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THE RELATIONSHIP BETWEEN INCIDENCE OF RESPIRATORY DISTRESS SYNDROME AND INCREASING OF TROPONIN T LEVELS IN PREMATURE NEONATES AT NEONATOLOGY WARD ADAM MALIK GENERAL HOSPITAL

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Abstract

Respiratory distress syndrome is a major cause of morbidity in low birth weight infants (LBW). Troponin T is a marker of myocardial damage in premature neonates with asphyxia where high troponin T levels found in premature neonates with respiratory distress syndrome. A Cross-sectional study was conducted in neonatology ward, H. Adam Malik hospital, Medan from November 2017 to April 2018. The inclusion criteria was premature neonates in gestational age < 36 weeks with respiratory distress syndrome. The data collected were analyzed using Chi Square test. P value < 0,05 was considered significant. Of participants 35, 30 meets the criteria. There were 23 premature neonates with respiratory distress syndrome (76,7%) and 7 premature neonates without respiratory distress syndrome (23,3%). Troponin T increases in premature neonates with respiratory distress syndrome. There were relationship between increasing troponin T level and incidence of respiratory distress syndrome in premature neonates.

Introduction

Respiratory distress syndrome is often found in neonates and a major cause of morbidity in low birth weight neonates (LBW).¹ The incidence in neonates with 28 week gestation period were 60% -80%, at 30 weeks were 25%, while at 32-36 weeks were 15-30%.^{2,3} Respiratory distress syndrome occurred due to incomplete pulmonary maturation due to surfactants deficiency. Respiratory distress syndrome is also known as hyaline membrane disease. Without surfactants, the alveoli collapses at the end of expiration, causing neonatal respiratory failure.⁴ The severity of respiratory distress syndrome could affect cardiovascular system.⁵ In severe hyaline membrane disease, cardiovascular abnormalities found include left and right ventricular systolic and diastolic physiological dysfunction, persistent pulmonary hypertension, decreased cardiac output, and can even cause hypotension until shock.⁶ Troponin T is a cardiac contractility regulating protein and normally not detected in the blood circulation. Troponin T is only detected if there is damage to heart cells, so troponin T is a sensitive and specific marker in heart damage. Troponin T is a marker of myocardial damage in neonates with asphyxia where troponin T levels are high in preterm neonates with respiratory distress syndrome.⁷

The aim of this study was to determine the relationship between increased levels of troponin T and respiratory distress syndrome in less-than-month neonates

Materials and Methods

This study used a cross sectional method to assess the relationship between increased troponin T and the incidence of respiratory distress syndrome in preterm neonates who were treated in neonatology intensive care at H. Adam Malik Hospital, Medan. The study was conducted during November 2017 - April 2018 with the number of respondents as 35 neonates. The inclusion criteria of this study: all less-than-month-old neonates who were treated in the intensive care unit of perinatology, aged 0-28 days. Exclusion criteria for this study: neonates with congenital anomaly and congenital heart disease. This study was approved by the University of North Sumatra Medical Faculty Research Ethics Committee and informed consent was obtained from parents.

The sample was collected by consecutive sampling. Research samples using venous blood. The samples were examined for blood gas analysis and troponin T and blood pressure examination. Troponin T was examined in laboratory of the Faculty of Medicine, University of North Sumatra and analyzed using the enzyme linked



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immunoassay kit method. The results of troponin T values are recorded in units of ng / ml which will be converted to micrograms per liter.

The collected data processed using computer software SPSS version 19.0 Univariate analysis using cross tab. Bivariate analysis with chi square test to assess the relationship between incidence of respiratory distress syndrome in preterm neonates with increasing in troponin T value with a significance level of $p < 0.05$. Multivariate analysis is used to find OR values.

Results

From 35 preterm neonates with respiratory distress syndrome, 5 samples were excluded because of congenital heart defects. There were 30 samples of preterm neonates with respiratory distress syndrome. Most respondents are female, and gestational age was 33-36 weeks. Most respondents with Down Score score of 4-5 is included in the category of moderate asphyxia. In neonates with respiratory distress syndrome have troponin T values ≥ 0.15 microgram / dl as many as 18 people (60%) while in neonates who do not suffer from respiratory distress syndrome with troponin T value < 0.15 microgram / dl as many as 5 people (16, 7%). Most respondents with result of blood gas analysis metabolic acidosis, PO₂ value < 80 mmHg and PCO₂ value < 35 mmHg. Most respondents with blood pressure values with mean atrial blood pressure < 33 mmHg and number of children with grand multipara.

