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A Comparison between Late Preterm and Term Infants with Respiratory Distress Syndrome, Early-Onset Sepsis, and Neonatal Jaundice in Ecuadorian Newborns

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Abstract

Background: To examine the differences in prevalence of respiratory distress syndrome, early-onset sepsis and jaundice, between late preterm infants versus term infants in Ecuadorian newborns. **Methods:** Study design: Epidemiological, observational, and cross-sectional, with two cohorts of patients. Settings: IESS Quito Sur Hospital at Quito, Ecuador, from February to April of 2020. Participants: This study included 204 newborns, 102 preterm infants, 102 term infants. **Results:** There are significant differences between late preterm infants and term infants, with a p-value of 0.000 in the prevalence of early sepsis, 70.59% vs. 35.29%. In respiratory distress syndrome between late and term premature infants, significant differences were observed with a p-value of 0.000, the proportion being 55.58% vs. 24.51% respectively. The prevalence of jaundice is higher in term infants with a p value of 0.002, 72.55%, versus 51.96% in late preterm infants, and the mean value of bilirubins in mg/dL was higher in term infants 14.32 versus 12.33 in late preterm infants; this difference is statistically significant with a p value of 0.004. Admission to the NICU is more frequent in late preterm infants with a p-value of 0.000, being 42.16% for late preterm infants vs. 7.84% in term infants; the mean of the hospital days with p-value 0.005, was higher in late preterm infants 4.97 days vs. 3.55 days for term newborns. **Conclusion:** Due to the conditions of their immaturity, late preterm infants are 2.86 times more likely to present early sepsis than full-term newborns. It is shown that late preterm infants are 2.69 times more likely to have respiratory distress syndrome compared to term infants, therefore, late preterm infants have a longer hospital stay of 4.97 days versus 3.55 days in term infants. Jaundice and mean bilirubin levels are higher in term infants due to blood group incompatibility and

insufficient breastfeeding.

Keywords

Late Preterm, Term Newborn, Respiratory Distress Syndrome, Early Onset Sepsis, Jaundice

1. Introduction

First of all, preterm births in low- and middle-income countries are 2.8 million per year, and of these late preterm infants constitute 84% [1]; therefore, late preterm infants represent 8% of all births [2]. Additionally, when comparing the birth rates of preterm infants, the birth rate of the other groups of premature infants (moderate, very premature, and extreme) has remained relatively constant for the past two decades, ranging from 1.8% to 2.0% [3]; conversely, late preterm infants (34 - 36 weeks) are the fastest growing population and represent more than 70% of all preterm births [4]; similarly, they account for 12.5% of all births in the United States [5].

In addition, the literature reports that late preterm infants would have a longer hospital stay compared to the group of term infants [6]; similarly, the days of stay in the Neonatal hospitalization would be inversely proportional to the weeks of gestational age of the premature baby [7]; furthermore, late preterm infants at 34 weeks gestational age remain on average 12.6 days, compared to late preterm infants 35 weeks gestational age at 6.1 days; and finally, 36-week gestational age late preterm infants would have a 3.8-day hospital stay [8].

It should be noted, that the most common factors that would contribute to the prolonged length of stay in neonatology of late preterm infants compared to term infants would be: sepsis (19.7% vs. 11.8%), jaundice (18.8% vs. 26.7%) [9]; similarly, late preterm infants would be 4.9 times more likely to enter invasive and noninvasive mechanical ventilation [10]; consequently, an increased risk of neonatal respiratory morbidity; among these, respiratory distress syndrome with 17.3 more probabilities of presenting in the late premature in relation to newborns at term [9]; including requirement for administration of exogenous surfactant [11].

Likewise, the maturation processes affected by late preterm delivery are those that occur during the last weeks of pregnancy [12]; therefore, there is an immaturity that affects all systems, which would be more evident, in the respiratory system [13]; as a consequence of a progressive decrease in the thickness of the alveolus wall and a simultaneous increase in the surface area of the airways [14]; for this reason, there would be respiratory functional consequences in the late premature newborn [15]. These would include difficulty in maintaining adequate functional residual capacity, vulnerability to alveolar collapse, and increased airway resistance [16].

