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Cesarean Delivery and Respiratory Distress Syndrome in Late Preterm Infants

Eni Rahmawati[1], Mekar Dwi Anggraeni, Erni Setiyowati

Nursing Department, Faculty of Health Sciences, Jenderal Soedirman University, Indonesia

Abstract. Cesarean sections (C-sections) associated with an increased risk of atopic disorders in infants. Late preterm infants born by C-sections tend to have more breathing problems especially Respiratory distress syndrome (RDS). RDS is one of the most common causes of respiratory morbidity and mortality in late preterm infants. Respiratory Distress Syndrome is one of the main causes of respiratory failure and neonatal death in premature infants and is caused by a lack of pulmonary surfactant due to fetal lung immaturity. The objectives of this research are to analyze the relationship between cesarean delivery and respiratory distress syndrome in late preterm infants. This type of research uses a type of quantitative research. The study design is a retrospective cohort study with a study cross-sectional approach. The sample in this study were 155 late preterm infants. This research was conducted in January-April 2019 in the Prof. DR. Margono Soekarjo Purwokerto. The analysis used univariate and bivariate analysis using The Chi-square test. The results of this study showed there is a significant relationship between C-sections and respiratory distress syndrome from p-value of 0.013 (> 0.05). Based on the results of this study, nurses are expected to recognize that C-sections delivery one of the risk factors of RDS in late preterm infants.

Keyword: respiratory distress syndrome, cesarean delivery, late preterm, risk factor

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1. Introduction

Cesarean sections (C-sections) delivery is the most common operation performed for the reason that it is repeated elective cesarean section, because of the major complications of uterine rupture, hysterectomy, injury to the uterine artery, bladder, and ureter. Uterine rupture may occur at the site of a previous uterine scar, usually a previous cesarean section scar. C-sections operation usually lasts 20–90 minutes. In this procedure, an abdominal incision is made below the navel in the midline and through the uterine wall [1], [2]. Delivery of C-sections can be elective, that is, it is planned for a date close to the woman's birth date for medical or other

*Corresponding author at: Jl. Dr. Soeparno, Karangwangkal, Purwokero, Indonesia 53122. Phone numbers: +62 (0281) 6572772
Corresponding email: eni.rahmawati@unsoed.ac.id

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reasons. Emergency C-sections surgery occurs after vaginal delivery has started, but difficulties with delivery or concerns about the health of the mother or fetus arise. C-sections delivery is performed when the fetus is in a transverse presentation or less frequently in the breech presentation, when the woman's pelvis is too small, the fetus is too large, or when the fetus shows signs of distress, such as abnormalities in heart function [2]. C-sections surgery is performed if the umbilical cord is pressed between the head and the wall of the birth canal (placenta previa), or if the placenta detaches prematurely from the uterus. All of these situations are dangerous for the fetus because the oxygen supply to the fetus is reduced, and proper delivery is required. In addition, C-sections surgery can prevent shoulder dystocia, fetal trauma, neonatal encephalopathy, and intrauterine fetal death [3].

C-sections delivery also carries significant risks for both the mother and the fetus. In infants, it is associated with an increased risk of atopic disorders [4]. Infants born by C-sections tend to have more breathing problems because the baby has epinephrine spikes during C-sections delivery. Previous studies have confirmed that the C-sections delivery experience does not improve respiratory performance and that only half the volume of lung fluid can be expelled at delivery [5]. Children born under C-sections are more likely to have asphyxia, asthma, and Respiratory Distress Syndrome (RDS). Babies born with this operation can breastfeed normally, although the response to breastfeeding in some babies may be slow to develop because of their breathing problems [6]

Respiratory distress syndrome (RDS) is one of the most common causes of respiratory morbidity and mortality in late preterm infants. Respiratory Distress Syndrome is one of the main causes of respiratory failure and neonatal death in premature infants and is caused by a lack of pulmonary surfactant due to fetal lung immaturity [2], [7]. Late preterm infant is a gestational age between 34-37 weeks. Surfactants produced at the late preterm infant are not ready for use. Infants with insufficient surfactant will show symptoms of tachypnea, nasal lobe breathing, intercostal and subcostal retraction, expiratory grunting. Other signs include, hypoxemia, hypercabia, and respiratory or mixed acidosis [8]. The medical intervention for RDS is the administration of synthesized pulmonary surfactant. According to previous reports, the most important risk factors for RDS were prematurity and male gender. The fact is that babies born term can also develop RDS and the baby should be admitted to the neonatal intensive care unit (NICU) for treatment of mechanical ventilators and pulmonary surfactants. RDS can occur due to incomplete emptying of lung fluid during delivery. During vaginal delivery about one-third of lung fluid is lost with pressure on the baby's chest. In the C-section the infant has a larger residual volume of pulmonary fluid so that it secretes less surfactant on the alveolar surface and therefore it is possible that a C-section delivery is at risk for RDS [9]. The objectives of this research are to analyze the relationship between cesarean delivery and respiratory distress syndrome in late preterm infants.

