

RESEARCH ARTICLE

Morbidity and mortality in premature newborns in the Irapuato General Hospital

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ABSTRACT

Background. Preterm birth is currently the leading obstetric problem, affecting between 5 and 12% of all births. The aim of this study was to determine the incidence of prematurity and major causes of morbidity and mortality in preterm infants in the Irapuato General Hospital.

Methods. We carried out a retrospective study analyzing the clinical records of preterm infants from 2011–2012.

Results. There were 10,532 births registered; 736 (6.9%) were premature and of these 472 were admitted to the Neonatal Intensive Care Unit, corresponding to 64% of premature births and 4.4% of all births. An increase was shown in cases of prematurity during the year 2011 ($n = 206$) compared to the year 2012 ($n = 266$). The main causes of admission were hyaline membrane disease, 248 cases (52.5%); septicemia, 12 cases (12.7%) and asphyxia, 43 cases (9.1%). The main causes of neonatal death were sepsis ($n = 12$, 32.4%), respiratory distress syndrome ($n = 8$, 21.6%) and congenital heart disease ($n = 4$, 10.8%). Neonatal mortality rate was 3.5.

Conclusions. The incidence of prematurity increased from 6.5% in 2011 to 7.4% in 2012. We must identify the risk factors in order to establish preventive measures.

Key words: prematurity, morbidity, mortality, Neonatal Intensive Care Unit.

INTRODUCTION

Preterm labor is the main obstetric problem today. Timely diagnosis and treatment are of basic importance in the management of prematurity.^{1,2} The World Health Organization (WHO) with the support of European centers defined prematurity as the product of early gestational age <37 completed weeks (259 days) with birth weight <2,500 g.²⁻⁴

Each year there are ~13 million preterm labors worldwide. Most of these births occur in developing countries. It is estimated that prematurity affects between 5 and 10% of births worldwide. In the U.S., prematurity affects 8-11% of births, whereas in Europe the rate varies from 5-7%.⁵⁻¹⁰

In underdeveloped countries the problem has greater repercussions. In Bangladesh, the incidence of prematurity is 17% and in Cuba, 38.4%.^{7,11,12}

In Mexico, the Instituto Nacional de Pediatría (INP) reported an incidence of prematurity of 19.7%, which contributes to 38.4% of neonatal deaths, ranking as the leading cause of perinatal death.^{1,5} The Instituto Mexicano del Seguro Social (IMSS) reports a prematurity rate of 8%, with figures ranging from 2.8% in Sinaloa and up to 16.6% in Hidalgo.^{7,13} At the General Hospital of Mexico, the reported incidence of prematurity was 4.1%, with 2.8% of admissions to the Neonatal Intensive Care Unit (NICU) in a study done from 1995-2001.¹⁴ In 2005, the Maternity Hospital of the state of Leon reported an incidence of 22.4% of admissions to the NICU representing premature births.⁷

Morbidity associated with prematurity is high. The main causes of admission reported are hyaline membrane disease, sepsis, pneumonia and asphyxia.^{5,7,14,15} Neonatal mortality rates (NMR) are closely linked to the incidence of prematurity. Preterm births account for 75% of all neonatal deaths not associated with malformations. NMR is

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one of the most important health indicators of a country as it allows for planning of policies and strategies for improvement.¹⁶⁻¹⁹ Bolivia has reported a NMR of 30/1000 live births (LB); in Brazil and Mexico, 15; in Chile, 6; in the U.S., 5; in Canada, 4; and in Spain, 3. The UNICEF report of mortality due to prematurity and its complications is 28%, asphyxia, 23% and sepsis, 36%.⁴

Given the magnitude of this health problem, it is necessary to determine both the incidence and leading causes of morbidity and mortality of premature infants of the Neonatology Service of the Hospital General of Irapuato (HGI) so that necessary preventive measures can be carried out.

METHODS

We performed a retrospective study with a review of medical records and logs of admissions and discharges of patients from the NICU, Intermediate Therapy and Nursery. Newborns (NB) analyzed were <37 weeks admitted to the Neonatology Service of the HGI in the state of Guanajuato from January 1, 2011 to December 31, 2012.

