



# Frequency of neonatal complications after premature delivery

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## ABSTRACT

**Introduction:** Preterm delivery is the delivery before 37 weeks of gestation are completed. The incidence of preterm birth ranges from 5 to 15%. Aims of the study were to determine the average body weight, Apgar score after one and five minutes, and the frequency of the most common complications in preterm infants.

**Methods:** The study involved a total of 631 newborns, of whom 331 were born prematurely Aims of this study were to (24th-37th gestational weeks-experimental group), while 300 infants were born in time (37-42 weeks of gestation-control group).

**Results:** Average body weight of prematurely born infants was 2382 grams, while the average Apgar score in this group after the first minute was 7.32 and 7.79 after the fifth minute. The incidence of respiratory distress syndrome was 50%, intracranial hemorrhage, 28.1% and 4.8% of sepsis. Respiratory distress syndrome was more common in infants born before 32 weeks of gestation. Mortality of premature infants is present in 9.1% and is higher than that of infants born at term.

**Conclusions:** Birth body weight and Apgar scores was lower in preterm infants. Respiratory distress syndrome is the most common fetal complication of prematurity. Intracranial hemorrhage is the second most common complication of prematurity. Mortality of premature infants is higher than the mortality of infants born at term birth.

**Keywords:** preterm delivery, prematurity, neonatal complications

## INTRODUCTION

Preterm delivery, defined by the WHO is the delivery before 37 weeks of gestation are completed (1). The incidence of preterm birth ranges from 5 to 15%. Preterm delivery is a major cause of neo-

natal morbidity and mortality. It is believed that the preterm delivery is cause of neonatal death in 75% of cases and in 50% of cases leads to the creation of permanent neurological sequelae (2). According to gestational weeks, preterm delivery is divided: the extreme preterm birth (before 32 weeks of gestation), moderately preterm delivery (32-33.6 weeks of gestation), and preterm delivery (34-36.6 weeks of gestation) (3). Characteristics of infants born prematurely are: body weight less than 2500 grams and body length less than 48 cm, subcutaneous adipose

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tissue is less developed, skin turgor is normal, the epidermis is normal, color is red, the vernix caseosa present, the nails do not rise to the top of the fingers, lanugo is enhanced, papillary membrane is known, ear cartilage is incompletely developed, high-pole lips cover small, the testicles are maintained in the inguinal canal, the color of the amniotic fluid is a colorless or clear (4). Extremely premature infants have immature gestational weeks less than 30 weeks. Small birth weight, with severe respiratory problems and frequent neurological complications. The percent of survival was 60% in the presence of sequelae in 20% of cases. Moderately premature infants are born premature between 30 and 34 gestational weeks with birth weight over 1500 grams, with lighter respiratory and metabolic problems, but can be treated successfully with modern equipment and trained staff. The percentage of survival is about 80%, with a small number of sequences. Marginally mature preterm are from 35- 37 weeks of gestation, with a birth weight over 2500 grams. Neonates born before term can have many complications such as respiratory distress syndrome (RDS), intraventricular hemorrhage, necrotizing enterocolitis, bronchopulmonary dysplasia, sepsis, persistent ductus arteriosus, and retinopathy. Infants born before 28 weeks of gestation have a higher risk of intraventricular hemorrhage (5). Respiratory distress syndrome is the specific clinical entity that is primarily common in premature infants, and occurs due to the reduced amount of surfactant in the alveoli (6). RDS is the main cause of morbidity in prematurely born infants (7). Risk factors favorable to the emergence of RDS are: prematurity, male sex, diabetic mothers, perinatal asphyxia, the second born twin, familial predisposition and pregnancy terminated by cesarean section (8). According to Stefanović, incidence of RDS is 10-15% in infants born prematurely and significantly rising as gestational age is lower (9). According to Crowley, the risk of developing RDS is higher than 50% if the gestational age is less than 30 weeks (10). Neonatal sepsis is an acute systemic disease of premature infants characterized by a general reaction to the infectious bacteremia. It occurs in the first month of life, and caused by the penetration bacteria and their toxins in the bloodstream, where besides the general reaction. Premature infants have incomplete growth and development at all structural levels, cellular and

tissue level, so it is not surprising the fact that 2/3 of the total children number born prematurely require intensive care and/or therapy within the first seven days of life (11).

