

Prevalence of respiratory distress syndrome in premature twins compared to premature singletons

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ABSTRACT

Aim To estimate prevalence of respiratory distress syndrome in preterm twins compared to preterm singletons.

Methods This is a retrospective observational point prevalence study conducted at the level of three neonatal intensive care units. Medical records of all preterm newborns (<37 weeks of gestation) with respiratory distress syndrome treated in a two-year period were reviewed. The birth order of twins, gestational age and mortality were analysed.

Results Out of 809 preterm newborns, 104 (12.9%) were twins. Median gestational age at birth was 30.3 (IQR 31.4–34.2) weeks. Respiratory distress syndrome was diagnosed in 525 (64.9%) preterm newborns, of which 441 singletons and 84 twins. Prevalence of respiratory distress syndrome in first-born twins was not significantly higher compared with singletons, 67.3% (35/52) vs. 62.6% (441/705), respectively ($p=0.06$). Prevalence of respiratory distress syndrome in second-born twins was 94.2% (49/52), which was significantly higher compared with both singletons and first-born twins ($p<0.001$). The mortality rate of preterm newborns was significantly higher in second-born twins compared with singletons and first-born twins, 15.4% vs. 6.8% ($p<0.001$) and 15.4% vs. 5.5% ($p<0.001$), respectively.

Conclusion There was a higher risk of respiratory distress syndrome and higher mortality rate in twins compared with singletons, but only in second-born twins the difference was statistically significant.

Keywords: preterm birth, respiratory distress syndrome, twin pregnancy

INTRODUCTION

Respiratory distress syndrome (RDS) is a clinical entity that occurs predominantly in premature infants due to surfactant deficiency. It is recognized by characteristic clinical symptoms and x-ray changes (1). In addition to premature birth, which is the most important risk factor for RDS, other risk factors are perinatal asphyxia, maternal diabetes, gender, twin pregnancy and Caesarean delivery before the onset of labour (2).

The disease is a consequence of a reduced amount of alveolar surfactant, which decreases with the lower gestational age (2). Although there is evidence that surfactant appears in the lungs already around 20 gestational weeks, functionally active surfactant is present in lungs only after 85–90% of gestation has passed (3). Surfactant is a chemical substance that reduces the surface tension of the alveoli and helps to keep them open at the end of expiration, thus increasing the functional residual lung capacity (3,4) and protects the lungs from complete collapse or atelectasis during expiration (3,4). The lack of surfactant in the alveoli causes high surface tension at the end of expiration, instability of the alveoli, loss of lung volume and atelectasis (4,5). Surfactant synthesis requires normal blood pH, normal body temperature and lung perfusion (3,5). Asphyxia, hypoxemia and pulmonary ische-

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mia, especially associated with hypovolemia, hypotension and hypothermia, can reduce surfactant synthesis (5).

At the time of birth, a newborn may appear healthy and have a normal Apgar score in the first and fifth minute (6). Within the first few hours of life, a typical clinical picture develops with tachypnoea, cyanosis and indentation of the intercostal spaces (7). Auscultation of the lungs reveals only superficial and very weak breathing, often without accompanying auscultation phenomena, or rare small crepitations are heard at the top of inspiration (8). An x-ray usually shows a homogeneously reduced lung transparency, with a small granular-reticulated pattern and the so-called air bronchogram: trachea and bronchi filled with air as a negative contrast are clearly outlined against the background of poorly ventilated lungs (9). In addition to the clinical presentation and x-ray findings, the newborn has changes in the acid-base status (ABS) in the form of hypoxia, hypercapnia and mixed respiratory-metabolic acidosis (10–12).

In general, twin pregnancies are associated with a higher risk of adverse neonatal outcomes as a consequence of complex interaction of genetic and environmental factors (maternal age, parity, family history of multiple pregnancies, habits, social conditions) (13). The RDS in twin premature newborns can be expected to be more frequent, but there are no such studies in Bosnia and Herzegovina.

The aim of the study was to analyse the frequency of respiratory distress syndrome in premature twins according to birth order, gender and gestational age, to determine the mortality rate of premature twins due to RDS and to compare all these indicators with premature newborns from singleton pregnancies.

PATIENTS AND METHODS

Patients and study design

In this retrospective observational point prevalence study medical records of 809 preterm newborns (<37 weeks of gestation) admitted to the Neonatal Intensive Care Unit of the Paediatric Clinic of University Medical Centre of Sarajevo, Bosnia and Herzegovina, in the period from May 2021 to May 2023 were reviewed. The diagnosis of RDS was based on the Silverman Andersen Respiratory Severity Score (13), and x-ray findings of bilateral fine granular opacities in the pulmonary parenchyma.