Similarly, early-onset neonatal sepsis is a serious health problem for late preterm infants [17]. This could be explained, since an early sepsis in the course of immune maturation presented by late preterm infants [18]; it would be associated with greater inflammatory responses and apoptosis [19]; therefore, they would present more severe symptoms and complications [20] compared to term infants. In addition, the early identification of sepsis is key in this patient population [21]; such that, currently, blood culture is the gold standard for the diagnosis of early-onset sepsis [22] in both late preterm infants and term infants; however, the incidence of proven early-onset neonatal sepsis by culture is estimated to be 0.77 to 1 per 1000 live births [23].

On the other hand, the prevalence of jaundice is presumed to occur in a higher proportion in late preterm infants compared to term infants; which would be explained by the characteristics of metabolic and digestive immaturity [24]. Additionally, another cause is due to feeding difficulties [25]. It should be noted that there are conflicting reports in the literature. On the one hand, a higher proportion of jaundice is reported in term infants 26.7% versus 18.8% in late preterm infants [9]. In contrast, another study shows that late preterm infants had a higher frequency of jaundice compared to term infants 54.4% versus 37.9% respectively [26]; consequently, the present study was conducted to clarify these findings.

2. Methods

2.1. Study Design

Epidemiological, observational, and cross-sectional, with two cohorts of patients.

2.2. Settings

IESS Quito Sur Hospital at Quito, Ecuador, from February to April of 2020.

2.3. Participants

To calculate the sample size, the universe is 3000 live births per year at the IESS Quito Sur Hospital, with a 5% margin of error. For the purposes of this study, each cohort has a minimum of 102 patients, a total of 204 patients, with the aim of achieving a discrimination power of at least 80%.

This study included 204 newborns; 102 late preterm newborns and 102 term newborns. During the investigation period, patients were randomly selected when they fully met the inclusion criteria. The inclusion criteria were all late preterm newborns or term newborns, patients of both sexes, of any ethnic group, admitted to the Neonatology Service at the IESS Quito Sur **Hospital; who presented jaundice, respiratory distress syndrome or early onset sepsis. The** exclusion criteria were: extreme preterm, very preterm, moderate preterm infants, congenital anomalies, perinatal asphyxia; as well as all forms that were incorrectly completed or incomplete. All were live newborns selectively enrolled in the study.

2.4. Variables

Patients who present respiratory distress syndrome, early onset sepsis or jaundice in relation to the condition of late preterm or term newborn. On the other hand, use of oxygen devices, days of hospital stay, proportion of admission to the NICU, mean values of bilirubins in mg/dl, causes of jaundice; in relation to the condition of late preterm or term newborn.

The maternal risk factors (chorioamnionitis, premature rupture of membranes ≥ 18 hours, fever, vaginitis, bacteriuria, foul-smelling amniotic fluid) that were considered for early sepsis in both premature and full-term newborns were obtained from the clinical history maternal. The clinical and laboratory diagnoses were carried out by the Gynecologists of the General Hospital of the South of Quito.

2.5. Data Sources

Secondary sources: maternal, obstetric and neonatal clinical history.

2.6. Bias Avoidance

The author collected all the information. The author did not require training due to his studies as a Pediatric Neonatologist. For the collection of information, a standardized data collection sheet was used.

2.7. Study Size

204 newborns, 102 late preterm infants and 102 term infants; 55.88% were males and 44.12% were females. The mean gestational age among late preterm infants was 35 weeks; while in term newborns the mean gestational age was 39 weeks.

2.8. Exposure and Event to Be Determined

Exposure variables were considered as the condition of late preterm newborn (34 - 36 weeks of gestational age) or term newborn (37 - 41 weeks of gestational age) [27]; while the events to be determined were the diagnosis of early onset sepsis, respiratory distress syndrome or jaundice; as well as average days of hospital stay, proportion of admissions to the Neonatal Intensive Care Unit, mean values of bilirubins in mg/dL, causes of jaundice. In the same way, maternal risk factors such as vaginitis, bacteriuria and premature rupture of membranes> 18 hours were taken into account in early-onset sepsis.

2.9. Statistical Methods

The analyzes were carried out with the statistical package IBM SPSS version 25, descriptive statistics were used, using tables, representing the absolute and relative variables of the qualitative variables, as well as measures of central tendency and variability for the quantitative variables with a 95% confidence interval (95% CI).

2.10. Institutional Review Board Authorization

This research was approved by the Committee of Ethics and in Humans' Research of the San Francisco University of Quito (CEISH-USFQ). All procedures performed in studies involving human participants were in accordance with the ethical standards of the 1964 Helsinki Declaration and its later amendments or comparable ethical standards. The authorization of the IESS Quito Sur Hospital was obtained.

