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NUTRITIONAL RISK IN PRETERM INFANTS AND ITS ASSOCIATION WITH MATERNAL AND PERINATAL HISTORY

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ABSTRACT

Prematurity affects neonatal growth and development, interrupting fetal maturation in the third trimester. Nutrition is essential for these babies, classified according to gestational age and birth weight. Maternal, fetal and socioeconomic factors influence preterm birth,

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and both malnutrition and maternal obesity increase the risks. Preterm infants often require intensive care in NICUs to prevent complications. Despite medical advances that have improved survival, delays in nutrition can impact growth and increase morbidity and mortality. Objective: To analyze the relationship between nutritional risk and maternal and perinatal history in preterm newborns, classify risk according to neonatology criteria, and correlate these risks with mothers' history. This study analyzed the relationship between nutritional risk and maternal history in premature newborns in the Neonatal ICU of the Hospital Beneficente da Unimar (HBU). The sample included premature newborns from the Neonatal ICU of the Hospital Beneficente da Unimar (HBU). The postpartum women were invited to participate by answering a questionnaire. The Neonatal Nutritional Risk Assessment Tool (FARNNeo) was used, which classifies the risk as low (0 points), medium (1 to 3 points) and high (4 or more points). Statistical analysis was performed with Excel and BioEstat 5.0. The results showed that birth weight (P = 0.0013), feeding route (P = 0.0242), and the presence of maternal comorbidities (P = 0.04497) had a significant association with nutritional risk. It is concluded that maternal history directly influences the nutrition of premature infants, highlighting the importance of screening and early nutritional monitoring to minimize risks and promote adequate development.

Keywords: Infant malnutrition. Early diagnosis. Premature newborns. Neonatal ICU.

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INTRODUCTION

Prematurity interrupts the physiological growth that occurs during the third trimester of pregnancy, the environment to which the preterm is exposed is extremely different from the uterine environment, causing an increase in energy expenditure due to the need to maintain thermal and metabolic homeostasis, this factor added to the incomplete maturation of the fetus makes nutrition crucial for the growth and development of the little one (Dudrick, Malkan, 2013). We classify premature babies with the following requirements: those born before 28 weeks of gestation are extremely premature babies, very premature babies are those born between 28 and 32 gestational weeks, and those who go from 32 weeks to 37 weeks of gestation are named moderate preterm (Mathewson *et al*., 2017). We can also evaluate them according to the weight of the newborn (Stewart; Barfield, 2019). Those born with less than 1,000g are considered extremely low weight, very low weight are those with less than 1,500g; and those born weighing less than 2,500g are classified as underweight (Schmidt; Saigal, 2020). There is one more type of classification used for babies born prematurely, we can divide them into: spontaneous premature birth, when the pregnant woman starts labor spontaneously or after an early rupture of membranes, or induced premature labor that would be for non-medical reasons, when maternal or fetal indications, initiated by health professionals, being induction of labor or elective cesarean section (Goldenberg *et al.*, 2012).

When we talk about premature babies, we are talking about 30 million preterm infants (WHO & UNICEF, 2018), in Brazil they represent about 11.5% of those born (Hass *et al.*, 2023), in previous studies, global estimates of the rate of preterm births show an increase, ranging from 9.8% in 2000 to 10.6% in 2014 (Chawanpaiboon *et al*., 2019).

Preterm birth encompasses a set of symptoms resulting from various factors, such as maternal sociodemographic, psychosocial, nutritional, behavioral and biological factors, these conditions are well known in the literature, but the correlation between them is poorly understood (Goldenberg *et al.*, 2008). The induction of preterm birth is associated with maternal biological factors such as: previous preterm birth, multiple pregnancy, maternal comorbidities, lifestyle, psychological health, health care, and also with circumstances related to the newborn, such as: fetal distress and restricted intrauterine growth (Blencowe *et al*., 2013; Phillips *et al.*, 2017).

The risk of preterm birth is related to the nutritional status of the mother before pregnancy or during, more specifically thinness or obesity (Hannaford *et al.,* 2017; Pigatti

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et al., 2019). Malnutrition is responsible for the decrease in blood flow due to the low concentration of micronutrients, leading to early delivery, and excess weight, due to diseases such as preeclampsia and diabetes, causes medically induced labor (Goldenberg, 2008; Poalelungi *et al*., 2018).

