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ORIGINAL ARTICLE

## Prognostic of necrotizing enterocolitis cases conducted clinically and surgery

Renata Joviano Alvim<sup>1</sup>, Hugo de Oliveira Olimpio<sup>2</sup>, Mônica Barthelson Carvalho de Moura<sup>3</sup>, Julia Valeriana Almeida<sup>4</sup>

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### Abstract

The necrotizing enterocolitis (NEC) is a clinical syndrome pathologic that corresponds to the most common intestinal emergency in neonatal intensive care units, with high mortality rate. Presents multifactorial etiopathogenesis, not well elucidated, which comprises several risk factors such as prematurity, low birth weight, intestinal ischemia, osmolality of enteral formula and the speed of progression of the diet. The classical clinical picture is of abdominal distension, enterorrhagia, vomiting obstruction or bloody, and may be incomplete and the imaging tests also inconclusive. Complications include shock, bacteremia, coagulopathy, neutropenia, severe thrombocytopenia, and acidosis metabolic signs of peritonitis and intestinal obstruction, fluid or gas image in the peritoneal cavity and others. The objective of this study was to evaluate the nutritional and non-nutritional factors associated with disease and death in newborns with NEC, as well as to evaluate the need and type of surgical intervention in the treatment. The clinical treatment should be started as soon as it establishes the suspicion of pathology. The follow up clinical-radiological intensive is essential and determinant of surgical indication.

<sup>1</sup> Pediatrician, Campinas, SP, Brasil.

<sup>2</sup> Pediatric Surgeon at the Campinas Maternity, SP, Brasil.

<sup>3</sup> Physician, Coordinator of the Intensive Care Unit of the Campinas Maternity, SP, Brasil.

<sup>4</sup> Physician, with a specialist degree in Pediatric Neurology from the Fernandes Figueira Institute of the Oswaldo Cruz Foundation (IFF/FIOCRUZ).

### Correspondence to:

Renata Joviano Alvim.

Campinas Maternity, Campinas, State of São Paulo, Brazil. Avenida Ruy Rodrigues, nº 3434, Bairro Jardim Yeda.  
Campinas - SP, Brazil. CEP: 13060-646. E-mail: renataalvim@gmail.com

## INTRODUCTION

Necrotizing enterocolitis (NEC) is a clinicopathological syndrome that constitutes the most common intestinal emergency in neonatal intensive care units. It has high mortality rate<sup>1</sup>. The etiopathogenesis of NEC involves multiple factors, is not well elucidated, and comprises several risk factors such as prematurity, low birth weight, intestinal ischemia, osmolality of the enteral formula, and speed of dietary progression. The classic clinical presentation includes abdominal distension, enterorrhagia, and bilious vomiting or hematemesis<sup>2</sup>. Some usual symptoms may be absent and imaging tests may also be inconclusive. Complications include shock, bacteremia, coagulopathy, neutropenia, severe thrombocytopenia, metabolic acidosis, signs of peritonitis, and intestinal obstruction. Images may show fluid or gas in the peritoneal cavity.

## METHODS

This study is a retrospective, descriptive analysis of data from the medical records of newborns diagnosed with necrotizing enterocolitis (NEC).

The study examined 30 randomly selected medical records of newborns diagnosed with NEC who were admitted to the Intermediate Care Unit and the Intensive Care Unit of Campinas Maternity, Campinas, State of São Paulo, Brazil. The newborns were born between July 2010 and April 2013, and their data were compared with the information on NEC in scientific publications and books.

The following parameters were analyzed: gestational age; birth weight; prenatal care; antibiotic therapy after birth (including types of antibiotics and start and duration of treatment); start time and type of nutrition; maternal comorbid conditions such as systemic arterial hypertension, diabetes mellitus, smoking, and use of illicit drugs; complete blood count; blood culture; postnatal use of antifungal agents and/or corticosteroids; need for surgery; presence or absence of intestinal perforation; and percentage of deaths.

## RESULTS

We studied 30 randomly selected medical records of newborns with NEC.

The study results agree with the literature, showing that most newborns with NEC are preterm: 90% of the newborns in this study (n = 27) were preterm, and 10% (n = 3) were full term.

As for birth weight, 33.3% of the newborns (n = 10) had low birth weight (< 2500 g), 16.7% (n = 5) had very low birth weight (< 1500 g), and 30% (n = 9) had extremely low birth weight (< 1000 g). Only 20% (n = 6) weighed more than 2500 g.

Sixty percent of the newborns (n = 18) were born by cesarean section and 40% (n = 12) by vaginal delivery. As for prenatal care, it was found that 56.7% of the mothers (n = 17) had < 5 consultations, 43.3% (n = 13) had 5–10 consultations, and none had > 10 consultations.

Additionally, 30% of the mothers (n = 9) had gestational systemic arterial hypertension, 3.3% (n = 1) had gestational diabetes mellitus, 10% (n = 3) were smokers, and 6.7% (n = 2) were illicit drug users.