3. Results

Table 1 shows the clinical characteristics, within gyneco-obstetrics, significant differences were observed in the frequency of the type of delivery when comparing between late and term premature newborns with a p value of 0.000, where the frequency of delivery by caesarean section was 81.37% for late preterm infants vs. 51.96% for term newborns, while the frequency of cephalo-vaginal delivery was 18.63% for late preterm infants vs. 48.04% for term infants. Prenatal controls presented significant differences with a p value of 0.002, with the proportion of prenatal controls <5 being 8.82% for late preterm infants vs. 0% (no case) for term infants; the frequency of prenatal controls ≥5 was 91.18% for late preterm infants vs. 100% for term infants.

Concerning maternal risk factors, significant differences were observed in the frequency of premature rupture of the membranes ≥ 18 hours with a value of p 0.019, where the proportions were 17.65% for late preterm infants vs. 6.86% for newborns at finished; likewise, significant differences were observed for the frequency of vaginitis with a p value of 0.001, where the frequency was 58.82% for late preterm infants vs. 35.29% for term newborns.

Regarding the natal characteristics, significant differences were observed when comparing between late and term premature newborns for birth weight with a p-value of 0.000, with the weights of 2.406 gr for late premature newborns vs 3.056 gr for term newborns, observed differences in gestational age with a p value of 0.000, with the mean gestational age being 35 weeks for late preterm infants vs. 39 weeks for term infants.

Regarding postnatal characteristics, significant differences were observed when comparing late and term premature newborns, for the prevalence of sepsis with a p value of 0.000, with the prevalences being 70.59% for late premature newborns vs. 35.29% for term newborns, for RDS with a p-value of 0.000, the prevalence of RDS being 55.88% for late preterm infants vs. 24.51% for term infants; the frequency of jaundice with a p value of 0.002, the prevalence being 51.96% for late preterm infants vs. 72.55% for term infants.

The frequency of use of oxygen by nasal cannula with a p value of 0.000, the frequency being 56.86% for late preterm infants vs. 21.57% for term infants; the frequency of use of NIMV with a p value of 0.000, the proportion being 34.31% for late preterm infants vs. 7.84% for term newborns; the use of IMV with a p value of 0.035, with a ratio of 7.84% for late preterm infants vs. 0.98% for term

Table 1. Distribution of the clinical characteristics in relation to the age of the newborn.

Clinical characteristics	Total	Group		p-value
		Late preterm	Term infant	
Gyneco-obstetric				
Delivery route (n (%))[1/]				
Cesarean	136 (66.67)	83 (81.37)	53 (51.96)	0.000*
Vaginal	68 (33.33)	19 (18.63)	49 (48.04)	
Prenatal controls (n (%))[1/]				
<5	9 (4.41)	9 (8.82)	0 (0.00)	0.002*
≥5	195 (95.59)	93 (91.18)	102 (100.00)	
Maternal risk factors (n (%))[1/]				
Chorioamnionitis	3 (1.47)	1 (0.98)	2 (1.96)	0.561
Premature rupture of membranes ≥ 18 h	25 (12.25)	18 (17.65)	7 (6.86)	0.019*
Fever	9 (4.41)	5 (4.90)	4 (3.92)	1.000
Vaginitis	96 (47.06)	60 (58.82)	36 (35.29)	0.001*
Bacteriuria	30 (14.71)	16 (15.69)	14 (13.73)	0.693
Foul-smelling amniotic fluid	3 (1.48)	1 (0.99)	2 (1.96)	1.000
Neonatal				
Gender (n (%))[1/]				
Male	114 (55.88)	61 (59.80)	53 (51.96)	0.259
Female	90 (44.12)	41 (40.20)	49 (48.04)	
5-min Apgar score (n (%))[1/]				
<7	4 (1.96)	1 (0.98)	3 (2.94)	0.621
≥7	200 (98.04)	101 (99.02)	99 (97.06)	
Birthweight (mean (SD))[2/] gr	2729 (503)	2406 (363)	3056 (404)	0.000**
Gestational age (GA) (mean (SD))[2/]weak	37 (2)	35 (0.82)	39 (1.09)	0.000**
Small for Gestational age (n (%))[1/]	31 (15.20)	16 (15.69)	15 (14.71)	0.845
Postnatal				
Diagnosis (n (%))[1/]				
Early-onset sepsis	108 (52.94%)	72 (70.59)	36 (35.29)	0.000*
RDS	82 (40.20)	57 (55.88)	25 (24.51)	0.000*
Jaundice	127 (62.25)	53 (51.96)	74 (72.55)	0.002*
Nasal cannula oxygen (n (%))[1/]	80 (39.22)	58 (56.86)	22 (21.57)	0.000*
NIRS (n (%))[1/]	43 (21.08)	35 (34.31)	8 (7.84)	0.000*
CMV (n (%))[1/]	9 (4.41)	8 (7.84)	1 (0.98)	0.035*
Admission NICU (n (%))[1/]	51 (25.00)	43 (42.16)	8 (7.84)	0.000*
Days length of hospital stay (mean (SD))[2/]	4.26 (3.59)	4.97 (4.40)	3.55 (2.35)	0.005*