The neonatal period is a phase that requires too much care, due to complications and changes in physiology that hinder healthy development, thus making it necessary to use the Neonatal Intensive Care Unit (Neonatal ICU) (Mesquita *et al., 2019).*

The Neonatal ICU is an area of high complexity dedicated to patients aged zero to 28 days who have serious illnesses and continuous care, in which interdisciplinary care, humanized care, respect for the human rights of the newborn, including the participation of parents and sensitivity to meet their needs (Brasil, 2010; Araki *et al., 2017).*

With technological advances and the modernization of the Neonatal Intensive Care Unit (Neonatal ICU), there has been an increase in survival and a reduction in long-term sequelae in these babies (Cordova; Belfort, 2020; Hass *et al*., 2023).

Any postnatal delay in achieving adequate nutritional intake creates a growth restriction over time and generates malnutrition, with different types of malnutrition expressions, which may be due to insufficient energy and nutrient intake, increased energy expenditure or nutrient demands, or impaired absorption capacity (Gouveia *et al.*, 2024).

The nutritional status of the child is closely related to the child's health and development conditions. In the case of malnutrition, an increase in morbidity and mortality, hospital time and cost is observed, negatively interfering with the quality of life of the family and the child (Teixeira; Viana; Araújo, 2016).

Despite the severity of these problems, hospital malnutrition often goes unnoticed, highlighting the urgent need for evaluation for early identification and strict monitoring of nutritional status during hospitalization, with the aim of preventing malnutrition and its consequences through the conduct of the most specialized and appropriate multidisciplinary team for the patient (Mehta *et al., 2013).*

It is from nutritional screening that it is possible to classify the nutritional risk of the premature infant with this to monitor the development and the chance of morbidity and mortality that is related to nutritional status, requiring its application as soon as hospitalization is admitted, even more so when the preterm has associated comorbidities, with specific needs (Cardoso, Falcão, 2007; Formiga, Linhares, 2009; Varaschini, Molz, Pereira, 2015).

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Observing the above considerations, this study aimed to analyze the relationship between nutritional risk and maternal and perinatal history among premature newborns.

MATERIAL AND METHODS

This was a methodological study, with a primary, analytical, observational interference design with cross-sectional periodicity and prospective. The sample consisted of premature newborns from the Neonatal ICU of the Hospital Beneficente da Unimar (HBU). We invited the postpartum women to participate and answer the questionnaire on maternal history, which included the following questions: Maternal age, underlying comorbidity, complications that occurred during pregnancy and/or delivery, how many kilos gained during pregnancy, pre-gestational weight, what pathology the newborn had, what type of diet he received, whether it was breast milk or formula and which, and finally alcohol and/or drug consumption before or during pregnancy. The project was forwarded to the ethics and research committee with human beings, and data collection was only initiated after the approval and signing of the free and informed consent form.

We used the Neonatal Nutritional Risk Assessment Tool (FARNNeo) as an assessment tool, which was created and validated by the University of São Paulo (USP). The tool consists of four questions: gestational age at birth, being equal to or greater than 37 weeks the score was 0, from 28 to less than 37 weeks, the score was 1 and less than 28 weeks were computed 2 points; birth weight (≥2500 g, 0 points; ≥1500 to <2500 g, 1 point; ≥1000 g to <1500 g, 2 points; <1000 g, 3 points); disease and/or clinical condition (with high nutritional risk), where a congenital anomaly or malformation that could compromise the gastrointestinal tract were considered, with the presence of these being considered 2 points and the absence 0 points; and the last question was nutritional therapy (exclusive oral route, 0 points; exclusive or mixed enteral nutritional therapy, 1 point; parenteral nutritional therapy, 2 points; no nutritional therapy, 3 points). The classification was made according to the answer to each question, where zero points were low risk, one to three points medium nutritional risk and equal to or greater than 4 was considered high risk.

The statistical treatment of the quantitative data was performed with the support of Excel for Windows and BioEstat 5.0. Descriptive statistics were used to characterize the population or sample and present the data, using frequency distribution and measures of central tendency and dispersion. To assess the significance of the analyses and

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association of the variables studied, inferential statistics were used with the application of appropriate tests, depending on the variance of the data to be analyzed. The probability of significance was 5% (p≤0.05) for the operations performed.

