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Preterm Births: Obstetric Features and Neonatal Outcomes at University Hospital Mostar

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ABSTRACT

Background: The aim of this study was to determine and analyze the frequency and obstetric features of preterm birth and neonatal outcomes of infants born before 37 completed weeks of pregnancy.

Methods: The retrospective study included 470 premature births. The following data on preterm births were collected from hospital records and analyzed: gestational age, type of preterm birth, multiple pregnancy and maternal parity. The parameters of preterm infants were: Apgar score, intrauterine growth restriction (IUGR), perinatal asphyxia, respiratory distress syndrome (RDS), sepsis, necrotizing enterocolitis, intracranial hemorrhage, neonatal convulsions, hypoglycemia, blood transfusion, the need for surfactant, the need for mechanical ventilation, the length of stay in an Intensive Care Unit and early and late neonatal mortality.

Main findings: The frequency of preterm births was 6.48%. The most common type of premature birth was spontaneous premature birth. Most complications occurred in neonates with a gestational age of 28-34 weeks. The most common respiratory complication was RDS (8.1%). Early neonatal mortality was 1.49% and late neonatal mortality was 0.85%.

Principal conclusion: Neonatal outcomes of premature infants are directly proportional to their gestational age. The neonatal mortality rate of premature infants at Clinical Hospital Center Mostar (CHC) Mostar is comparable to other developing countries.

Key words: preterm birth, gestational age neonatal outcome, perinatal care, neonatal mortality

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INTRODUCTION

Preterm birth is defined as any birth before 37 completed weeks of pregnancy (less than 259 days of gestation). It is the leading cause of neonatal morbidity and mortality in developed and developing countries (1). According to the literature, 5-13% of pregnancies end prematurely with a trend of increasing frequency of preterm birth (2). Premature birth is divided into: spontaneous preterm birth, that begins with contractions without prior rupture of the amniotic sac; iatrogenic, in which there is a medical indication for induction of labor (placental abruption, preeclampsia, small-for-gestational-age (SGA), etc.) and preterm premature rupture of the membranes (PPROM) that begins with rupture of the membranes before labor begins (3). Most attention is given to spontaneous preterm birth because it makes up two-thirds of the cases. The etiology is not fully understood but infection, stress, hypoxia and history of previous preterm birth are believed to play the most important roles (4,5). Gestational age is one of the main determinants of neonatal outcomes. The lower the gestational age, the worse the outcome in the newborn (6). There are sub-categories of preterm birth, based on gestational age: extremely low gestation (<28 weeks), very low gestation (28 to 32 weeks), early preterm birth 32 to 34 weeks and late preterm birth 34 to 37 weeks (7). Premature babies are exposed to a number of neonatal complications such as respiratory distress syndrome (RDS), bronchopulmonary dysplasia (BPD), apnea, sepsis, necrotizing enterocolitis, hypoglycemia, hyperbilirubinemia, cardiovascular disorders, impaired retinal and immunological systems, paralysis and chronic lung disease (8). Premature birth is the leading cause of neonatal mortality and morbidity and 1 million children under the age of 5 die due to complications associated with premature birth (6). Neonatal death (a live-born child who died during the first 27 days of life) is the most severe outcome of premature birth. It is divided into early (0-6 days) and late neonatal death (7-27 days of life) (9). It is estimated that around 70% of infant deaths in the early neonatal period and 75% of neonatal morbidity are related to preterm birth (3). Since a large number of preterm births cannot be prevented, the quality of perinatal and neonatal care remains to be improved, in order to reduce mortality and permanent damage to premature babies (10). Inadequate care for children in the neonatal period leads not only to increased mortality but also to various difficulties in the child's development. Accordingly, special attention should be paid to better organization and equipment for neonatal intensive care units (11). The aim of this study was to determine and analyze the frequency and obstetric features of preterm birth and neonatal outcomes of children born before 37 completed weeks of pregnancy. An additional aim is to use the obtained results in planning measures to improve perinatal and especially neonatal care at CHC Mostar.

MATERIALS AND METHODS

Participants

The study included 470 preterm infants who were born between 28th and 37th week of pregnancy at the Clinic for Gynecology and Obstetrics. They were treated at the Department of Neonatology and Intensive Care Unit of the CHC Mostar during the time period from January 1, 2016. to December 31, 2019. All preterm infants with congenital anomalies that caused death, stillbirth or fetal death during pregnancy (in utero) and newborns older than 37 weeks were excluded from the study.

