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International Journal of Current Research
Vol. 10, Issue, 07, pp.71986-71989, July, 2018

INTERNATIONAL JOURNAL OF CURRENT RESEARCH

ISSN: 0975-833X

RESEARCH ARTICLE

NEONATAL SEPSIS IN A HOSPITAL OF CAMPECHE CITY, MEXICO

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ARTICLE INFO

Article History:
Received 14th April, 2018
Received in revised form
09th May, 2018
Accepted 29th June, 2018
Published online 31st July, 2018

Key words:
Neonate, Early neonatal sepsis,
Late neonatal sepsis,
Mortality neonatal.

ABSTRACT

Introduction: Neonatal sepsis is a systemic infection usually caused by bacteria with consequences so severe that they can cause the death of newborns. In our country, neonatal sepsis varies from one hospital to another, being the second cause of mortality in newborns. **Objective:** The purposes of this study were to determine the incidence rate of neonatal sepsis, early and late neonatal sepsis, as well as the mortality rate and its association with gestational age and days of hospitalization in the Neonatal Intensive Care Unit of the General Hospital of Specialties "Dr. Javier Buenfil Osorio" of Campeche City. **Material and Methods:** A transversal, retrospective, observational, descriptive study was carried out that included all newborns that met the inclusion criteria, with a confirmed diagnosis of sepsis with or without added pathology, who were admitted at NICU of the hospital from January 2017 to December 2017. **Results:** During the period of study, 3800 neonates were born; which 373 neonates were included in this work. A total of 64 newborn were diagnosed with neonatal sepsis representing an incidence rate of 16.8 cases per 1,000 live births. Neonatal mortality rate associated with sepsis corresponded to 6.3 per 1,000 live births. In general, bacteria isolated from blood cultures were Klebsiella pneumoniae and Staphylococcus spp. **Conclusions:** This study found a high incidence rate of neonatal sepsis, being early sepsis higher compared with late sepsis. According to the acquisition time of neonatal sepsis, an association between the prematurity of newborn and late sepsis was demonstrated. Mortality of neonatal sepsis had a higher incidence with respect to the observed in neonates who died without diagnosis of sepsis. Longest stay in the NICU of premature newborn increased the risk of contracting a nosocomial infection in the hospital and dying.

Citation: Karla Baz Chablé, Luis Núñez Oreza, Betty Sarabia Alcocer, Claudia Caamal Ortiz, Jessica Quintal Panti, Paulino Tamay Segovia and Selene Blum Domínguez. 2018. "Neonatal sepsis in a hospital of campeche city, mexico", *International Journal of Current Research*, 10, (07), 71986-71989.

INTRODUCTION

Neonatal sepsis (NS) is a Clinical Syndrome characterized by the presence of a Systemic Inflammatory Response System (SIRS) as a result of infection by bacteria, fungi or viruses during the first month of extra-uterine life demonstrated in blood or cerebrospinal fluid, which occurs in newborns up to 28 days of age, and represents a cause of morbidity and mortality in this population (Anaya Prado, 2017 and Pérez Santana, 2015). Each year there are four million deaths in neonates in the world and a large number of them are due to infectious processes. In Mexico, neonatal sepsis varies from one hospital to another, being the second cause of death in neonates in the country (Anaya Prado, 2017; Brady, 2005; Coronell, 2009; Ganatra, 2010), with rates for early neonatal sepsis reported from 4 to 15.4 cases per 1,000 live born (Anaya Prado, 2017; Pérez, 2015 and Rodríguez Weber, 2003). NS can be classified in early sepsis, when appears in the first five days of life, caused by microorganisms acquired in the maternal route before and during delivery, although in neonates weighing less than 1500 g, it is limited to infections that they

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DOI: https://doi.org/10.24941/ijcr.31444.07.2018

occur in the first 72 hours of life, and late sepsis refers to the one that occurs after five days of born until 28 days of extra-uterine life, often caused by microorganisms acquired after birth, usually in the hospital (Anaya Prado, 2017; Pérez Santana,, 2015 and Brady, 2005). The main risk factors associated with early neonatal sepsis are mainly: premature rupture of membranes, chorioamnionitis, colonization of the genital tract by bacteria, infection of the urinary tract and gestational age less than 37 weeks (Anderson, 2007). On the contrary, late neonatal or nosocomial sepsis is associated with microorganisms present at NICU services, which colonize the skin and mucous membranes of the admitted neonates; being the main risk factors: insufficient washing and disinfection of the hands as a vehicle for contamination of the skin and/or mucous membranes, the use of insufficiently disinfected material, invasive procedures, parenteral nutrition, prolonged use of antibiotics and H2 antagonist drugs, neonatal exposure due to the presence of other colonized neonates, prolonged hospitalization, etc. (Alonso, 2013 and Alvarado Gamarra, 2016). Therefore, the aims of this study were to determine the incidence rate neonatal sepsis and early and late neonatal sepsis, as well as the mortality rate and its association with gestational age and days of hospitalization in the Neonatal Intensive Care Unit (NICU) of the General Hospital of Specialties. "Dr. Javier Buenfil Osorio "(GHSJBO) of Campeche City, during the period from January 2017 to December 2017.

