [...] as well as pulmonary vasoconstriction. It can even lead to acidosis, depending on the degree of hypothermia [...] the newborn's body will try to compensate for this hypothermia in some way, then it will start to use the devices it has in the body, use of fats, to turn into energy, increase heat, then, for sure, hypothermia is a problem that damages [...] the newborn's body. (Enf04)

The low oxygenation of the newborn, the altered metabolism, the metabolic disturbances that can be caused, even an intracranial hemorrhage [...]. (Enf03)

[...] they end up trying to make this compensation, leading to calorie loss, and triggering vasoconstrictions, causing some brain and intestinal lesions [...] necrosis in the intestine and other organs, because they end up trying to compensate. (Enf06)

among other things [...]. (Enf11)

Nurses agree that hypothermia causes complications of systemic repercussion in the neonate, highlighting hemodynamic, neurological, metabolic, respiratory, and digestive changes. The speeches also show that the repercussions can be explained from the moment the body tries to compensate, generating stress for not being able to maintain homeostasis, bringing consequences to the entire NB organism.

Pre- and intraoperative repercussion for the newborn

In this category, the environmental influence for the pre- (handling and transfer) and transoperative (exposure in the operating room) phases of the newborn can be highlighted. The neonate is already in a delicate health situation due to their clinical status and the procedure to which they will be exposed. Therefore, the temperature imbalance can affect your health status and, consequently, the surgical procedure to be performed.

[...] the newborn is already going to the operating room; he/she is already naturally exposed to several changes in his entire system. So, from the moment we expose this baby to hypoheating, we expose all the vital organs of this baby. (Enf01)

[...] when we are going to transfer a baby to the operating room, the baby has to be normothermic, precisely because of the complications that can happen, especially during transport, that we know the consequences of hypothermia for a newborn. And this can cause difficulties in the surgery itself, and the issue of hemodynamics, which can be altered, unstable; and even the surgery itself, which may not happen, due to hypothermia [...]. (Enf09)

Repercussion of the newborn's surgical recovery

In the nurses' reports, it is clear how the adverse event of hypothermia can impair the surgical outcome and the restoration of the health status of the neonatal patient in the postoperative period.

[...] hypothermia can even interfere with his/hers immediate and long-term recovery, in the results of the surgery [...] it can damage the level of surgical recovery. (Enf03)

[...] the loss of heat, ends up [...] generating a future problem that is more serious than the surgical procedure, it can be a simple procedure that may trigger an episode of serious hypothermia, severe [...] future injuries much worse than that surgical procedure [...]. (Enf06)

[...] can bring several complications for the NB [...] metabolic acidosis, post-surgical decompensation, among other complications. (Enf07)

[...] from the moment a newborn returns from an immediate postoperative period with hypothermia, his/hers hemodynamics can complicate the issue of his/hers brain perfusion due to hypothermia, a consequence in relation to protection. The issue of capillary blood glucose in the newborn. And to later reverse the condition of hypothermia, it takes time for us to stabilize this child. (Enf10)

Repercussion on the morbidity and mortality of surgical newborn

Nurses recognize hypothermia as an adverse event considered very serious for the NB, as it can cause damage to the patient's body and even lead to death due to its complications.

Hypothermia is serious, it is an event that has numerous repercussions [...] it is a risk [...] it leads to death, so we are more careful with hypothermia [...]. (Enf08)

[...] in newborns [...] even more so for premature infants [...] I consider it an aggravation and it really brings irreversible damage [...]. (Enf02)

[...] hypothermia favors an increase in oxygen consumption, these sequelae generate other sequelae, aggravating the clinical picture and even causing the death of the NB [...]. (Enf04)

DISCUSSION

In the nurses' speeches, it is evident that a hypothermic condition can have a systemic impact on the health of the neonate, on the success of the surgical procedure to which he/she is exposed and on the continuity of his life.

When exposed to the cold environment, the newborn's body undergoes physiological stress when trying to compensate for the loss of heat, exacerbating its cellular metabolism. This compensation can have repercussions on different body systems⁸, which is recognized in the nurses' statements.