## METHODS

### Subjects

This is retrospective study in which we analyzed and compared the frequency of occurrence of fetal complications in infants born prematurely with complications in term newborns. The study was conducted at the Department of Obstetrics and Gynecology and Pediatric Clinic of the University Clinical Center Tuzla. This research included 631 newborns, 331 infants were born prematurely (24- 37 gestational weeks-experimental group), while 300 infants born in time (37- 42 gestational weeks-control group). We analyzed the body weight of the newborn, Apgar scores after the first and fifth minutes, and the presence of neonatal complications in both groups.

### Statistical analysis

In the analysis of results were used Student's test,  $\chi^2$  test, Mann-Whitney and Fischer's test and Spearman correlation coefficient. The difference between samples were considered significant if  $p < 0.05$ .

## RESULTS

Table 1 shows the average body weight of newborns in the two groups. In premature infants average birth body weight was  $2382 \pm 679$  grams, while in term newborns was  $3459 \pm 452$  grams. There was a statistically significant difference in the average body weight infants in the experimental and control groups ( $t = 23.62$ ,  $p < 0.0001$ ).

Figure 1 presents the frequency of low birth weight babies in women delivered preterm infants. Weigh less than 2499 grams had 51.1% of premature infants, while 48.9% of infants had weigh more than 2500 grams.

**TABLE 1.** The average body weight infants in the experimental and control groups

Group	Body weight min.	Body weight max.	Body weight midle.	SD
Experimental	590	4050	2382	$\pm 679$
Control	2100	4750	3459	$\pm 452$

**TABLE 2.** Apgar scores at the first and fifth minutes of the experimental and control groups

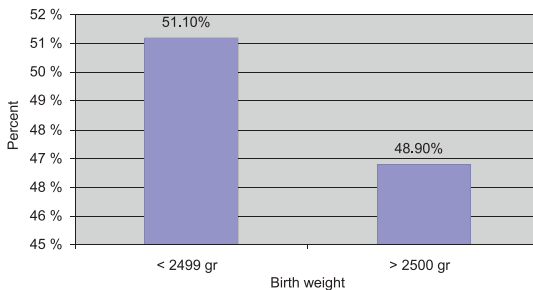
Apgar scores	Experimental group	Control group
After first minute	7.3263	8.7767
After fifth minute	7.7946	8.9133
Total	331	300

**TABLE 3.** The incidence of fetal complications in the experimental and control groups.

Fetal complications	Experimental group N (%)	Control group N (%)
RDS	82 (50%)	0
Haemorrhagio intra-cranialis	46 (28.1%)	2 (6.8%)
Encephalopath. hipox. ischemica	1 (0.6%)	4 (13.7%)
Sepsis	8 (4.8%)	0
Icterus	8 (4.8%)	9 (31.1%)
Anomalio congenitalis	14 (8.5%)	10 (34.7%)
Tachipnea	5 (3.2%)	0
Asphyxio perinatalis	0	4 (13.7%)
Total	164 (100%)	29 (100%)

Table 2 shows Apgar scores after the first and fifth minutes in both groups. Mann-Whitney test showed that the Apgar score after the first minute, significantly greater in the control group than in the experimental group ( $U=28368$ ,  $p<0.0001$ ), and the Apgar scores after the fifth minutes is significantly greater in the control group than in the experimental group ( $U=30103$ ,  $p<0.0001$ ).

Table 3 shows the incidence of fetal complications in the experimental and control groups. It was found that the fetal complications were associated to membership in a particular group ( $\chi^2=119.3$ ;  $p<0.0001$ ).



**FIGURE 1.** Newborn infants with low birth weight in the experimental group

**TABLE 4.** Representation of RDS by gestational weeks in the experimental group

Group	<32. WG N (%)	32.-33.6. WG N (%)	>34. WG N (%)	TOTAL N (%)
Experimental	30 (36.5%)	20 (24.3%)	32 (39.2%)	82 (100%)
Total delivery	45 (15%)	37 (12.3%)	218 (72.7%)	300 (100%)
Percentage proportion RDS in the total number of delivery	66.7	54.1	14.7	27.3

**TABLE 5.** Infants mortality in the experimental and control groups

Group	Mortality N (%)
Experimental	30 (9.1%)
Control	2 (0.7%)

Fetal complications were more common in premature than in term delivered infants. The chance of fetal complications in the experimental group was 9.52 times higher than in the control group (95% CI: 6.04 to 15.31).

