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Measures of Mortality in Patients with Neonatal Pneumonia in a Hospital

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Abstract

Reducing neonatal mortality is a global challenge. The aim of this study was to determine predictors of mortality in patients with neonatal pneumonia. The study was a retrospective cohort study conducted in Peruvian hospitals from January 2014 to April 2022 and also included neonates diagnosed with pneumonia. A Cox proportional regression model was used to find predictors of mortality. We studied 288 neonates with pneumonia. Her mean birth weight was 3,270 g and her mean hospital stay was 7 days. At follow-up, 18.4% did not survive, with the most common complications being jaundice (35.42%). The most frequently isolated bacterium was Klebsiella pneumoniae. A risk factor associated with higher mortality was preterm birth platelets <150,00 creatinine >1.10, septic shock and inclusion in IMV whereas breastfeeding was associated with a lower risk of death. In summary, we report high mortality, clinical features (prematurity, septic shock, inclusion in IMV) and laboratory features (elevated creatinine and platelets) associated with high mortality in neonatal pneumonia patients. Breastfeeding was a factor associated with survival in these patients.

Keywords: Neonatal pneumonia; Newborn; Mortality; Premature

Introduction

Tackling infant and neonatal mortality is a global challenge. Although the under-five mortality rate has fallen from 5 million in 1999 to 2.5 million in 2017, neonatal mortality remains high, especially in developing countries such as Latin America. One of the leading causes of neonatal mortality is pneumonia. Pneumonia is a clinical syndrome characterized by signs and symptoms of infection with or without bacteremia [1]. Mortality from neonatal pneumonia ranges from 9% to 65%. This depends on factors such as gestational age, maternal characteristics, and bacteria involved [2]. In developed countries, despite advanced strategies for prevention and treatment of neonatal pneumonia and early treatment initiation, mortality rates range from 5% to 20%, resulting in significant disability for patients. In contrast, mortality rates in Middle Eastern and African countries range from 10 to 30%. Emerging countries such as Egypt and South Sudan have reported neonatal mortality rates of over 50%. Previous studies in Peru have reported a high mortality rate (21.6%) from neonatal pneumonia, as in other Middle Eastern and African countries [3]. Despite Peru's progress and socio-economic development, neonatal pneumonia remains the second leading cause of neonatal death in the country. The neonatal mortality rate (66.6%) of all children under the age of 1 in Peru accounts for the majority of total minor mortality. 5 years old (55.6%) [4]. Complications of pneumonia, on the other hand, are associated with longer hospital stays, increased treatment costs, decreased neurological development, and poor growth during early childhood, making the disease a major public health concern [5].

Although inflammatory markers have been evaluated with sufficient sensitivity and specificity to identify infected neonates early in Peru and more generally in Latin American countries, information on predictors of neonatal mortality from pneumonia is lacking [6]. These are more expensive, especially in resource-poor settings, and limit the analysis of more specific markers of inflammation. In this sense, this study aimed to identify predictors of mortality in neonatal pneumonia patients treated at referral hospitals in southern Peru [7].

Materials and Methods

Environment design

A retrospective cohort study was designed using data from the medical records of Hipolito Unanue Hospital in the Tacna Region of Peru (HUHT). This reference hospital in southern Peru has a 25-bed neonatal intensive care unit (NCIU), 10 stationary and 2 transport incubators, and 6 neonatal ventilators (VMI). The study period was from January 1, 2014 to April 30, 2022 [8]. The manuscript was written according to the Guidelines for Enhanced Reporting of Observational Studies in Epidemiology (STROBE).

Population and sample

A diagnosis of neonatal Pneumonia, which was defined as the presence of more than one of the following characteristics: fever (temperature >38 °C) or hypothermia (temperature 60 breaths per minute), severe chest indrawing total leukocyte count 12,000 cells/m3, absolute neutrophil count 7500 cells/mm3, erythrocyte sedimentation rate (ESR) >15/1 h, and platelet count 440,000 cell/mm3 for late [9].

To calculate the sample size, we used the study the independent variable (exposure) was gestational age <37 weeks, and the outcome was death. In their study, 60% of patients with gestational age <37 weeks died during follow-up, compared to 40% mortality in those with age ≥37 weeks. Likewise, a non-exposed/exposed ratio of 2.98 (164/55) was reported with these parameters: confidence level of 95%, and a power of 80%. A sample size of 288 was calculated, to which 10% of potentially insufficient medical records were added, resulting in a final total of 310 records [10].

Discussion

This retrospective cohort study found a high mortality rate from neonatal pneumonia and a low rate of positive blood cultures. The most common bacterium was Klebsiella pneumoniae ESBL. Predictors of mortality in neonates with pneumonia were gestational age less than

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her 37 weeks, thrombocytopenia, and elevated creatinine levels. Of the total (77) preterm infants, 62.34% died, 20.78% late preterm, 14.29% moderately preterm, 31.17% very preterm and 33.77% very preterm. The mortality rate from neonatal pneumonia in our study was 18.40%. This is comparable to other studies carried out in Ethiopian hospitals, for example, which reported mortality rates between 18.6% and 25.5%. This similarity in neonatal mortality may be due to several factors, including limited medical resources and high birth rates. In contrast, our mortality was higher than reported. This is probably because unpreventable conditions such as birth defects are the main risk factors for death from neonatal pneumonia in developed countries and cities. In contrast, newborns in developing countries die from preventable diseases such as prematurity and septic shock, which contribute significantly to neonatal mortality. The gold standard for diagnosing neonatal pneumonia is bacterial isolation by blood culture. Blood can be drawn before or after taking antibiotics, which affects the results. However, more than 20% of his patients who received antibiotics after sample collection still had positive results using this method. This study found that only 9% of patients had positive blood cultures and the most frequently isolated bacterium was Klebsiella pneumoniae ESBL. There are several possible reasons for the low positivity rate in blood cultures. First, our hospital does not have an automated culture system. On the other hand, in the field of microbiology he has only eight hours of shift, which can hinder proper processing and evaluation of the collected samples. This is an important limitation in the context of scarce financial resources in health care. Providing larger budgets, better controls, and agreements with other institutions could be solutions to this common problem in developing countries.

Conclusions

To our knowledge, this is the first Peruvian study to investigate mortality predictors in neonatal pneumonia patients. We found a high mortality rate, mainly occurring within 72 hours of life. Predictors of mortality in neonatal pneumonia patients identified in this study were prematurity, low birth weight, platelet count of 1.1 g/dl, development of septic shock, and use of invasive mechanical ventilation. Breastfeeding, on the other hand, was associated with a lower risk of death. Early detection of these risk factors will help identify patients with a poor prognosis earlier in the disease course and implement better strategies that may reduce mortality associated with neonatal pneumonia.

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