Table1. Characteristics of research samples

Variable	Troponin T < 0,15 µg/L	Troponin T ≥0,15 µg/L	P
Sex(n,%)			
Male	3 (10)	8 (26,7)	0,16
Female	7 (23,3)	12 (40)	
Gestational age(n,%)			
< 28 weeks	0 (0)	2 (6,7)	0,329
28-32 weeks	4 (13,3)	6 (20)	
33-36 weeks	6 (20)	12 (40)	
Down score, (n, %)			
1-3	5 (16,7)	2 (6,7)	0,0001
4-5	4 (13,3)	9 (30)	
≥6	1 (3,3)	9 (30)	
Respiratory distress syndrome (n, %)			
Yes	5 (16,7)	18 (60)	0,0001
No	5 (16,7)	2 (6,7)	
Blood gas analysis (n,%)			
Metabolic acidosis			
Respiratory acidosis	1 (3,3)	13 (43,4)	0,002
Metabolic alkalosis	1 (3,3)	5 (16,7)	
Respiratory alkalosis	3 (10)	1 (3,3)	
PO ₂			
<80 mmHg			
80-100 mmHg	1 (3,3)	15 (50)	0,003
>100 mmHg	7 (23,3)	3 (10)	
PCO ₂			
<35 mmHg			
35-45 mmHg	6 (20)	14 (46,7)	0,350
>45mmHg	0 (0)	1 (3,3)	
MAP value			
<33,3mmHg			
33,3 – 70 mmHg	1 (3,3)	17 (56,7)	0,001
Number of children	9 (30)	3 (10)	



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Primipara			
Multipara	3 (10)	6 (20)	0,826
Grande multipara	4 (13,3)	6 (20)	
	3 (10)	8 (26,7)	

Table 2. Multivariate analysis of the relationship of respiratory distress syndrome and the mean of blood pressure to increase in Troponin T

Variable	P	OR	95 % CI	
			Upper	Lower
Respiratory distress syndrome	0,0001	9,000	1,325	61,138
MAP	0,0001	5,1000	0,416	56,39

Based on analysis using the chi-square test, there was a significant relationship between Down scores, respiratory distress syndrome, blood gas analysis, PO₂ values and blood pressure values with an increase in troponin T ($p < 0.05$). While the variables of gestational age, gender, PCO₂ value and number of children did not have a significant relationship with troponin T increase ($p > 0.05$). Based on the results of multivariate analysis neonates with respiratory syndrome had a 9 times tendency to increase troponin T compared to neonates who did not suffer respiratory distress (OR = 9, 95% CI) and neonates with low MAP values had a 5.1 times tendency in increasing troponin T compared to neonates with normal MAP values. (OR = 5.1, 95% CI).

Discussion

Recent awareness of the effects of cardiovascular compensation is recognized in term and preterm neonates.⁸ Respiratory distress syndrome (RDS) is associated with a low output of the left and right ventricles. Cardiac contractility is affected by acid base development. Conditions of acidosis (PH 6,8 - 7,2) both metabolic and respiratory acidosis result in decreased of contractility, while alkalosis results in increased of contractility.^{9,10} From the results of this study, troponin T values were higher in neonates with metabolic acidosis and low MAP.

Troponin T is found increased independently and can be used to predict the development of respiratory disorder. Troponin T is a marker of myocardial damage in neonates with asphyxia where troponin T levels are high in preterm neonates with respiratory distress syndrome.⁷ From the results of this study, Troponin T values were higher in neonates with respiratory distress syndrome (P value < 0.05).

Research conducted by Clark et al. assessed the levels of troponin T in the placenta of healthy infants compared to RDS infants. From this study, infants with respiratory distress with a gestational age of 31 to 42 weeks and birth weight of 1.4 kg to 5 kg found an average troponin T value of 0.01 micrograms / liter.¹¹ In a study conducted by Trevisanuto, et al. troponin T levels in neonates with respiratory distress syndrome was 0.38 microgram / liter.¹² Research conducted by Clark, et al. with taking venous blood in 113 healthy infants (average birth weight 2990 grams, 38 weeks' gestation, age 68) hours) and 49 sick babies (birth weight 1330 grams, 29 weeks' gestation, 26 hours sampling age). Troponin T values in healthy infants 0.025 micrograms / liter and troponin T values in infants sick 0.159 micrograms / liter.¹³ In other studies showed that troponin T had a 70% sensitivity and 100% specificity in determining mortality. Troponin T cutoff value in infants with less months with respiratory syndrome 0.15 micrograms / liter.¹⁴ The results of multivariate analysis in this study indicate that the variables that influence troponin T increase are the incidence of respiratory distress syndrome (OR = 9, 95% CI).

Conclusion

The results of the study show that in preterm neonates with respiratory distress syndrome have a higher troponin T value than neonates who do not suffer from respiratory distress

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