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Original Article

Can Serum Lactate Dehydrogenase Differentiate between Respiratory Distress Syndrome (RDS) and Transient Tachypnea of Newborn (TTN) in Preterm Neonates?

Asmaa Natag Moustafa[1]; Marwa Sayed Mohamed Ahmed[1]; Abdel-Azeem M. El-Mazary[1]; Noha M. Abdullah[2]

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***Correspondence:** Pediatric Department, Faculty of Medicine, Minia University, Egypt
Email: aya766906@gmail.com
Full list of author information is available at the end of the article

Abstract

Background: Respiratory distress is one of the most common causes for admission in NICU. Respiratory distress syndrome is a common cause for respiratory distress especially in the newborn while transient tachypnea of newborn TTN is a common cause in fullterm infants especially who delivered by caesarean section. **Aim of the work**: to assess the value of lactate dehydrogenase serum levels on differentiating between RDS and TTN in Neonates suffering from respiratory distress. **Methods**: The study is a cross sectional study conducted on 90 neonates delivered by cesarean section and suffering from respiratory distress recruited from neonatal intensive care unit during the period from April 2023 to November 2023. They were classified into two groups: group I: included 45 neonates who suffered from RDS and group II: included 45 neonates who suffered from TTN diagnosed clinically and radiologically. In addition to history taking and clinical examination and chest x-ray; the following laboratory investigations were done: Serum lactate dehydrogenase level, complete Blood Count (CBC), CRP and ABG. **Results**: Our results showed that serum LDH level is significantly higher (p value=0.001) in RDS neonates (mean= 1040±110 in 1st day and 1482 ±170 in the 3rd day) than in TTN neonates (mean=898±90.6 in 1st day and 709±211 in the 3rd day). **Conclusion:** Lactate dehydrogenase (LDH) serum levels can differentiate between respiratory distress syndrome and transient tachypnea of newborn in neonates. LDH levels were higher in neonates suffering from RDS

Key words: RDS, TTN. Lactate dehydrogenase enzyme

Introduction

A benign, self-limiting syndrome known as transient tachypnea of the newborn (TTN) can occur in newborns at any gestational age and manifest itself immediately after birth. It is brought on by a delay in the fetal lung fluid's clearance during delivery, which results in tachypnea, respiratory distress, and inefficient gas exchange. It frequently presents a serious diagnostic conundrum in the nursery when caring for newborns experiencing respiratory distress.[1] Requiring oxygen supplementation within 24 hours of delivery in order to maintain a saturation over 85%, neonatal respiratory distress syndrome (RDS) is defined as the clinical manifestations of early neonatal respiratory distress with consistent chest radiologic features. Affecting approximately 1% of babies, it continues to be the leading cause of early mortality and morbidity during infancy and youth.[2]

Low birthweight, low gestational age, maternal diabetes, maternal age, and multifetal pregnancy are possible risk factors for neonatal RDS. [3]

The cause of neonatal respiratory distress syndrome (RDS) is a surfactant shortage brought on by either insufficient surfactant synthesis or surfactant inactivation in the setting of developing lungs. Both variables are impacted by premature birth, which directly contributes to RDS. [4]

Lactate dehydrogenase in serum when a child is sick, tissue perfusion markers must be monitored in order to detect the illness early and begin appropriate treatment as soon as possible. It has been suggested that lactate dehydrogenase (LDH) is a sign of tissue injury. Numerous investigations on adults, children, and neonates have shown that improved survival relates to blood LDH level normalization. LDH levels at the time of pediatric age may be positively correlated with the prognosis of the illness. Several LDH concentration measures are helpful in determining the prognosis and therapy response [5].

Patients and Methods

The study is a cross sectional study conducted on neonates who were recruited from neonatal intensive care unit-Minia university hospital for gynecology & obstetrics and children during the period from April 2023 to November 2023.

They were classified into two groups:

Group I: included 45 neonates who suffered from RDS and group II included 45 neonates who suffered from TTN

Inclusion criteria:

Neonates in first 3 days of life who suffering from RDS or TTN delivered by cesarean section

Exclusion criteria:

Neonates who will suffer from RD from any causes other than RDS and TTN and neonates who will be delivered vaginally or be assisted delivery to fix the mode of delivery to avoid its affection in the results of our parameters

Patients were subjected to:

Full history taking:

Name, date of birth, sex, gestational age, maternal history, history of abortion, history of any maternal drugs, mode of delivery, order of delivery, history of other sibling incubated, history of sibling died.