If there is this thermal instability with a decrease in temperature, the NB reacts differently from the adult patient, that is, the NB performs chemical or non-spasmogenic thermogenesis, performing brown fat catabolism.^{8,14} The adult, in turn, performs a spasmogenic thermogenesis, because muscle metabolism generates energy and consequently releases heat that warms your body.⁹

The influence of temperature is mentioned by Florence Nightingale in her assumptions about the balance of environmental factors, which are: cleanliness (related to the prevention of infections) and comfort of the physical environment; ventilation; lighting; and ambient heating. As for the environment, the theory recommended that a moderate temperature be provided in the patient's room, avoiding cooling^{11,12}, that is, hypothermia in the body.

There is agreement among nurses that hypothermia in the neonate has pathophysiological repercussions on the systems, highlighting the endocrine, metabolic, cardiovascular, pulmonary, and neurological systems. This is due to the attempt to compensate and the systemic immaturity of the NB, which suffers greater environmental influence in the extrauterine adaptation.^{7,16}

Among the alterations in the organism resulting from hypothermia, the literature shows that the increase in cellular metabolism in neonates leads to greater oxygen consumption; increases glucose consumption, accelerating the depletion of glycogen stores and increasing the risk of hypoglycemia; it generates risk of increased lactate and metabolic acidosis⁸, it still presents alterations in ventilation that generate abnormality in PCO₂ levels; risk of hypoxia due to a decrease in PaO₂, which leads to a decrease in SaO₂; changes in heart rate (tachycardia, at the beginning of the hypothermic condition, and bradycardia, at its onset), abnormal levels in blood pressure, in breathing; pulmonary vasoconstriction and slow capillary refill, which causes reduced peripheral perfusion.¹⁷

Nightingale¹² reflects how important the nurse's ability to observe is to identify which signs and symptoms

indicate improvement or worsening in the patient's condition, the seriousness or not of these signs and symptoms, as well as evidence of negligence or not.

Thus, the importance of monitoring the vital signs of this NB is highlighted, since the episode of hypothermia goes beyond the drop in temperature, mainly causing a deterioration in the hemodynamic condition¹⁸; thus, the role of Nursing in monitoring neonatal temperature is highlighted for the early detection of thermal variations and prevention of systemic changes such as heart rate, blood pressure, respiratory rate, glycemic level and consciousness^{8,19}, or even expressions of pain such as crying and facial changes¹⁹, both for diagnostic measures and for a quick intervention.

Another interesting point highlighted by the principles of environmental theory is that, in childcare, the sudden death of a sick child can be determined by factors such as sudden noises and fear provocation¹², which converges with more technological and complex environments such as the NICU and the surgical center. This is because they are places that, sometimes, present a large amount of light and excessive noise, such as alarms and monitors and the tone of voice of the professionals who circulate the environment, which can disturb sleep, cause anxiety, agitation and crying in the NB, contributing to a large expenditure of energy.^{11,15}

Studies^{18,20} state that hypothermia is one of the most prevalent perioperative complications. Hypothermia is an event that, in addition to the pathophysiology (gestational age, weight and diseases), is influenced by the environmental conditions to which the patient is subjected (room temperature, transport and handling of the NB).¹⁵ In this sense, it was understood by the nurses of the present research and other studies^{3,19} that the maintenance of normothermia is an essential care during all neonatal surgical stages, and safe and quality equipment must be used for the prevention of hypothermia, and the monitoring of the intervention must be carried out by qualified professionals.

Hypothermia is considered an AE, which can not only prevent or delay the intraoperative period, but also have repercussions on the worsening of the health status of the neonate. It can lead to the incidence of surgical site infection²¹, to an increase in cardiac and oxygenation demand, to clotting disorders and hemodynamic complications such as thrombosis, to changes in renal function, to a lowering of the level of consciousness and, therefore, to a greater length of stay at the hospital.^{17,18}

The assistance to the NB in the postoperative period requires care with the prevention of intercurrents

and constant monitoring until the patient returns to consciousness and homeostasis.²⁰ In this installation of hypothermia, when causing physiological stress, distresses and complications arise (such as those already cited) that prolong the period of stay in the rehabilitation room¹⁸, in addition to contributing to morbidities such as late-onset sepsis (generalized infection)¹ and exacerbation of postoperative pain.