The study began only after the appreciation and approval of the Research Ethics Committee of the University of Marília – Unimar (opinion: 6.906.973). Authorization was requested from the clinical head of the neonatal ICU of the Associação Beneficente Hospital Universitário (ABHU) and from the extension and research department of ABHU. Premature newborns who met the inclusion criteria and postpartum women were invited to participate in the study, and those interested signed a free and informed consent form after receiving detailed information about the nature of the investigation.

RESULTS

The research was carried out with 29 puerperal women and 30 premature babies, one participant being a twin mother, these had an average of 32.4 years, with a minimum gestational age of 26 weeks and a maximum of 37, where 62% had comorbidities, and 37.9% did not present any gestational complications. The preterm infants presented an average of 1.9 kg (with a maximum of 3.5 kg and a minimum of 0.9 kg), with 63.3% receiving feeding through a nasoenteral tube, 16.6% mixed feeding, the type of food was a data similar to the feeding route, where the highest percentage is breast milk, followed by breast milk plus formula and the general classification was medium risk (70%), according to FARNNeo scoring.

Table 1 – Correlation of the FARNNeo score with the variables of preterm infants in a neonatal ICU.

Variables Maternal History		FARNNeo			p-value
		MR		AIR	
Maternal Age	Up to 35 years old	13 (65,0%)		7(35,0%)	0,2968
	Over 35 years old	8 (88,8%)		1 (11,1%)	
Prematurity (gestational age)	Premature	19 (70,3%)		8 (29,7%)	0,1781
	Extremely premature	0 (0%)		2 (100%)	
Type of food	Breast milk	12 (63,1%)		7 (36,8%)	0,6970
	Formula	3 (60,0%)		2 (40,0%)	
	Mixed	6 (100%)		0 (0%)	
Birth weight	Up to 1.5kg	0 (0%)		5 (100%)	0,0013
	1.5kg more	21 (84,0%)		4 (16,0%)	
Presence/Absence comorbidity	Presence	9 (81,8%)		2 (18,1%)	0,04497
	Absence	11 (61,1%)		7 (38,8%)	
Gestational complications	YES	13 (72,2%)		5 (27,7%	0,9431
	NO	7 (63,6%)		4 (36,3%)	

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Feeding route	V.O	6 (100%)		0 (0%)	0,0242
	NSS	10 (52,6%)		9 (47,3%)	
	V.O + SNE	5 (100%)		0 (0%)	

Caption: MR: Medium risk. AR: High risk. V.O: oral route. NSS: Nasoenteral tube. Chi-square test.

Birth weight (p:0.0013), the presence of comorbidities (p:0.04497), and the feeding route (p:0.242) showed significant correlations with the FARNNeo score, with p-values below 0.05. Newborns weighing less than 1.5 kg were at high risk, while the presence of comorbidities was associated with a higher average risk. In addition, the feeding route (oral or combination with nasoenteral tube) influenced the distribution of risk.

DISCUSSION

The findings of this study indicate a significant relationship between nutritional risk in preterm infants and factors such as birth weight, presence of maternal comorbidities, and feeding route. These results corroborate previous research that shows the influence of maternal nutritional status on neonatal development, highlighting the need for early evaluation to prevent complications associated with prematurity (BLENCOWE et al., 2013; GOLDENBERG et al., 2008). Nutritional screening allows the identification of potential risks before the emergence of more serious problems, enabling timely and effective interventions (CARDOSO; FALCÃO, 2007).

The Neonatal Nutritional Risk Assessment Tool (FARNNeo) demonstrated high efficacy in classifying the nutritional risk of the preterm infants analyzed, being able to detect that the majority (70%) were at medium risk. This tool, which has been widely validated in neonatal units, stands out for its reliability and agility in nutritional assessment. Its use enables more precise and effective nutritional interventions, helping to manage nutritional risk and promoting better clinical outcomes for infants hospitalized in neonatal intensive care units (NICU) (SILVINO et al., 2021). Early identification and appropriate nutritional intervention are crucial to reduce complications that can prolong the length of hospital stay and impact long-term health (BRASIL, 2010).