Thorough clinical examination

A) Complete general examination

Anthropometric measure: Body weight and height, weight in kilogram by the square of the height in meters, vital signs: heart rate, respiratory rate, blood pressure and temperature, abdominal examination, chest and heart examination, neonatal reflex, neurological examination.

Measurement of O2 saturation and chest x ray were done

Laboratory investigations:

Serum lactate dehydrogenase level, complete blood count (CBC), CRP and ABG

Ethical Considerations:

The hospital ethics committee approved this study and a written consent was

obtained from each patient caregiver. (Approval number: 595/2023)

Data management and analysis

Before the data were imported into IBM SPSS, a statistical program for social science research, version 27, they were inputted, amended, coded, and updated. For quantitative data that was not parametric, the means, standard deviations, and ranges were given; for parametric data, these were the median and inter-quartile range (IQR). Quantitative data was also displayed using numbers and percentages. The independent t-test, the Chi-square test, or the Fisher exact test were used to evaluate the qualitative data between groups; the Mann-Whitney test was used for non-parametric distributions.

The Wilcoxon Rank test was used to compare the quantitative data from two paired groups with a non-parametric distribution, while the Paired t-test was used to analyze the parametric data from two groups. Within the same group, a relationship between two quantitative parameters was established using Spearman correlation coefficients. To determine the optimal cut off point, the investigated marker's area under the curve (AUC), sensitivity, specificity, positive predictive value, and negative predictive value were analyzed using the receiver operating characteristic curve (ROC). We examined the factors that contribute to an inadequate weaning process using both univariate and multivariate logistic regression analysis. A 95% confidence interval and a 5% allowable margin of error were established. As a result, a p-value of less than 0.05 was regarded as significant.

Results

Our results showed that serum LDH level is significantly higher (p value=0.001) in RDS neonates (mean= 1040±110 in 1st day and 1482 ±170 in the 3rd day) than in TTN neonates (mean=898±90.6 in 1st day and 709±211 in the 3rd day).

Table (1): Demographic data of the studied cases

Demographic data		RDS (N=45)	TTN (N=45)	P value
Gestational Age	Mean ± SD (Range)	34±1.9 30:37	33.8±1.9 30:37	0.89
Sex	Male Female	24(53.3%) 21(46.7%)	26(57.8%) 19(42.2%)	0.67
Birth weight	Mean ± SD Median (Range)		2.2±0.5 2.3(1.2:3)	0.94
Mode of delivery	Normal CS	0 45(100%)	0 45(100%)	—
2±0.6 2.4(1:3.1)	PROM	18(40%)	14(31.1%)	0.37
	PIH	18(40%)	14(31.1%)	0.37
	GDM	4(8.9%)	1(2.2%)	0.36
	Hypothyroidism	9(20%)	4(8.9%)	0.23
APAGAR at 0 min	Mean ± SD Median (Range)	6.1±0.3 6(6:7)	7.2±0.5 7(6:8)	<0.001*
APAGAR 5 min	Late onset Other	7.1±0.3 7(7:8)	8.2±0.5 8(7:9)	<0.001*
Antenatal steroid	Positive Negative	36(80%) 9(20%)	7(15.6%) 38(84.4%)	<0.001*

Table (2) Comparison between RDS cases and TTN cases regarding LDH

LDH	RDS (N=45)	TTN (N=45)	P value
LDH first day Mean ± SD (Range)	 1040±110 (867:1300)	 898.5±90.6 795:1000	 <0.001*
LDH third day Mean ± SD (Range)	 1482±170 1027:1789	 709.8±211 249:1402	 <0.001*
P value	<0.001*	<0.001*	

Table (3): Data of ROC curve analysis for LDH in first day for prediction of RDS

AUC	95% CI	Cut off value	P value	Sensitivity	Specificity	PPV	NPV
0.90	**0.84:0.96**	**>926**	**<0.001***	**93.3%**	**66.7%**	**73.6%**	**90.9%**