2. Research Method

Ethical approval was obtained from the Ethical Board of the RSUD PROF. DR. Margono Soekarjo Hospital before the study conducted (Registration No. 420 / 08893a / IV / 2019). This type of research uses a type of quantitative research. The study design is a retrospective cohort study with a study cross sectional approach. The aim of the research was to analyze the relationship between cesarean delivery and respiratory distress syndrome in late preterm infants. The research was conducted in the Prof. DR. Margono Soekarjo Purwokerto. Data were collected from the hospital medical record using the data collection sheet from January to April 2019. Involved 155 samples were analyzed using a computer software program. The variables in this study were maternal age (years old; y.o), gender of babies, birth weight (gram; g), method of delivery, and RDS. The Chi-square test was used to check for any significant relationship and statistical significance was considered in $p<0.05$. Using the coefficients of the model, the ORs were estimated with their 95% confidence intervals (CI).

3. Research Result and Discussion

The results are as follows (Table 1) shows the results of the univariate analysis of each variable with 155 samples. Respondents in the gender-balanced group, as many as 84 (54.2%) female and 71 (45.8%) male. The infant's birth weight was mostly in low birth weight (LBW:1501-2500 gram) category 142 (91.6%). The maternal age in the sample was more in the range of 20-35 years old (y.o) 94 (60.6%). The method of delivery for C-sections was more than vaginal delivery 87 (56.1%) and 88 (56.8%) of late preterm infants had complications of RDS disease.

Table 1. Univariate analyze (n=155)

Variable	Item	n (%)
Sex of babies	Female	84 (54.2)
	Male	71 (45.8)
Birth Weight	LBW (1501-2500g)	142 (91.6)
	VLBW (1000-1500 g)	13 (8.4)
	ELBW (<1000 g)	0 (0)
Age of mothers	At risk (<20 y.o or> 35 y.o)	61 (39.4)
	No risk (20-35 y.o)	94 (60.6)
Delivery method	Cesarean section	87 (56.1)
	Vaginal section	68 (43.9)
RDS	Yes	88 (56.8)
	No	67 (43.2)

The results of the bivariate analysis (Table 2) show p-value= 0.013 (P<0.05); OR= 0.441 (CI 95%: 0.230-0.845). The results of this study showed there is a significant relationship between C-sections and respiratory distress syndrome.

Table 2. Bivariate analyze (n=155)

Variable		RDS (n,%)		p value	OR (CI 95%)
		Yes	No		
Cesarean section (n,%)	No	31 (20)	37 (23.87)	.013 *	.441(.230- .845)
	Yes	57 (36.77)	30 (19.35)		

*significant at p-value < 0.05

The results of this study showed there is a significant relationship between C-sections and respiratory distress syndrome (p-value= 0.013). In theory, vaginal delivery greatly improves respiratory performance, and this effect is greater than that achieved with C-section delivery. During vaginal delivery, about one-third of the lung fluid is lost with the pressure on the baby's chest. Discharge from the lungs that begins before the birth of the labor process. Lung fluid is carried by several lymphatic pathways of the lung, upper airway, mediastinum, and pleural cavity. Previous studies cite recent evidence suggesting that fetal pulmonary fluid expression is facilitated by cilia function [2], [10]. The active sodium transport process helps the lung to push fluid from the pulmonary lumen into the interstitium, with subsequent absorption into the blood vessels [11].

The C-section is one of the most important risk factors for RDS in late preterm infants [9]. In the C-section there is less activity of amiloride-sensitive sodium channels in the alveolar epithelium after cesarean section, leading to their reduction due to fluid. In the lungs, sodium reabsorption occurs in two stages. The first step is passive movement of sodium from the apical membrane lumen into permeable sodium ion channel channels. The second step is active extrusion of sodium from the cells protecting the basolateral membrane into the serosal space [12]. Immaturity of sodium transport services contributes to RDS. There is evidence of the ability of various agents to increase fetal absorption of pulmonary fluid in pregnancy. Pharmacological therapies, such as presenting steroids have been shown to have beneficial effects on the surfactant system as well as the pulmonary community. [13].