Methods

Data were collected from medical documentation (BIS, medical history of mothers and their newborns, protocols). The parameters for premature births were: gestational age, type of preterm birth (spontaneous, PPROM, iatrogenic), multiple pregnancy and maternal parity. The parameters for infants were: Apgar Score at 5 minutes and complications: IUGR, perinatal asphyxia, respiratory difficulties (RDS, apnea), sepsis, necrotizing enterocolitis,

intracranial hemorrhage (grades I-IV), neonatal convulsions, hypoglycemia, blood transfusion, (RDS, apnea), sepsis, necrotizing enterocolitis, intracranial hemorrhage (grades I-IV), neonatal convulsions, hypoglycemia, blood transfusion, the need for surfactant, the need for mechanical ventilation, length of stay in ICU and early and late neonatal mortality. To generate the data addressing our research question, a retrospective cohort study was utilized to minimize the confounders.

Statistics

Data were collected in an MS Excel database (version 11, Microsoft Corporation, Redmond, WA, USA). The SPSS 20.0 statistical program (IBM Corp., Armonk, NY, USA) was used for statistical analysis. Data were processed by descriptive statistical methods: categorical variables were presented as frequencies and percentages, while continuous variables were presented as an arithmetic mean with standard deviation. The chi-square test ($\chi 2$) was used to test the differences between the nominal variables, while the Student t-test was used for comparing continuous variables. A p-value less than 0.05 was taken as statistically significant.

RESULTS

Most preterm births were in primiparous women, followed by secundiparous mothers. Spontaneous preterm birth was the most common, followed by PPROM. There was a significantly lower proportion of multiple pregnancies compared to singleton pregnancies. We noticed that twins were more common than triplets (Table 1). It was noticed that more preterm infants died in the early neonatal period compared to the late neonatal period. The frequency of early neonatal mortality was 1.49%, while late neonatal mortality was 0.85%. The most common Apgar score at 5 minutes was 8 to 10, followed by 4 to 7. The most common complications were respiratory complications of which RDS was the most common, followed by apnea. In the sample examined, most neonates stayed in the intensive care unit (NICU) for less than 14 days (Table 2).

Table 1. Obstetric features of preterm birth

	n	%	χ^2	p
Type of birth			0.019	0.890
Vaginal	233	49.7		
Cesarean section	236	50.3		
Maternal parity			200.569	**<0.001**
1	239	51.0		
2	124	26.4		
3	67	14.3		
4	39	8.3		
Type of preterm birth			40.072	**<0.001**
Spontaneous	216	46.1		
PRVP	148	31.6		
Elective	105	22.4		
Multiple pregnancy			377.582	**<0.001**
No	342	72.9		
Twins	124	26.4		
Triplets	3	0.6		

Table 2. Neonatal outcomes of preterm infants

	n	%	χ^2	p
Neonatal mortality			873.190	**<0,001**
No	458	97.7		
Early	7	1.5		
Late	4	0.9		
Apgar Score			721.667	**<0.001**
0 - 3	4	0.9		
4 - 7	35	7.5		
8 - 10	430	91.7		
Respiratory disorders			1020.441	**<0.001**
No	416	88.7		
Apnea	11	2.3		
RDS	38	8.1		
Apnea + RDS	4	0.9		
Length of stay in NICU			132.299	**<0.001**
No	211	45.0		
<14 days	219	46.7		
14+ days	39	8.3		

Complications that occurred significantly more often in children with a lower gestational age were: perinatal asphyxia, sepsis, necrotizing enterocolitis, intracranial hemorrhage (grades I-IV), neonatal convulsions, hyperbilirubinemia requiring phototherapy, neonates in need of blood transfusion and surfactant therapy, and newborns who stay on mechanical ventilation (Table 3).