Note: RDS = Respiratory Distress Syndrome; SD = Desviación Estándar; CMV = Conventional Mechanical Ventilation; NIRS = Non-Invasive Respiratory Support; NICU = Neonatal Intensive Care Unit. * significant differences in the proportion of the characteristic, 1/based on the Chi-square test; ** significant differences in the mean of the characteristic, 2/based on t test, significance p-value < 0.05. Source: study data; elaboration: authors.

newborns; admission to the NICU with a p-value of 0.000, the frequencies being 42.16% for late preterm infants vs. 7.84% for term newborns; days of hospitalization with a p value of 0.005, the means being 4.97 days for late preterm infants vs. 3.55 days for term infants.

Table 2 presents the clinical characteristics in relation to the presence or absence of early sepsis; regarding maternal risk factors, differences were observed for premature rupture of membranes with a p value of 0.000, with a prevalence of sepsis of 96.00% and 27.14 times more probability of presenting sepsis in relation to mothers without premature rupture of membranes ≥ 18 hours; maternal fever with a p value of 0.004 and a prevalence of 100% in sepsis; vaginitis with p value 0.000, sepsis prevalence of 83.33% and 14.29 times more likely to present sepsis in relation to mothers without vaginitis; bacteriuria with a p value of 0.000, sepsis prevalence of 96.67% and 34.87 times more probability of presenting sepsis when the mother presents this risk factor. When comparing the presence of sepsis between late and term premature newborns, significant differences were observed with a p value of 0.000, with the proportion of sepsis being 70.59% for late premature newborns vs. 35.29% for term newborns, where late preterm infants were 4.40 times more likely to develop sepsis than full-term infants.

Table 3 presents the clinical characteristics in relation to the presence of RDS, where it was observed for the neonates whose deliveries were by caesarean section, they were 2.75 times more likely to develop RDS compared to those with cephalo-vaginal delivery. Regarding the natal characteristics when related to the presence of RDS, significant differences were observed for the Apgar at 5 minutes with a p value of 0.025, where the frequency of the presence of RDS was 100% for newborns with Apgar <7 vs. 39.00% for newborns with Apgar ≥7; when comparing the presence of RDS between late and term premature infants; Significant differences were observed with a p value of 0.000, with the RDS ratio being 55.58% for late preterm infants vs. 24.51% for term infants; where late preterm infants are 3.90 times more likely to have RDS compared to term infants. Admission to the NICU with a p value of 0.000, the frequencies being 59.76% for newborns with RDS vs. 1.64% for newborns without RDS.

Table 4 shows the distribution of clinical characteristics in relation to the presence of jaundice between the two study groups, the highest frequency being in term newborns 72.55%; versus 51.96% for late preterm infants; this difference being statistically significant with a p value of 0.002. The mean value of bilirubins in mg/dL was higher in term infants with 14.32; versus 12.33 for late preterm infants, this difference is statistically significant with a p value of 0.004. The main cause of jaundice is the lack of breastfeeding, being for the most part 85% in the late preterm newborn versus 46% in the term newborn with a p value of 0.002. ABO incompatibility is the cause with the highest frequency of jaundice in term newborns 49% versus 15% in late preterm infants with a p value of 0.003.

Table 2. Distribution of clinical characteristics in relation to the presence or absence of early-onset sepsis.