The results of the study Fanny (2015) states that there is a relationship between C-section and neonatal asphyxia. Anesthesia in a C-section can affect blood flow by changing the vascular pressure or resistance either directly or indirectly, leading to asphyxia [14]. However, different research results were found by Marfuah (2013) that there was no relationship between the C-section and the incidence of respiratory emergency in neonates (p = 0.951). The C-section is a risk factor that can increase the severity of neonatal factors, not a factor that reduces the incidence of RDS [15]. Risk of RDS in term infants and comparing it with preterm infants. The report states that risk factors such as male gender, birth weight, and caesarean section increase the risk of RDS in preterm and term infants, while gestational diabetes and gestational hypertension are risk factors for RDS in preterm infants and neonates are moderately risk factors for months [5].

4. Conclusion

There is a significant relationship between C-sections and respiratory distress syndrome from p-value of 0.013 (> 0.05).

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6. Conflict of Interest

There is no conflict of interest in this research result

REFERENCES

[1] H. Valgeirsdottir, H. Hardardottir, and R. I. Bjarnadottir, "Complications of cesarean deliveries," *Laeknabladid*, 2010, doi: 10.17992/lbl.2010.01.06.

[2] N. R. Blue *et al.*, "Neonatal Outcomes by Mode of Delivery in Preterm Birth," *Am. J. Perinatol.*, 2015, doi: 10.1055/s-0035-1562931.

[3] Y. Li, C. Zhang, and D. Zhang, "Cesarean section and the risk of neonatal respiratory distress syndrome: a meta-analysis," *Archives of Gynecology and Obstetrics*. 2019, doi: 10.1007/s00404-019-05208-7.

[4] V. Condò *et al.*, "Neonatal respiratory distress syndrome: are risk factors the same in preterm and term infants?," *J. Matern. Neonatal Med.*, 2017, doi: 10.1080/14767058.2016.1210597.

[5] J. H. Kim, S. M. Lee, and Y. H. Lee, "Risk factors for respiratory distress syndrome in full-term neonates," *Yeungnam Univ. J. Med.*, 2018, doi: 10.12701/yujm.2018.35.2.187.

[6] W. A. Carlo *et al.*, "Respiratory support in preterm infants at birth," *Pediatrics*, 2014, doi: 10.1542/peds.2013-3442.

[7] S. Banerjee *et al.*, "Surfactant replacement therapy for respiratory distress syndrome in preterm infants : United Kingdom national consensus," *Pediatr. Res.*, vol. 86, no. 1, pp. 12–14, 2019, doi: 10.1038/s41390-019-0344-5.

[8] R. A. Polin *et al.*, "Surfactant replacement therapy for preterm and term neonates with respiratory distress," *Pediatrics*, 2014, doi: 10.1542/peds.2013-3443.

[9] J. Liu, N. Yang, and Y. Liu, "High-risk factors of respiratory distress syndrome in term neonates: A retrospective case-control study," *Balkan Med. J.*, 2014, doi: 10.5152/balkanmedj.2014.8733.

[10] G. Capogna, *Anesthesia for Cesarean section*. 2017.

[11] L. Claire and R. Vieux, "Efficacy of Antenatal Corticosteroids According to Maternal and Perinatal Factors: A Retrospective Cohort Study," *Am. J. Perinatol.*, 2015, doi: 10.1055/s-0035-1548537.

[12] R. K. Chaudary, R. Ghimire, and D. R. Kafle, "Perinatal outcome of vaginal breech delivery versus caesarean breech delivery in a tertiary care center," *J. Nepal Med. Assoc.*, 2018, doi: 10.31729/jnma.3697.

[13] D. G. Sweet *et al.*, "European Consensus Guidelines on the Management of Respiratory

Distress Syndrome - 2019 Update," *Neonatology*. 2019, doi: 10.1159/000499361.

[14] F. Fanny, "Sectio Caesarea sebagai Faktor Risiko Kejadian Asfiksia Neonatorum," *J. Major.*, 2015.

[15] M. Marfuah, W. Barlianto, and D. Susmarini, "Faktor Risiko Kegawatan Nafas Pada Neonatus Di Rsd. Dr. Haryoto Kabupaten Lumajang Tahun 2013," *J. Ilmu Keperawatan*, 2013.