MATERIAL AND METHODS

A retrospective and observational descriptive study was carried out that included all newborns with a confirmed diagnosis of sepsis with or without added pathology, who were admitted to the NICU of the General Hospital of Specialties "Dr. Javier Buenfil Osorio "during the period from January 2017 to December 2017. The hospital is a second-level hospital that has more than 300 beds and whose neonatology service is integrated by intensive neonatal therapy with 14 cots and 8 cots of intermediate therapy. The inclusion criteria were: neonates with a gestational age of 24 to 42 weeks with an age up to 28 days, a neonate with a diagnosis of early or late sepsis requiring attention at the NICU service, a neonate treated or not with antimicrobials, a neonate of mother treated or not with antimicrobials, male or female neonate born in the hospital. The study was reviewed and approved by the Committee of Research of Coordination of Teaching and Nursing Research of the General Hospital of Specialties "Dr. Javier Buenfil Osorio" Neonatal sepsis was defined as bacteremia demonstrated and clinical. The NS with bacteremia was diagnosed based on symptoms or clinical signs of infection, biological markers of abnormal SRIS that included the alteration of leukocyte count and a reactive "C" protein (CRP) upper than 12 mg/L and a positive blood culture. On the other hand, clinical NS was defined when a neonate presented clinical data with abnormal SRIS biomarkers, but a negative blood culture. According to the time of presentation of the NS, this infectious pathology was classified early sepsis when appeared in the first five days and late sepsis after this time until 28 days of extra-uterine life (Alonso, 2013 and Alvarado Gamarra, 2016). The information was recollected from medical records of the newborns. The clinical data obtained were: gender, gestational age estimated by the Capurro scale, diagnostic, causal agent of sepsis, day of hospitalization and others data. Based on the gestation weeks (GW) of the newborns (NB), they were classified as mature newborn (TNB) when neonate had 37 GW or more, and as premature newborn (PTNB) with less than 37 GW. The statistical analysis consisted in the qualitative variables were quantified in frequencies, percentages and rates. For the quantitative variables, mean, standard deviation (SD) and ranges were also calculated. From the gestational age or days of hospitalization, dichotomous variables were generated with different cut-off points. The measure of association between the variables was made by calculating the relative risk and the chi^2 statistical test. The program used was the IBM SPSS Statistics Version 21 program.

RESULTS

In the General Hospital of Specialties "Dr. Javier Buenfil Osorio" of Campeche City, 3,800 neonates were born during the period from January 1 to December 31, 2017. At the NICU were admitted 436 neonates for medical care, but only met inclusion criteria of this study 373 newborn. About the gender of patients, 196 were male (52.5%) and 177 were female (47.5%) with an average gestational age of 35.5 gestational weeks. Likewise, 133 corresponded to mature newborn (35.7%) and 240 to premature newborn (64.3%). Neonatal sepsis reached an incidence rate of 16.8 cases per 1,000 live births, corresponding a higher rate for early sepsis than for late sepsis; so, early sepsis was 11.8 cases per 1000 live births while late sepsis 5.0events per 1,000 live newborns. A total of 64 neonates were diagnosed with sepsis with or without other pathologies added, attended in the NICU during the study period; 45 cases corresponded to early sepsis and the rest to late sepsis (Figure 1). Regarding gestational age, neonates who presented sepsis corresponded to 19 mature newborn and 45 premature newborn. A higher incidence of sepsis was found in the premature newborn.