Clinical characteristics	Early-onset sepsis		p-value	OR (IC-95%)
	Present	Absent		
Gyneco-obstetric				
Prenatal controls (n (%))[1/]				
<5	8 (88.89)	1 (11.11)	0.038*	7.60 (0.93 - 61.92)
≥5	100 (51.28)	95 (48.72)		
Maternal risk factors (n (%))[1/]				
Chorioamnionitis	3 (100.00)	0 (0.00)	0.249	-
Premature rupture of membranes ≥ 18 h	24 (96.00)	1 (4.00)	0.000*	27.14*** (3.59 - 204.98)
Fever	9 (100.00)	0 (0.00)	0.004*	-
Vaginitis	80 (83.33)	16 (16.67)	0.000*	14.29*** (7.18 - 28.42)
Bacteriuria	29 (96.67)	1 (3.33)	0.000*	34.87*** (4.65 - 261.76)
Foul-smelling amniotic fluid	3 (100.00)	0 (0.00)	0.249	-
Neonatal				
Gender (n (%))[1/]				
Male	62 (54.39)	52 (45.61)	0.642	1.14 (0.66 - 1.98)
Female	46 (51.11)	44 (48.89)		
5-min Apgar score (n (%))[1/]				
<7	3 (75.00)	1 (25.00)	0.624	2.71 (0.28 - 26.54)
≥7	105 (52.50)	95 (47.50)		
Birthweight (mean (SD))[2/] gr	2578 (464)	2901 (492)	0.000**	-
Gestational age (GA) (mean (SD))[2/]weak	36 (1.84)	38 (1.95)	0.000**	-
Small for Gestational age (n (%))[1/]	19 (61.29)	12 (38.71)	0.312	1.49 (0.68 - 3.27)
Newborn (n (%))[1/]				
Late preterm	72 (70.59)	30 (29.41)	0.000*	4.40*** (2.44 - 7.93)
Term infant	36 (35.29)	66 (64.71)		
Postnatal				
Nasal cannula oxygen (n (%))[1/]	63 (58.33)	17 (17.71)	0.000*	-
NIRS (n (%))[1/]	39 (36.11)	4 (4.17)	0.000*	-
CMV (n (%))[1/]	9 (8.33)	0 (0.00)	0.004*	-
Admission NICU (n (%))[1/]	44 (40.74)	7 (7.29)	0.000*	-
Days length of hospital stay (mean (SD))[3/]	5.77 (4.18)	2.56 (1.54)	0.000**	-

Note: RDS = Respiratory Distress Syndrome; SD = Desviación Estándar; CMV = Conventional Mechanical Ventilation; NIRS = Non-Invasive Respiratory Support; NICU = Neonatal Intensive Care Unit; * significant differences in the proportion of the characteristic, 1/based on the Chi-square test; ** significant differences in the mean of the characteristic, 2/based on the t test, 3/based on the Mann Whitney test, p-value significance < 0.05; OR = Odds Ratio, *** risk factor for sepsis lower limit of OR > 1. Source: study data; elaboration: authors.

Table 3. Distribution of clinical characteristics in relation to the presence of RDS.

Clinical characteristics	RDS		p-value	OR (IC-95%)
	Present	Absent		
Gyneco-obstetric				
Delivery route (n (%))[1/]				
Cesarean	65 (47.79)	71 (52.21)	0.002*	2.75*** (1.44 - 5.23)
Vaginal	17 (25.00)	51 (75.00)		
Prenatal controls (n (%))[1/]				
<5	4 (44.44)	5 (55.56)	0.790	1.20 (0.31 - 4.61)
≥5	78 (40.00)	117 (60.00)		
Maternal risk factors (n (%))[1/]				
Chorioamnionitis	1 (33.33)	2 (66.67)	1.000	0.74 (0.10 - 8.31)
Premature rupture of membranes ≥18h	11 (44.00)	14 (56.00)	0.679	1.20 (0.51 - 2.78)
Fever	4 (44.44)	5 (55.56)	1.000	1.20 (0.31 - 4.61)
Vaginitis	51 (53.13)	45 (46.88)	0.000*	2.81*** (1.58 - 5.02)
Bacteriuria	11 (36.67)	19 (63.33)	0.669	0.84 (0.38 - 1.87)
Foul-smelling amniotic fluid	1 (33.33)	2 (66.67)	1.000	0.74 (0.07 - 8.24)
Neonatal				
Gender (n (%))[1/]				
Male	47 (41.23)	67 (58.77)	0.735	1.10 (0.63 - 1.94)
Female	35 (38.89)	55 (61.11)		
5-min Apgar score (n (%))[1/]				
<7	4 (100.00)	0 (0.00)	0.025*	-
≥7	78 (39.00)	122 (61.00)		
Birthweight (mean (SD))[2/] gr	2628 (462)	2499 (519)	0.017**	-
Gestational age (GA) (mean (SD))[2/]weak	36 (1.93)	38 (1.89)	0.000**	-
Small for Gestational age (n (%))[1/]	8 (25.81)	23 (74.19)	0.076	0.47 (0.20 - 1.10)
Newborn (n (%))[1/]				
Late preterm	57 (55.88)	45 (44.12)	0.000*	3.90*** (2.15 - 7.09)
Term infant	25 (24.51)	77 (75.49)		
Postnatal				
Nasal cannula oxygen (n (%))[1/]	79 (96.34)	1 (0.82)	0.000*	-
NIRS (n (%))[1/]	42 (51.22)	1 (0.82)	0.000*	-
CMV (n (%))[1/]	9 (10.98)	0 (0.00)	0.004*	-
Admission NICU (n (%))[1/]	49 (59.76)	2 (1.64)	0.000*	
Days length of hospital stay (mean (SD))[3/]	5.84 (4.77)	3.20 (1.89)	0.000**	