Table 3. Complications in preterm infants related to gestational age

		Gestational age		t	p
		$\bar{X}$	SD		
IUGR	Yes	31.15	5.120	1.240	0.216
	No	31.74	5.888		
Perinatal asphyxia	Yes	31.36	5.555	3.090	**0.002**
	No	31.72	5.857		
Sepsis	Yes	32.45	5.042	4.598	**<0.001**
	No	31.68	5.880		
Necrotizing enterocolitis	Yes	30.00	7.439	3.682	**<0.001**
	No	31.73	5.837		
Intracranial hemorrhage from grade I-IV	Yes	32.42	5.752	7.410	**<0.001**
	No	31.49	5.864		
Neonatal convulsions	Yes	28.33	5.116	2.654	**0.008**
	No	31.73	5.819		
Hypoglycemia	Yes	31.80	5.630	0.030	0.976
	No	31.71	5.853		
Hyperbilirubinemia with the need for phototherapy	Yes	30.82	5.651	3.511	**<0.001**
	No	32.12	5.895		
Perinatal infection	Yes	31.47	6.159	3.511	**<0.001**
	No	31.73	5.828		
Blood transfusion	Yes	32.10	6.170	10.544	**<0.001**
	No	31.65	5.794		
Need for a surfactant	Yes	33.38	5.830	9.586	**<0.001**
	No	31.59	5.834		
Mechanical ventilation	Yes	31.72	4.928	4.828	**<0.001**
	No	31.71	5.950		

DISCUSSION

This study showed that neonatal complications and neonatal outcomes of preterm infants depend on the gestational age of the newborn, and they are inversely proportional. This is expected for physiological reasons, as a shorter duration of pregnancy is necessarily associated with a lower degree of maturation of various organs and organ systems (12). Children who had perinatal asphyxia, sepsis, necrotizing enterocolitis, intracranial hemorrhage, neonatal convulsions, hyperbilirubinemia requiring phototherapy and perinatal infection were born of lower gestational age, compared with children who did not develop these complications. This is fully consistent with the 'previous reports on association between neonatal complications and early gestational age' (8,13). Neonates who were born with hypoglycemia and IUGR did not differ significantly in gestational age compared to children who did not have these complications. This is also in line with the results of many studies stating that IUGR and hypoglycemia are more common in late premature infants of gestational age between 34 and 37 weeks (14). The frequency of early neonatal mortality was 1.49%, while late neonatal mortality was 0.85%. This coincides with the results of studies in China and the USA (15). We expected the neonatal mortality rate to be higher, and the reason for the low mortality rate could be that extreme preterm infants were not included in this study (<28 GA). Results also show that mothers were mostly primiparous, which correlates with previous data, indicating that first-time mothers are more likely to give birth prematurely (16). As previous research shows, women with a previous preterm delivery have approximately a 4-6 times greater risk of having another preterm delivery (17). 'This data was not available to us due to difficulty accessing patient records during the COVID-19 pandemic but will be focus of our future research. These data were not available to us, due to the difficulty of accessing patient records during the COVID-19 pandemic but will be the focus of

our future research. In addition, the risk factors for preterm birth were not investigated, therefore, there was no obligation to obtain data on previous preterm birth. The most common type of preterm birth in this research is, as expected, spontaneous preterm birth, the second most common is PPROM, followed by elective preterm birth. This is at variance to the literature data which reports that elective preterm birth is more common than PPROM. In our study there was also a significantly lower proportion of multiple pregnancies compared to singleton pregnancies, and twins were more prevalent than triplets. These data correlate with research conducted in the United States (18). In this study the most common respiratory complication was RDS, followed by apnea. According to one American study, 10% of premature babies develop respiratory difficulties, which correlates entirely with the results of our study (19). Future studies should also include data on the socio-economic status of mothers. Highly educated women give birth to their first child at an older age. Less educated women give birth to their first child at an earlier age and are more likely to be multiparous (20). Therefore, age, parity and the socio-economic status of pregnant women are closely related risk factors for preterm birth. Consequently, future studies should examine the impact of all three of these factors on preterm birth.

CONCLUSIONS

Our data confirm already established literature that the clinical outcomes of premature infants are directly proportional to their gestational age. Additionally, the neonatal mortality rate at CHC Mostar is not significantly different in comparison to healthcare institutions in developing countries.

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CONFLICT OF INTEREST

The authors declare no conflict of interest.

AUTHORS' CONTRIBUTIONS

I.S and V.T conceived and designed the study; I.S.,V.T., V.B and D.T. collected the data; I.S. and N.B. analyzed data; I.S, V.B, and D.T. interpreted the results; I.S and V.T prepared the figures; I.S drafted the manuscript; I.S, V.T., V.B. and D.T. edited and revised the manuscript; V.T. approved the final version of the manuscript.