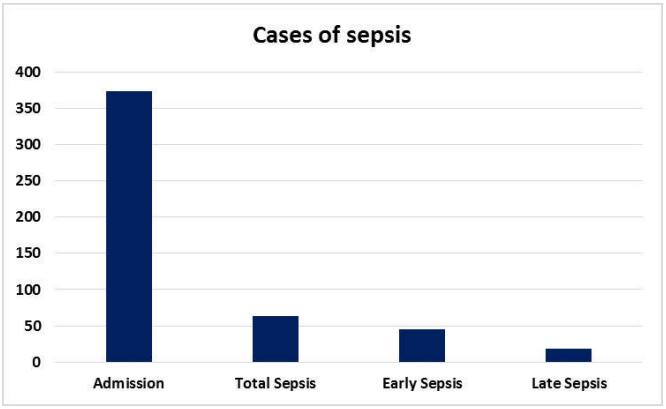

Figure 1. Cases of neonatal sepsis

The probability in premature to acquire a nosocomial infection of horizontal transmission was higher than mature newborn (chi^2, $p<0.05$, RR = 3.0), while to early sepsis, no association was found with gestational age (Figure 2). The incidence of mortality rate was 11.0 events per 1000 live newborns, which due to sepsis corresponded to 6.3 per 1,000 live births. So, 42 neonates died during their hospitalization in the NICU. 24 deaths were diagnosed with neonatal sepsis and showing in chi^2 test an asociation between death neonatal by sepsis and premature newborns ($p<0.5$, RR=3.9). In addition, early sepsis with a RR of 4.4 caused more death in neonates that late sepsis with a RR of 2.7 (Figure 3). The average of hospitalization at NICU for neonates without sepsis was of 10 days and with sepsis diagnostic of 12 days.

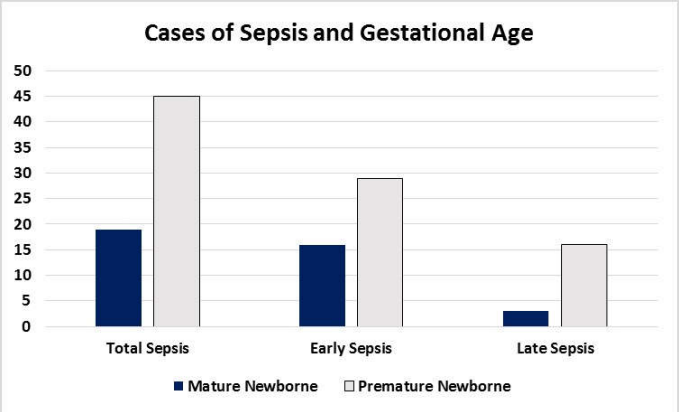

Figure 2. Early and late neonatal sepsis about gestational age. It was found an association between the prematurity and late sepsis

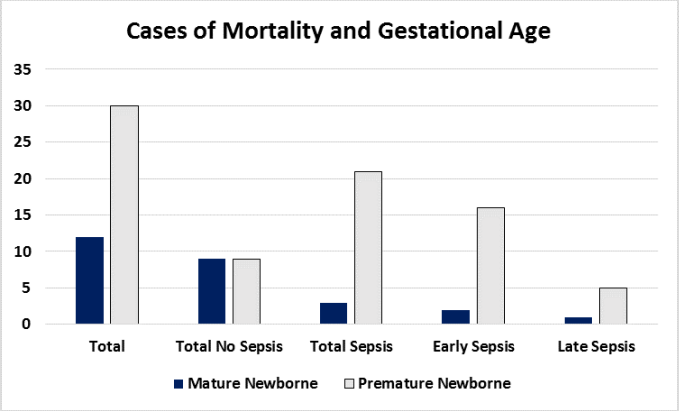

Figure 3. Cases of neonatal mortality. There were more cases of death in premature neonates being the majority due early sepsis

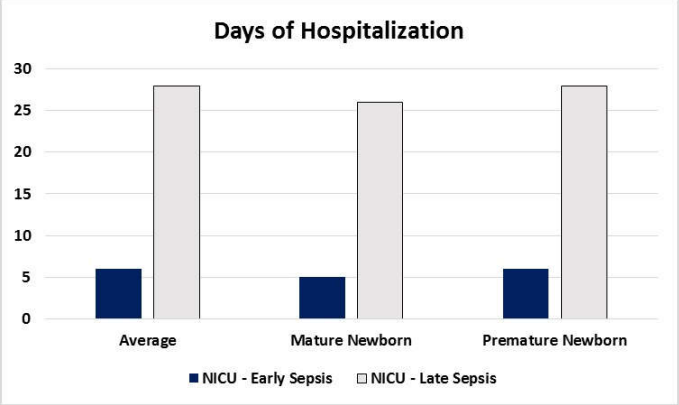

Figure 4. Days of hospitalization of newborns treated in NICU. It is notorious that newborns had a much longer stay in time with sepsis

On the other hand, in neonates diagnosed with sepsis the average days of hospitalization was of 12 days. In neonates with late sepsis the stay was of 28 days while with early sepsis was of 6 days. In relation to gestational age, mature and premature newborns with late sepsis corresponding to 26and 28 days, respectively. To early sepsis between 5 and 6 days for mature and premature newborn, respectively (Figure 4). About total of 64 cases of neonatal sepsis, 45 events were diagnosed as clinical sepsis and the rest as sepsis confirmed by positive blood culture. The microorganisms isolated from the blood cultures were gram-negative bacteria that including *Klebsiella pneumoniae*, *Escherichia coli*, and *Pseudomonas aeruginosa*. Likewise, isolated gram-positive bacteria corresponding to *Staphylococcus aureus*, *S. epidermidis*, *S. hominis*, *S. haemolyticus* and *Enterococcus faecium* and yeast *Candida albicans*.