Prenatal corticosteroid use was observed in 46.7% of the studied newborns (n = 14), whereas 53.3% (n = 16) did not receive corticosteroid therapy before birth.

As for age at the moment of diagnosis, 30% (n = 9) were diagnosed during the first week of life and 70% (n = 21) after the first week.

Treatment was clinical for 63.3% (n = 19) of the newborns and surgical for 36.7% (n = 11).

Colostomy was performed in 13.3% of the newborns (n = 4). Of the studied newborns, 30% (n = 9) had intestinal loop perforation and 70% (n = 21) did not have it.

Antibiotic therapy was given to 83.3% of the newborns (n = 25) in the first 2 weeks of life, whereas 16.7% (n = 5) received antibiotics after those first 2 weeks.

Among those who received antibiotics in the first two weeks of life, 52% (n = 13) took the medication for > 10 days and 48% (n = 12) for < 10 days.

The choice antibiotics (either alone or associated) were the following: vancomycin in 64% of the newborns (n = 16), cefepime in 16% (n = 4), amikacin in 36% (n = 9), clindamycin in 28% (n = 7), meropenem in 28% (n = 7), ampicillin in 16% (n = 4), gentamicin in 16% (n = 4), metronidazole in 16% (n = 4), ceftazidime in 8% (n = 2), piperacillin/tazobactam in 4% (n = 1), and oxacillin in 4% (n = 1).

Antifungal agents were taken by 30% of the newborns (n = 9) and not by 70% (n = 21).

Among those who were treated with antifungal agents, therapy lasted > 7 days in 66.7% (n = 6) and < 7 days in 33.3% (n = 3). The antifungal agents used were amphotericin B in 33.3% of the newborns (n = 3) and fluconazole in 66.7% (n = 6).

Blood culture was positive in 40% of the studied cases (n = 12) and negative in 60% (n = 18). The most frequent infectious agents were *Staphylococcus epidermidis* in 41.7% of the newborns with a positive culture (n = 5) and *Enterobacter cloacae* in 16.7% (n = 2). *Staphylococcus hominis*, *Candida albicans*, *Serratia marcescens*, *Streptococcus haemolyticus*, *Streptococcus capitis*, *Streptococcus faecalis*, and *Escherichia coli* were each found in 8.3% of the newborns (n = 1).

Polycythemia was observed in 20% of the studied cases (n = 6) and absent in 80% of the cases (n = 24). The same percentages were obtained for newborns with thrombocytopenia.

Nutrition regimens were initiated during the first week of life in 80% of the newborns (n = 24). As for the types of diet, 75% (n = 18) received enteral nutrition and 25% (n = 6) received parenteral nutrition.

Of the newborns receiving enteral nutrition, breast milk (BM) alone was given to 16.7% of the newborns (n = 3), milk formula (MF) alone to 72.2% (n = 13), and mixed feeding (BM + MF) to 11.1% (n = 2). Nutrition regimens were started in 20% (n = 6) of the newborns after the first week of life. In

this group, 50% (n = 3) received enteral nutrition and 50% (n = 3) received parenteral nutrition.

All newborns (100%) who received enteral nutrition after the first week of life (n = 3) were fed MF.

The mortality rate was 30% (n = 9;). The analysis of mortality data showed that 22.2% of the newborns who died (n = 2) had undergone surgery, whereas 77.8% (n = 7) had received clinical treatment.

It was also noted that 33.3% of death cases (n = 3) had been diagnosed with NEC in the first week of life and 66.7% (n = 6) after that first week. The data showed that all deaths (100%; n = 9) occurred in preterm newborns.

As for birth weight, 22.2% of the newborns who died (n = 2) had low birth weight, 22.2 % (n = 2) had very low birth weight, and 55.6% (n = 5) had extremely low birth weight.

In 33.3% of death cases (n = 3), the mother had been treated with corticosteroids during pregnancy and in 66.7% (n = 6), she had not. Additionally, 66.7% of the newborns who died (n = 6) had undergone surfactant treatment and 33.3% (n = 3) had not.

Blood cultures were positive for 33.3% (n = 3) of the newborns who died. Among the positive cultures, 33.3% (n = 1) were positive for each of *C. albicans*, *S. capitis*, and *S. epidermidis*. Cultures were negative in 66.7% of death cases (n = 6).

## Discussion and conclusions

The lower the birth weight, the gestational age in the clinical presentation of the disease, the greater is the NEC severity and lethality.

Diet is a matter of discussion between different authors. Some studies observe the immunoprotective effect of breast milk in the prevention of NEC. For the feeding of the RN, the human milk is nutritionally better than the milk formula. However, it may not meet the nutritional requirements of pre-terms and very low birth weight newborns. This led to the development of human milk additives that result in increased milk osmolality. Hyperosmolar diets have been associated with the presence of NEC.

The surgical approach has also received special attention looking for more careful behaviors that can bring better long-term results, mainly in regard to the management of premature infants with low weight and short bowel syndrome.

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