Gestational age was calculated from the date of the last menstruation. When this method was not reliable, we used the Capurro method. In the NB with gestational age <30 weeks, evaluation was done by the Ballard method. We also reviewed the automatic sub-system statistics on hospital discharges. SSPS statistical program for Windows v.19 and descriptive analysis for percentages were used. The NMR was the ratio of deaths in the first 28 days of life/total live births (LB) x 1000. NB with weight <10th percentile for gestational age were called "low weight", those <1500 g, "very low weight," and those <1000 g as "extremely low weight" or "extremely premature" if the gestational age was <26 weeks.²

RESULTS

During the study period, 10,532 births were recorded. Of these, 736 (6.9%) were preterm, of which 472 were admitted to the NICU, accounting for 64% of premature births and 4.4% of all births. Of the patients who were admitted, there was a predominance of males (57.2%) (ratio 1.3:1). As for deaths, a total of 45 patients died. Of these, 37 were preterm (7.8% of hospitalized preterm NB, 5% of preterm

and 0.3% of total births), representing an NMR due to prematurity of 3.5%. NMR was 4.2/1000 LB.

Table 1 specifies these results according to year. It can be seen that there was an increase in reported cases of prematurity in 2012 relative to 2011, with lower total births in 2012. Table 2 specifies the NMR associated with prematurity according to the period of occurrence: immediate neonatal mortality (within the first 24 h), mid-period (24-168 h) and late (7-28 days).

The minimum gestational age on admission was 25 weeks and maximum 36 weeks. Most infants were in the group of 34-35 weeks (36%), followed by the group of 32-33 weeks (29%).

As for weight, there were 34 patients with a weight <1000 g (7.2%) with a mortality of 41.1% ($n = 14$), 97 weighing between 1000 and 1499 g (21.1%) with a mortality of 16.4% ($n = 16$), 289 weighing between 1500 and 1999 g (61.2%) with a mortality rate of 2% ($n = 6$), 32 weighing between 2000 and 2499 g (6.7%) with 3% mortality ($n = 1$) and 20 weighing 2500-3000 g (4.2%) with no deaths in this age group. The majority of the preterm NB had low weight at birth (289 cases), 97 cases had very low weight; 52 cases, adequate weight, and 34 cases, extremely low weight (Figure 1).

The average hospital stay was 19.8 days. Of the 472 patients admitted, 432 were discharged due to improvement (91.5%), two were referred to a tertiary care center (0.4%) and 37 died (7.8%). The NMR due to prematurity was 3.5/1000 LB.

The main pathologies responsible for the admission of premature infants to the NICU are shown in Table 3. It is observed that hyaline membrane disease was the leading cause followed by sepsis (confirmed with positive cultures) and neonatal asphyxia (according to the established diagnostic criteria). The principal causes of death are listed in Table 4.

DISCUSSION

In the HGI during the study period (2011-2012), there were 736 premature NB documented from a total of 10,532 births, i.e., 6.9% of premature NB.

According to the international literature, the incidence of prematurity is estimated to be ~5 to 10%, although in developing countries and in some hospitals in Mexico the incidence is much higher.^{5,14} In the HGI

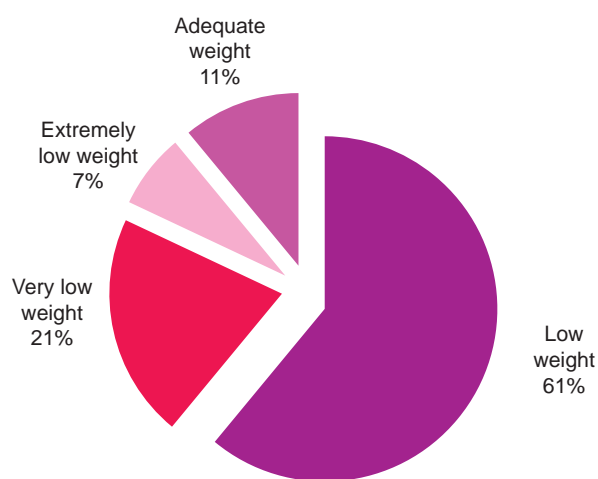
Table 1. Premature births according to year, admitted to the NICU, gender and deaths

Year	Births	Premature	NICU	Male	Female	Deaths
2011	5,308	349 (6.5%)	206 (64%)	118 (57.2%)	88 (42.8%)	20
2012	5,224	387 (7.4%)	266 (68.7%)	152 (57.1%)	114 (42.9%)	17
Total	10,532	736 (6.9%)	472 (64.1%)	270 (57.2%)	202 (42.8%)	37

NICU, neonatal intensive care unit.