DISCUSSION

This study demonstrates a high incidence rate of neonatal sepsis, but similar to the reported for others hospitals in our country. Despite what has been described, the neonatal rate of sepsis is still very high compared to developed countries, and the work of neonatal than the registered sepsis could contribute in decrease it even more (Alvarado Gamarra, 2016). The rate of early sepsis was similar to the reported at Guadalajara hospital (Pérez, 2015), but lesser that a previous research conducted in our hospital (Sarabia Alcocer, 2016) or to the reported in a cohort study conducted in hospitals in the southeast of the country (Leal, 2012). For above, let's suggest that the General Hospital of Specialties "JBO" should implement better programs of prenatal control, to continue reducing the incidence of this pathology. To late sepsis, the rate of nosocomial infections in NICU, in a previous work in our hospital was higher than the reported in this study (Ganatra, 2010).

Although no alarming data were found, but instead a lower number of cases of late sepsis, it is important that health personnel continue training programs in hand washing and disinfection them, because an deficient asepsis represents a vehicle of contamination to the skin and/or mucous membranes of the newborn, which increases their risk of nosocomial sepsis. According to the acquisition time of neonatal sepsis, it was found an association between the prematurity of neonates and late sepsis, largely due to the increase in hospitalization time for neonates at NICU and by the various invasive procedures that neonates require as medical care. This results are in coincidence with other works (Alonso, 2013 and Alvarado Gamarra, 2016). It is important to note that knowing in a timely manner the incidence rate of nosocomial infection in the NICU will allow to control and prevent infectious outbreaks among neonates. In addition, the death rate about neonatal sepsis, associated or not with other pathologies, had a higher incidence with respect to the observed in neonates who died without sepsis due to other causes. So, prematurity with longer stay at NICU increased risk of contracting a nosocomial infection and dying.

Gram-negative bacteria isolated from the blood cultures were *Klebsiella pneumoniae*, *Escherichia coli*, *Pseudomonas aeruginosa* and as Gram-positive bacteria species of *Staphylococcus aureus*, and others coagulase negative staphylococci. Similarly to the reported in other studies, bacteria identified were of the same genus and specie (Pérez, 2015), these coincidences are common in various reports from Latin American countries. So, ignore or not give importance to nosocomial infections acquired by neonates when are admitted at NICU, due to insufficient reports that prevent identifying the infectious sources of horizontal transmission to which newborns face daily, are deteriorating the health of the neonates and increasing their death rate. It is worth mentioning the need to continue with the epidemiological surveillance that has allowed to identify the circulating bacterial strains, as well as their susceptibility-resistance in NICU of the GHSJBO, but it is necessary to apply an analysis that allows to evaluate the efficacy of the antibiotic therapy used in the neonates to implement an antimicrobial rotation program.

Conclusion

This study found a high incidence rate of neonatal sepsis, being early sepsis higher compared with late sepsis. According to the acquisition time of neonatal sepsis, an association between the prematurity of newborn and late sepsis was demonstrated, largely due to the increase of hospitalization days and to the various invasive procedures that need the neonates to medical care. Mortality of neonatal sepsis had a higher incidence with respect to the observed in neonates who died without diagnosis of sepsis. Longest stay in the NICU of premature newborn increased the risk of contracting a nosocomial infection in the hospital and dying. Similarly to the reported in other studies, causal bacteria of late are common in various reports from Latin American countries that including *Klebsiella pneumoniae*, *Escherichia coli*, *Pseudomonas aeruginosa* and as gram-positive bacteria *Staphylococcus aureus*, and others coagulase negative *Staphylococcus*.

Acknowledgment

We acknowledge General Hospital of Specialties "Dr. Javier Buenfil Osorio" for the permission to carry out the study at institution. We also thank to Licensed in nursing specialized in neonatology Magdalena Hoil Gala, Dr. Ana Leticia Rivero de Dios, and Master of Sciences Daniel Antonio Muñoz González for the facilities granted during the study.

Funding source

This study was financially supported by General Hospital of Specialties "Dr. Javier Buenfil Osorio" of Campeche City.

Declaration of conflicts of interest: The authors declare no have conflicts of interest.

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