Note: RDS = Respiratory Distress Syndrome; SD = Desviación Estándar; CMV = Conventional Mechanical Ventilation; NIRS = Non-Invasive Respiratory Support; NICU = Neonatal Intensive Care Unit; * significant differences in the proportion of the characteristic, 1/based on the Chi-square test; ** significant differences in the mean of the characteristic, 2/based on the t test, 3/based on the Mann Whitney test, p-value significance < 0.05; OR = Odds Ratio, *** risk factor for SDR lower limit of OR > 1. Source: study data; elaboration: authors.

Table 4. Distribution of clinical characteristics in relation to the presence of jaundice.

Characteristics	Total	Group		p-value
		Late preterm	Term infant	
Jaundice	127 (62.25)	53 (51.96)	74 (72.55)	0.002*
Bilirrubina (mean (SD))[2/] mg/dL	13.51 (3.87)	12.33 (3.47)	14.32 (3.95)	0.004*
Causes [1/]	79 (131)	45 (85)	34 (46)	0.002*
Lack of breastfeeding	45 (64)	8 (15)	37 (49)	0.003*
Group ABO incompatibility				
Others	4 (5)	0 (0)	4 (5)	0.013*

Note: SD = Standard Deviation; * significant differences in the proportion of the characteristic, 1/based on the Chi-square test; 2/based on t-test, significance p-value < 0.05. Source: study data; elaboration: authors.

4. Discussion

In the present investigation, jaundice, early-onset sepsis and respiratory difficulty were studied, because they are the most prevalent pathologies in the Neonatology Service of the IESS Quito Sur Hospital, Ecuador. In addition, a comparison was made between late premature and full-term infants to demonstrate that due to the characteristics of their prematurity, they have a greater risk of presenting pathologies, complications and hospitalization in Neonatology that must be taken into account when attending to a late premature birth.

There is a recent recognition that late preterm infants have a significantly higher risk of adverse neonatal outcomes compared to term infants, therefore it has led to increased research on morbidity in these late preterm infants. However, previously the late preterm infant was considered mature enough to be treated similarly to term infants, on the other hand, for many of these late preterm infants as demonstrated in this study, there is an increased morbidity in sepsis and respiratory distress syndrome when compared to term infants. It should be emphasized that it is due to the fact that the physiological, metabolic, endocrine, immune and histological maturation; in fact, it continues also during the last weeks of gestation [6].

Likewise, in late preterm delivery the normal development that occurs in the uterus is interrupted and the relative immaturity is further aggravated by adverse perinatal factors such as higher caesarean section rates in late preterm infants, which in effect is shown in the results of this research **Table 1**. Of course, the increase in cesarean births in late preterm infants are associated with higher rates in the mother of hypertension, diabetes, obesity, smoking, changes in maternal age, fertility treatments, increased prevalence of multiple deliveries and obstetric interventions [3]. Therefore, additional research is required to clarify the cause and guide interventions to reverse this trend.