However, it is possible to find evidence that there is a gap in knowledge about hypothermia, as in the study²¹ which identifies that 85.7% of mid-level Nursing professionals at the researched institution are not aware of the relationship between hypothermia control. A study carried out in a postoperative recovery room highlights that this period requires the nurse to plan actions aimed at the prevention and treatment of complications, observing the changes in organic functions related to anesthetic interventions, comorbidities, complications of the procedure, treatment effectiveness and age group of the patient, providing elements to improve care for patients undergoing surgical procedures.²⁰

Finally, the last category shows that nurses see hypothermia as an AE that has harmful effects on the patient's body¹, being related to a worsening of prognosis¹⁹, being associated with morbidities that can culminate in cardio-respiratory arrest and death¹⁷ and contributing, directly or indirectly, to increase neonatal mortality rates.⁴

The premature NB was cited by the interviewees as the population most vulnerable to developing very serious sequelae, even death, since premature and low birth weight NBs are more susceptible to hypothermia^{7,15} due to factors such as: lower brown fat storage, lower thermogenic response due to hypoxia, larger body surface compared to weight, epidermis with inadequate keratinization, greater amount of extracellular water (greater evaporation) and less cutaneous vasoconstriction^{3,14}, which requires greater caution in thermal control.¹⁶

Furthermore, a study⁵ that determined the prevalence of the most common morbidities in extremely low birth weight NBs hospitalized in the NICU showed that, in 50.3% of the cases, events and complications related to hypothermia occurred. Thus, it is recognized that hypothermia interferes with the health of the neonate, requiring the implementation of strategies to mitigate the risk of its occurrence, recognizing, and implementing strategies¹ based on safe and quality care, seeking to eradicate the occurrence of AE related to thermal instability.

It appears that neonatal hypothermia is a preventable AE, from the moment that nurses recognize, in the pathophysiology of neonatal thermal regulation, factors that trigger thermal instability, having resources and technologies for prevention. Therefore, the team involved in the systematization of NB care needs to direct its actions to the deliberation of effective protocols for the eradication of this AE that contributes to the neonatal morbidity and mortality of surgical NBs.^{1,8,17}

The environmentalist theory approaches that the cause of illness or non-recovery of the sick patient is related to the environmental conditions in which he/she is immersed. That said, Nightingale presents the nurse's role as balancing this environment, conserving the patient's vital power, in order to allow a space that encourages the restoration of the patient's health.^{11,12,22}

However, a study that evaluated the knowledge of Nursing professionals about the occurrence of hypothermia in patients undergoing surgical procedures found that 92.2% of these professionals had no training regarding the phenomenon.¹⁸ Thus, the need for training of Nursing professionals to act in the prevention of neonatal hypothermia, including the use of new technological equipment, as well as the implementation and/or implementation of clinical care protocols is highlighted.

It is also recommended that the nurse manages and coordinates the team in the prevention of thermal instability of the NB, promoting a neutral thermal environment, in a way that guarantees assistance away from risks, damages and aggravations to the neonate, seeking to reduce neonatal morbidity and mortality, which is high in the country and in the world.

The evidence of a research that carried out a critical analysis of the environmental theory is also highlighted, having concluded that this theory contributes substantially to the practice of Nursing.²² Therefore, it is understood that, in order to theoretically support the assistance of the Nursing team, in neonatal care, the environmental theory helps nurses to reflect on how the environment favors the occurrence or worsening of hypothermia in the neonate, or even how it can help in the patient's thermal stability and in the control of its repercussions.

Thus, the present study promotes the development of scientific knowledge, specifically about the work process of Nursing workers in neonatology, by presenting the nurses' perception of the phenomenon studied and, consequently, enabling the development of feasible strategies for the prevention of hypothermia in NB.

CONCLUSION

In the nurses' perception, hypothermia is a health problem that has systemic repercussions on the health of the neonate, due to the compensatory stress caused, interfering unfavorably in the pre-, trans- and neonatal postoperative period. For early diagnosis and rapid management, the monitoring of the NB's vital signs by the Nursing team is essential.

In addition, through the results, it was possible to reflect on the importance of the applicability of the environmental theory in the management and assistance of the nurse in the hypothermic condition, which is characterized as a serious AE, which can trigger reversible and irreversible complications to the health of the NB, especially preterm infants, favoring an increase in neonatal morbidity and mortality rates.

Although it is considered that the objective has been achieved, the study has as a limitation the scenario of a single health institution. However, the data refer to other national and international realities. Thus, further research on the subject is suggested, covering other professional categories in other Brazilian regions.

Thus, the findings of this research can collaborate with the professional nurse in the systematization of Nursing care to the surgical NB, in the sense of recognizing the risks and impacts caused by hypothermia, being able to eradicate its occurrence and guarantee a safe environment for the neonate.

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