Methods

Twin preterm newborns were compared mutually and to the singleton group. Obstetric estimate of gestational age by the date of the last menstrual period and ultrasound measurement of the embryo or foetus in the first trimester was used. The ultrasound measurement of the

embryo or foetus in the first trimester is the most accurate method to establish or confirm gestational age, but after the first trimester ultrasound measurements it is not so reliable for determining the gestational age (13).

Statistical analysis

The χ^2 test was used to test statistical significance between the groups. Two-sided $p \leq 0.05$ were regarded as significant.

RESULTS

Out of 809 preterm newborns, 104 (12.9%) were twins and 705 (87.1%) were singletons. The mean gestational age was 30.3 (IQR 31.4–34.2) weeks. The RDS developed in 525 (64.9%) preterm newborns, 84 (80.8%) twins and 441 (62.6%) singletons. The prevalence of RDS in preterm twins was significantly higher compared to singletons, 80.8% (84/104) vs. 62.6% (441/705) ($p < 0.001$). The comparison between only first-borns with singletons, no significant difference in the prevalence of RDS was found, 35 (out of 52; 67.3%) and 441 (out of 705; 62.6%), respectively ($p = 0.06$). However, the second-born twins had significantly higher prevalence of RDS compared with both the singletons and the first-borns, 49 (out of 52; 94.2%) vs. 441 (out of 705; 62.6%) and 35 (out of 52; 67.3%), respectively ($p < 0.001$). Mortality rate of the second-born twins was significantly higher than in the singletons and first-born twins, 15.4% (8/54) vs. 6.8% (48/705) ($p < 0.001$) and 15.4% (8/54) vs. 5.5% (3/54) ($p < 0.001$), respectively (Table 1.).

Table 1. Causes of death in studied preterm newborns

Causes of death	No (%) of died (N=60)
Complications related to prematurity*	31 (51.7)
Neonatal sepsis	11 (18.3)
Perinatal asphyxia	11 (18.3)
Congenital malformations	7 (11.7)

*respiratory distress, bronchopulmonary dysplasia, necrotizing enterocolitis, intracranial haemorrhage, patent ductus arteriosus

Deaths due to preterm birth complications were 51.7% (31/60), followed by sepsis 18.3% (11/60). Perinatal asphyxia and malformations accounted for 11.6% (7/60) and 6.7% (4/60) of all deaths, respectively.

DISCUSSION

The risk of developing RDS is related primarily to premature birth, but also to twins. To a large extent, this connection resulted from the more frequent premature delivery in twin pregnancies and thus the interrupted possibility of surfactant synthesis (12). The frequency of RDS is about 1% in the total newborn population, and is inversely proportional to the gestational age, because surfactant synthesis is most intense towards the end of

pregnancy (12). In the studied two-year period, we found the prevalence of RDS in preterm newborns of 64.9 %, which is higher than reported prevalence of RDS in the general population of preterm newborns (13). RDS develops in 60-80% of newborns below 28 weeks of gestation, at 32-36 weeks of gestation in 15-30%, while RDS is rare above 36 weeks of gestation (13). High prevalence of RDS in our study resulted from a large proportion of newborns with a very low gestational age since our study was done in a neonatal intensive care unit at the tertiary level. Twins participated in prematurity with 12.9 %, which also led to a higher frequency of RDS. Our results showed that twins were at higher risk of RDS compared with singletons, but that risk was mainly due to second-borns since they had significantly higher prevalence of RDS compared with both singletons and first-borns.

Wadhawan et al. (14) looked at short-term and long-term outcomes of more than 13,000 extremely low birth weight babies (birth weight 401–1000 g) born out of multiple births in participating centres of the Neonatal Research Network between 1996 and 2005, and they found a significantly higher need for surfactant therapy in twins and triplet births compared to singletons, and also a higher need for mechanical ventilation in triplet compared to singleton births; they also reported a higher incidence of bronchopulmonary dysplasia (BPD) among twin births compared to triplets. Higher prevalence of RDS in the second twin was probably caused by some birth complications, such as delayed extraction or breech presentation, and less likely due to a different amount of surfactant (15). Also, this could be due to higher risk of the second twin to asphyxia and growth discrepancy (16–18).

In conclusion, the results of this study confirmed the results of other authors that the twin pregnancy presents a significant risk factor of unfavourable outcome in the form of higher neonatal morbidity and mortality. This is mainly a consequence of prematurity and difficulties linked to delivery of the second twin. It is the first such research in Bosnia and Herzegovina and it can help in clinical practice.

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TRANSPARENCY DECLARATION

Conflict of interests: None to declare.

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