RDS is most prevalent in the group of premature infants born before 32 weeks of gestation in relation to the total number of preterm births (Table 4). Spearman correlation coefficient was 0,469, which means that the correlation is medium size, but is statistically significant at the level of significance  $p=0.01$ , so we can say that there is a relationship between the occurrence of RDS and weeks of gestation, and it is such that if the pregnancy would terminate at an earlier weeks of gestation, the greater the possibility for new RDS.

Table 5 shows infants mortality in the two groups. Fischer's exact test has shown that the difference of infants mortality in the experimental and control group were statistically significant ( $p<0.001$ ).

**DISCUSSION**

In comparison with term delivery, a premature infant is immature and less able to adapt to conditions outside the mother's body. Two-thirds of children who were born before the age of 32 weeks of pregnancy with birth weight below 1500 grams can have a permanent handicap. Unfortunately, the

higher risk of permanent consequences and high mortality rates also have children in less risk groups. This group includes infants born between 34 and 37 weeks of gestation, especially if you are underweight, born with infection contact and with proven change the morphology of the brain (12). According to WHO with all infants birth weight below 2500 grams, regardless of the duration of pregnancy, newborns have low birth weight. The term ,premature baby, is used for infants whose intrauterine growth lasted less than 37 weeks of gestation. Therefore, preterm infants are a risk group and have high perinatal mortality, more complications in the newborn period and are more likely to infections. The later in life often have suboptimal psychomotor development and growth (13). In our study, we found that 3.3% of preterm infants weigh less than 999 grams, 9.1% had 1000-1499 grams, and 12.4% had 1500-1999 grams. Of the total number of 26.3% of preterm infants were born with a birth weight between 2000 and 2499 grams, while the highest number (48.9%) infants had more than 2500 grams birth weight. Overall, 51.1% of newborns were with birth weight less than 2500 grams. In a similar study Viledenčić et al. found that the percentage of infants who weighed less than 2500 grams was 59.2% (14). On the other hand, the weight below 1500 grams we found in 12.4% of infants, which is less than in the aforementioned study where the percentage was 16%. Of the total number, we found 3.3% of preterm infants with birth weight less than 1000 grams, while a study of Viledenčić et al. found 3% of preterm infants with this birth-weight (14). The analysis of the average body weight between the early and timely infants, we found a significant difference. The average body weight in premature infants was 2382 grams (minimum body weight was 590, and the maximum 4050 grams). Similar results were shown by Marzano et al., where the average body weight was 2241 grams (minimum body weight was 450, maximum 4300 grams) (15). In our study we found a significant difference in the average values of Apgar score after one and five minutes after birth. However, the average Apgar score in preterm infants after the first minute was 7.3 and 7.7 after fifth minutes. In infants born after 37 week gestation, average Apgar score after the first minute was 8.7 and 8.9 after fifth minutes. In the study of Marzana et al. the average Apgar score in preterm infants after the

first minute was 6.5, and the average term newborns Apgar scores at fifth minute was 8.5 (15). Analyzing neonatal complications in our study we found that the most common complication of prematurity (50%) was RDS. It is known that RDS is due to lack of surfactant and inability to maintain adequate neonatal oxygenation of blood when breathing room air. Surfactant is a chemical substance that reduces the surface tension of the alveoli and helps to maintain them open at the end of expiratory flow, thus enhancing the functional residual capacity of the lungs, reducing the surface tension in the lungs, and protecting the lungs from total collapse and possible atelectasis during expiratory flow (5). We have also shown that the lower the gestational age of the pregnancy, the incidence of RDS is higher. The largest number of infants suffering from respiratory distress syndrome and belongs to those born before 32 weeks of gestation (36.5%). Second in frequency of fetal complications in our study was intracranial hemorrhage. This complication had 28.1% of preterm and 6.8% term newborn. The study of Čurković et al. intracranial hemorrhage was present at 32.24% of preterm neonates (17). The next most frequent complication was sepsis. Complication of prematurity had occurred in 4.8%. In neonates born between 37th and 42th gestational week there were no cases of sepsis. In the study of Čurković et al. 9.21% of infants had sepsis (16). Analyzing neonatal mortality in our study we found that the mortality of preterm infants was 9.1%, while the neonatal mortality in term infants was 0.7%. Our results confirm that prematurely born children make 70-85% of perinatal mortality (17).