** significant at p value <0.05*

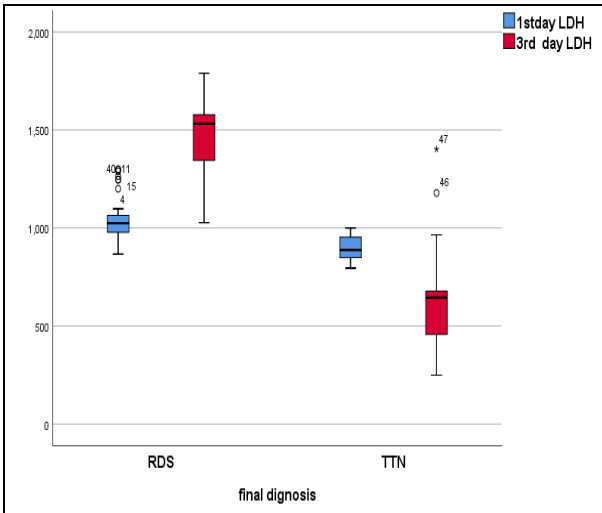

Fig (1) Box plot represent change in LDH between RDS cases and TTN cases

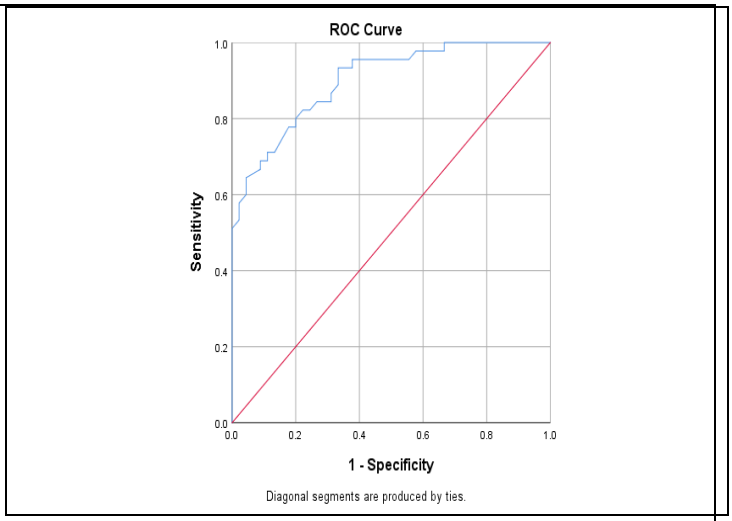

Fig (2): ROC curve analysis for LDH in first day for prediction of RDS

Discussion

Tachypnea, retraction, grunting, and/or cyanosis are signs of respiratory distress (RD), which is the most common reason for a newborn to be sent to the neonatal intensive care unit (NICU) [2]. Respiratory or non-respiratory factors (cardiac, neurological, metabolic, hematological, and other) might cause RD. Respiratory distress syndrome (RDS) and transient tachypnea of newborn (TTN) are the most frequent respiratory causes of respiratory disease (RD) in neonates. [6]

Neonatal respiratory disease syndrome (RDS) is a common respiratory illness that affects newborns. It is primarily associated with preterm neonates due to

immature type 2 pneumocytes. Pneumocytes secrete surfactant, which helps the alveoli expand during inspiration and prevents atelectasis and collapse of the alveoli during expiration. Males are more likely than females to be affected by RDS. One of the pathogenetic pathways leading to human newborn RDS is the development of immature epithelial Na+ channels. [7].

Our results showed that serum LDH level is significantly higher (p value=0.001) in RDS neonates (mean= 1040±110 in 1st day and 1482 ±170 in the 3rd day) than in TTN neonates (mean=898±90.6 in 1st day and 709±211 in the 3rd day), this result agrees with (Lee, et al 2021) who suggests that a raised LDH on day 1 reflect respiratory distress in the absence of perinatal asphyxia [8].

LDH levels during the first day were 1337.2 ± 285.3 for RDS and 1205.6± 399.0 for TTN, suggesting a range of 1051.9-1622.5 and 806.6–1604.6, respectively. and of predictive value as it increases with progression in RDS and decreases on the 3rd day in TTN, this is in agreement with other reports [9,10] who concluded that elevated LDH serum levels could be used as predictors for the severity of neonatal RDS.

Conclusions

Lactate dehydrogenase (LDH) serum levels can differentiate between respiratory distress syndrome and transient tachypnea of newborn in neonates. LDH levels were higher in neonates suffering from RDS

Data Availability

The datasets used and/or analysed during the current study available from the corresponding author on reasonable request.

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Author's contributions

AN helped in the study design, acquisition of data, and drafting the manuscript. AE and MS was responsible for conception of the idea, study design, analysis of the data, and drafting of the first manuscript. NA was responsible for analysis and interpretation of the data, writing the manuscript, and responding to the reviewer comments. MS and NA helped in the

acquisition of data, management of the patients, and revising the manuscript. All authors approved the manuscript and agreed to be accountable for all aspects of the work.

Conflict of interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper

Author's details

[1] Pediatric department, faculty of Medicine, Minia University, Egypt

[2] Clinical-pathology department, faculty of Medicine, Minia University, Egypt

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