Table 2. Neonatal mortality rate associated with prematurity

Year	Immediate period	Mid-period	Late	Total
2011	6	9	5	20
2012	5	6	6	17
Total	11 (1.04%)	15 (1.42%)	11 (1.04%)	37 (3.5%)


Figure 1. Classification of weight of premature newborns from the Neonatal Intensive Care Unit. Hospital General de Irapuato (2011-2012).

the reported incidence is low. However, there was an increase in the number of premature births in 2012 in relation to the previous year. The total number of patients admitted to the NICU corresponds to ~5% of total births. In this study the total number of admissions is what is expected for an ICU.^{14,16}

The Iberoamerican Society of Neonatology (SIBEN) reported a wide disparity in NMR in different regions across countries and within the country itself. In Mexico, for example, the NMR is 15, with 6 being the lowest and 35 as the highest.⁴ The NMR reported in this study was 4.2 and the NMR due to prematurity was 3.5, corresponding to 5% of total admissions.

Table 3. Principal reasons for admission to the NICU

Enfermedad	Cases	
	n	%
Hyaline membrane disease	248	52.5
Sepsis	60	12.7
Neonatal asphyxia	43	9.1
Adaptive transitional period	33	7
Pneumonia	13	2.8
Congenital cardiopathy	11	2.3
Intestinal malformations (intestinal atresia and abdominal wall defects)	7	1.5
Diabetic fetopathy	5	1
Necrotizing enterocolitis	5	1
Others (icterus, hydrocephalus, etc.)	47	10

NICU, neonatal intensive care unit.

Table 4. Principal causes of death in the NICU of the HGI (2011-2012)

Disease	Cases	
	n	%
Sepsis	12	32.5
Hyaline membrane disease	8	21.6
Congenital cardiopathy	4	10.9
Persistent pulmonary hypertension of the newborn	3	8.1
Intraventricular hemorrhage	3	8.1
Intestinal malformations (severe defects of the abdominal wall)	2	5.4
Perforated enterocolitis	2	5.4
Pulmonary malformation with hemorrhage	1	2.7
Multiple organ failure	1	2.7
Neonatal asphyxia	1	2.7

NICU, neonatal intensive care unit; HGI, Hospital General Irapuato.

Most serious illnesses and death are reported in NB <32 weeks gestation and weighing <1500 g.²⁰ In a tertiary care center, a NMR is reported for those <750 g of 597/1000 LB and for those <1000 g of 457.¹⁹ In Chile, survival for children between 1000 and 1499 g is 71%, whereas for newborns between 500 and 900 g the survival

rate is 34.4%.³ In the NICU of the HGI there was a mortality rate of 41.1% in those NB <1000 g and 16.4% in the preterm NB weighing between 1000 and 1500 g.

Survival of very low birth weight premature infants has experienced significant improvement, mainly due to advances in perinatal medicine, advent of the NICU, use of mechanical ventilation, noninvasive monitoring techniques and pharmacological agents.^{3,21} It is also due to improvements in clinical practice and the level of medical care.⁴ The literature also reports a significant decrease in morbidity and mortality by avoiding transfers from the birth unit to other units of higher care.^{22,23} HGI is a hospital providing a secondary level of health care. However, it has become a referral center and its NICU area was certified in 2010 for the management of preterm NB. All NB are treated, even those with extremely low birth weight. Only those patients with complex congenital heart disease requiring surgery are transferred. In 2010, 32 deaths were reported. This figure decreased dramatically in the following years.

The main reasons for admission were respiratory diseases (62.3%) followed by septicemia (12.7%) and asphyxia (9.1%). The average length of stay was 19.8 days. The main complications were sepsis, hyperbilirubinemia and necrotizing enterocolitis and were associated with increased hospital stay.

Prematurity has become a serious public health problem. Although the understanding of the pathogenesis of preterm birth is a major goal of perinatal biomedical research, it has not yet been possible to reduce its incidence.

In this study we observed that the incidence of prematurity increased from 6.5% in 2011 to 7.4% in 2012. This figure, although not statistically significant, makes it necessary to implement good primary prevention aimed at reducing the rate of preterm births. However, to establish prevention strategies, knowledge of the risk factors associated with prematurity is required. At HGI we do not have a record of these risk factors for the population. Therefore, one of the strategies will be to perform an investigation to identify the risk factors.

The need to carry out this work arises as a result of the need to determine the reality and to compare the results of this investigation with other published works. From this situational diagnosis, our challenge is to improve according to each of the points where a weakness is noted. To obtain a decrease in the number of premature births may

not be within our reality, but we can establish strategies that will attempt to decrease morbidity and mortality in the vulnerable groups.

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