Maternal nutritional status also showed a strong influence on neonatal nutritional risk. The presence of maternal comorbidities was directly associated with greater nutritional vulnerability of newborns. Recent studies point out that both malnutrition and maternal overweight can compromise the birth weight and nutritional status of the baby (BRASPENJOURNAL, 2021). Inadequate weight gain during pregnancy can result in newborns being large or small for gestational age, directly impacting their health and

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development (HANNAFORD et al., 2017). Very low birth weight infants face challenges such as immune immaturity, breathing difficulties, and feeding problems, while those with high birth weight may experience complications at birth and require special care after birth (PIGATTO et al., 2019).

In view of these factors, the relevance of maternal nutritional monitoring throughout pregnancy is highlighted. Pregnant women with comorbidities, such as gestational diabetes, hypertension, and obesity, should receive close monitoring and specific nutritional interventions to minimize risks to the newborn. Adequate nutritional support for high-risk pregnant women should be a priority for health professionals, as it can reduce obstetric and neonatal complications, including prematurity and the development of future chronic diseases (GOUVEIA et al., 2024).

Another relevant aspect observed was the relationship between the feeding route and neonatal nutritional risk. Preterm infants fed exclusively by nasoenteral tube had a higher nutritional risk when compared to those who received breast milk orally or in a mixed form. Scientific evidence suggests that the early introduction of breast milk, whenever feasible, is associated with better nutritional outcomes and lower morbidity and mortality (CHAWANPAIBOON et al., 2019). Breast milk is widely recognized as the best source of nutrition for newborns, as it contains all the essential nutrients and substances that strengthen the immune system (CORDOVA; BELFORT, 2021). In preterm infants fed exclusively by tube, challenges in nutrient absorption and a higher risk of infections may occur, common complications in immature infants (MESQUITA et al., 2019).

Therefore, promoting breastfeeding from the first days of the premature baby's life should be a priority. Adapting nutritional interventions to the clinical conditions of each infant is essential. Maternal support, both in the emotional aspect and in breastfeeding education, is crucial to increase breastfeeding success rates, especially in neonatal ICU settings (STEWART; BARFIELD, 2019). The use of human milk banks can be a viable alternative in cases where direct breastfeeding is not possible. The early introduction of breast milk contributes to reducing complications such as infections and growth delays, promoting a more effective recovery (DUDRICK; MALKAN, 2013).

The findings of this study reinforce the need for interdisciplinary approaches in neonatal care. Maternal nutritional assessment from the beginning of pregnancy, combined with effective nutritional screenings such as FARNNeo, is essential to ensure a better prognosis for premature newborns (TEIXEIRA; VIANA; ARAÚJO, 2016). Nutritional

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monitoring during pregnancy and in the neonatal period plays a crucial role in reducing complications and improving the quality of life of these children. Collaboration between professionals from different areas, including nutritionists, obstetricians, neonatologists and nurses, is essential to offer complete and effective care to premature newborns (FORMIGA; LINHARES, 2009).

The integration of nutritional screening strategies, such as FARNNeo, into clinical practices should be prioritized to enable continuous monitoring of the nutritional conditions of preterm infants. This continuous monitoring allows the early detection of nutritional changes and the adoption of corrective measures before the worsening of complications (SCHIMIDT; SAIGAL, 2018). The use of nutritional risk assessment tools enables rapid and effective interventions, minimizing the impacts of prematurity on child health (MEHTA et al., 2013).

Finally, there is an urgent need for further studies evaluating specific nutritional strategies for high-risk and preterm pregnant women admitted to neonatal ICUs. Adequate nutritional assistance has the potential to significantly reduce neonatal morbidity and mortality rates. The implementation of personalized nutritional approaches, adapted to the individual needs of each pregnant woman and newborn, can contribute to the improvement of neonatal health and the reduction of complications associated with prematurity. The strengthening of maternal and child nutrition care policies and the continuous training of health professionals are fundamental for health promotion and the improvement of clinical outcomes of premature infants. Thus, investing in quality nutritional care represents an essential step to ensure a healthy childhood and reduce the impacts of prematurity in the long term.

CONCLUSION

With the data collected, it was possible to conclude that maternal history will not influence the nutritional risk of preterm newborns. The factors that presented significance in the intervention of nutritional risk are the birth weight of the preterm infant and the feeding route.

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