## CONCLUSIONS

Birth body weight and Apgar scores after the first and fifth minutes were lower in the preterm infants. Respiratory distress syndrome is the most common fetal complication of prematurity. Intracranial hemorrhage is the second most common complication of prematurity. Premature infant mortality is significantly higher than the mortality of infants born at term birth.

## COMPETING INTERESTS

The authors declare no conflict of interests.

## REFERENCES

1. World Health Organisation. Prevention of perinatal mortality. Public Health Papers 42 1969, Geneve WHO.
2. Prodan M, Petrović O. Liječenje prijevremenog poroda. *Gynecol Perinatol.* 2008;17(4):207-215.
3. Passini R, Tedesco R, Marba S, Martinez F. Brazilian multicenter study on prevalence of preterm birth and associated factors. *BMC Pregnancy and childbird.* 2010;10:22.
4. Antonović O, Gazikalović. Novorođenče. In: Davidović M and Garić B (eds). *Opstetricija.* Beograd: Novinsko-izdavačka ustanova, 1996:1115-1149.
5. Levene IM, Tupedohe ID, Thearle JM. Respiratory disorders. In: Levene IM, Tupedohe ID, Thearle JM (eds). *Neonatal Medicine.* Third edition. London: Blackwell Science Ltd, 2000:93-11.
6. Gleißner M, Jorch G, Avenarius S. Risk factors for intraventricular hemorrhage in a birth cohort of 3721 premature infants. *J Perinat Med.* 2000;28:104-110.
7. Lewis FD, Fatayyeh S, Towers VC, Asrat T, Edwards SM, Brooks GG. Pre-term delivery from 34 to 37 weeks of gestations: Is respiratory distress syndrome a problem? *Am J Obstet Gynecol.* 1996;174:525-529.
8. Orlando S. Pathophysiology of acute respiratory distress. In: Nugent J (ed): *Acute respiratory care of the neonate.* Petaluma: Nicu Ink book publishers, 1991:27-47.
9. Stefanović N. Prevencija i liječenje hijalinomembranske bolesti pluća. Treći tečaj trajnog medicinskog usavršavanja liječnika, Zagreb, 1991:28-34.
10. Crowley AP. Antenatal corticosteroid therapy: A meta-analysis of the randomised trials, 1972 to 1994. *Am J Obstet Gynecol.* 1995;173:322-335.
11. Skokić F, Balić B. Incidenca i struktura ranog neonatalnog morbiditeta. *Acta Medica Saliniana.* 1994;23(1-2):39-42.
12. Kuvačić I, Elvedij-Gašapović V. Prijevremeni porođaj. U: Kuvačić I, Kurjak A, Delemiš J. *Porodništvo.* Zagreb: Medicinska naklada, 2009:323-332.
13. Mardešić D. Novorođenče. U: Mardešić D i sar. (ur). *Pedijatrija. Školska knjiga:* Zagreb, 2000:303-395.
14. Vilendečić R, Perendija V, Savić S, Grahovac S, Ećim V, Vilendečić Z, et al. Prevremeni porođaj i perinatalni ishod. Zbornik radova, pedeseta ginekološko-akušerska nedelja SLD. Beograd, 2006:102-7.
15. Marzano S, Padula F, Meloni P, Anaceschi M. Preterm delivery at low gestational age risks factors for short latency. *Jurnal of Prenatal Medicine.* 2008;2(2):15-18.
16. Ćurković A, Sokolović D, Ćutura N, Karadžov Orlić N, Soldo V, Zamurović N, et al. Neonatalne komplikacije prevremenih porođaja. Zbornik radova, pedeset i šesta ginekološko-akušerska nedelja SLD. Beograd, 2012:100-115.
17. DiRenzo GC, Cabero Roura L and the European Assotiation of Perinatal Medicine – Study Group on „Preterm birth“. Guidelines for the management of spontaneous preterm labor. *J Perinat Med.* 2006;34:359-366.