ETHICAL BACKGROUND

Institutional Review Board Statement: The study was conducted according to the guidelines of the Declaration of Helsinki and approved by the Ethics Committee of the University Hospital in Mostar (Reg. No. 578/20, Mostar, July 7, 2020).

Informed consent statement: Informed consent was obtained from all subjects involved in the study.

Data availability statement: We deny any restrictions on the availability of data, materials and associated protocols. Derived data supporting the findings of this study are available from the corresponding author on request.

REFERENCES

1. Jiang M, Mishu MM, Lu D, Yin X. A case control study of risk factors and neonatal outcomes of preterm birth. Taiwan J Obstet and Gynecol. 2018;57:814-818.
2. Owusu BA, Lim A, Makaje N, Wobil P, SameAe A. Neonatal mortality at the neonatal unit: the situation at a teaching hospital in Ghana. Afr Health Sci. 2018;18:369-377.
3. Elveđi-Gašparović V. Prijevremeni porođaj. [Fetalna medicina I opstetricija]. Zagreb: Medicinska naklada; 2014 (in Croatian).
4. Glover AV, Manuck TA. Screening for spontaneous preterm birth and resultant therapies to reduce neonatal morbidity and mortality: A review. Semin Fetal Neonatal Med. 2018;23:126-132.
5. Romero R, Dey S, Fisher S. Preterm labor: One syndrome, many causes. Science. 2014;345:760-5.
6. Manuck TA, Rice MM, Bailit JL, Grobman WA, Reddy UM, Wapner RJ, et al. Preterm neonatal morbidity and mortality by gestational age: a contemporary cohort. Am J Obstet Gynecol.2016;215:103.
7. Glass HC, Costarino AT, Stayer SA, Brett C, Cladis F, Davis PJ. Outcomes for extremely premature infants. AnesthAnalg. 2015;120:1337.
8. Purisch S, Gyamfi-Bannerman C. Epidemiology of preterm birth. SeminPerinatol. 2017;41:387-91.
9. Rodin U. [Perinatalni mortalitet, fetalna smrtnost I maternalni mortalitet] in [Fetalna medicina I opstetricija]. Đelmiš J, Orešković S, ed. Zagreb: Medicinska naklada; 2014 (in Croatian).
10. Barfield WD. Public health implications of very preterm birth. ClinPerinatol. 2018;45:565-577.

11. Mujkić A. [Socijalna pedijatrija] Mardešić D. Ed. Pedijatrija. Zagreb: Školska knjiga; 2016 (in Croatian).
12. Lemons JA, Bauer CR, Oh W, Korones SB, Papile LA, Stoll BJ et al. Very Low Birth Weight Outcomes of the National Institute of Child Health and Human Development Neonatal Research Network, January 1995 through December 1996. NICHD Neonatal Research Network. Pediatrics. 2001;107:E1
13. Mandy GT. Short-term complications of the preterm infant. U: UpToDate, Weisman LE ur. UpToDate 2016 [cited May 25, 2020] [Epub ahead of print].
14. Bertino E, Occhi L, Di Nicola P. The late preterm IUGR and/or SGA. Ital J Pediatr. 2014;40:3.
15. Wang XL, Wang J, Yuan L, Shi WJ, Cao Y, Chen C. Trend and causes of neonatal mortality in a level III children's hospital in Shangai: a 15-year retrospective study. World J Pediatr.2018;14:44-51.
16. Schempf A, Branum A, Lukacs S, Schoendorf K. Maternal age and parity-associated risks of preterm birth: differences by race/ethnicity. Paediatr Perinat Epidemiol. 2007;21:34-43.
17. Baer R, Yang J, Berghella V, Chambers C, Coker T, Kuppermann M, et al. Risk of preterm birth by maternal age at first and second pregnancy and race/ethnicity. J Perinat Med. 2017.
18. Martin JA, Kirmeyer S, Osterman M, Shepherd RA. Born a bit too early: Recent trends in late preterm births. NCHS Data Brief. 2009;24:1-8.
19. Hibbard JU, Wilkins I, Sun L, Gregory K, Haberman S, Hoffman M et al. Respiratory morbidity in late preterm births. JAMA. 2010;304:419-25.
20. Schempf A, Branum A, Lukacs S, Schoendorf K. Maternal age and parity-associated risks of preterm birth: differences by race/ethnicity. Paediatr Perinat Epidemiol. 2007;21:34-43.