Pulmonary immaturity, linked to the production insufficient and inefficient surfactant and formation alveolar still incomplete [27], the immature lung structure may be functionally associated with delayed intrapulmonary fluid absorption and inefficient gas exchange. Moreover, during the last 6 weeks of ges-

tation, the fetus begins to develop synchrony and control over breathing, so that preterm delivery increases the risk of apnea [28].

Similarly, in the results of this research shown in Tables 1 and 3, they indicate that late preterm infants have a higher prevalence of respiratory distress syndrome, as well as greater use of oxygen devices such as nasal cannula, NIRS and CMV; when compared to the term newborn. Therefore, this is because in the late premature the stages of normal lung development are interrupted, within these, the saccular period that occurs between 24 to 36 weeks of gestational age and the alveolar period that begins at 36 weeks of gestation and continues in postnatal life. In addition, the saccular period is characterized by capillary proliferation, saccule formation, and the start of surfactant production, so these late preterm infants may require exogenous surfactant administration [14] [15].

In the same way, in relation to early sepsis, the results of which are shown in **Table 2**, a higher prevalence of early sepsis is reported in late preterm infants when compared to term infants; because premature birth interrupts maternal antibody transfer and immune maturation does not occur until 6 months of age; in addition, late preterm infants are susceptible to infections as a consequence of immature humoral immunity; likewise, the response of adaptive immunity cytotoxic T lymphocytes is immature; as well as elimination of viruses by innate immunity is inefficient [18].

Likewise, detection of early-onset sepsis is often challenging due to variation in practice, nonspecific laboratory markers, and clinical findings that mimic immaturity. Therefore, in this study, the EOScalc early-onset neonatal sepsis calculator was used for the diagnosis of early-onset sepsis in both late preterm as well as term neonates; Consequently, it is shown to be a useful screening tool to adequately identify early-onset neonatal sepsis, therefore, reducing unnecessary use of antibiotics and laboratory tests; For this reason, the use of EOScalc is recommended to support the diagnosis of early neonatal sepsis in both full-term and late preterm newborns in neonatal units [17].

It should be noted that late preterm infants contribute to a significant hospitalization burden and public health costs compared to term infants, just as **Table 1** shows more average days of hospital stay in the Neonatology Service, as well as, higher rates of admission to the Neonatal Intensive Care Unit in late preterm infants when compared to term infants. This is explained by the pathologies of respiratory distress syndrome, early sepsis and jaundice shown in **Table 1**. Likewise, these findings are due to the characteristics of immaturity characteristic of this group of late preterm infants, who also have an increased risk for acute morbidities that start immediately after birth.

Additionally, **Table 4** shows that the prevalence of jaundice was higher in term infants than in late preterm infants, with the mean mean bilirubin value in mg/dL higher in term infants when compared to late preterm infants; This is explained, taking into account that within the present investigation, it was evidenced that within the group of term newborns among the three pathologies studied, jaundice was the one that presented with more frequency, and within

this, the ABO blood group incompatibility was the leading cause of jaundice, followed by jaundice due to lack of breastfeeding, therefore, higher bilirubin values are shown to occur when there is ABO incompatibility, which is explained by an autoimmune immune condition in the neonate.

Furthermore, Table 4 shows that feeding difficulties occurred in 85% of the late premature infants in the present study with a diagnosis of jaundice, which is related to the characteristics of their prematurity as a reflection of regular sucking. For this reason, to reduce the incidence of jaundice in this group, early enteral and parenteral feeding and stimulation of the sucking reflex are recommended in late premature neonates who require it as soon as possible.

5. Conclusion

Due to the conditions of their immaturity, late preterm infants are 2.86 times more likely to present early sepsis than full-term newborns; among maternal risk factors: premature rupture of membranes, vaginitis and bacteriuria are predictors of early sepsis in late preterm infants. Late preterm infants were shown to be 2.69 times more likely to have respiratory distress syndrome compared to term infants, therefore, late preterm infants had a longer hospital stay of 4.97 days versus 3.55 days in the term infants. Jaundice and mean bilirubin levels are higher in term infants due to insufficient breastfeeding and blood group incompatibility.

Ethical Approval

The study was approved by the ethics committee for research with humans (CEISH) and the Institutional Board Committee of the San Francisco University of Quito (USFQ). All procedures performed in studies involving human participants were in accordance with the ethical standards of the 1964 Helsinki Declaration and its later amendments or comparable ethical standards.

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Conflicts of Interest

The author declares no conflicts of interest regarding the publication of this paper.

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