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Original Article

The Rule of Inhaled Salbutamol on The Outcome of Transient Tachypnea of Newborn

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Abstract

Background: Transient Tachypnea of newborn is one of the most common respiratory problems in newborns. The cause of development of TTN is failure of transition from intrauterine to extra uterine life due to delay in absorption of lung fluids.

Objective: studying the effect of inhaled salbutamol on outcome of transient tachypnea of newborn.

Patients and Methods: This prospective study was attended at department of neonatology at El Azhar (Assuit) University & Sohag Teaching Hospital: Group I (50 cases): infants in this group receive salbutamol inhalation. Group II (50 cases): infants in this group don`t receive salbutamol inhalation.

Results: There were insignificant differences between two groups as regard needing of oxygen support and duration of oxygen as in salbutamol group lower number of cases needs oxygen support and cases that need it had lower duration versus no salbutamol group (P-Value < 0.001). There was a significant decrease in enteral feeding initiation time (P-value < 0.001) and hospital stay among cases received salbutamol versus no salbutamol (P-value <0.0001).

Conclusion: The current study indicated that administration of salbutamol in treatment of TTN patients causes improvement in the clinical parameters, as well as the initiation of oral feeding, a reduction in the need for oxygen therapy, a reduction in the need for advanced respiratory support and the duration of hospitalization

Key words: Inhaled salbutamol, Transient Tachypnea of Newborn, TTN

Introduction

Transient tachypnea of the newborn (TTN) is among the most common causes of respiratory distress in the newborn period, affecting 0.5%– 4% of all late preterm and term neonates. The symptoms of respiratory distress typically start within the first several hours after birth and result from failure of adequate absorption of fetal lung fluid. Studies have consistently shown that risk factors for TTNB include prematurity, birth by cesarean delivery, and male sex [1].

The common clinical picture consists of mild to moderate respiratory distress in late preterm or term neonates. Symptoms are generally transient, with infants usually improving within 24–48 h but the respiratory disorder may occasionally be more severe [2].

Infants with TTN generally present within the firrst few minutes to hours after birth. They have signs of respiratory distress such as tachypnea (respiratory rate > 60 breaths/min), nasal flaring, grunting, and intercostal, subcostal, and/or suprasternal retractions. On auscultation, breath sounds may be diminished, crackles may be appreciated, or lung fields may be clear. Tachycardia may often be associated. Newborns with TTN may also have cyanosis and need supplemental oxygen , but usually no more than Fioo2 of 0.40 [3].

Fetal catecholamines (adrenaline and glucocorticoids) are released through the stimulation of beta-adrenergic receptors in alveolar type 2 cells in response to labour stress. Such conditions result in an increase in epithelial sodium channels and sodium-potassium triphosphates (Na-K-ATPase) pumps on the surface of the membrane and, consequently, the respiratory active mode transits from the secretion of chloride and liquids to the reabsorption of sodium [4].

Criteria used to diagnose TTN were as follows: clinical signs of dyspnea (including tachypnea, grunting, foaming at the mouth, flaring, retractions, or respiratory distress) [5].

Salbutamol shortens the time of oxygen therapy in newborns with transient tachypnea, but it has little impact on the need for respiratory assistance or any other related outcomes [6].

Inhaled Salbutamol can reduce the time spent on respiratory support and hospitalization, as well as the time spent on enteral feeding, in TTN patients with mild to severe respiratory symptoms, without causing any side effects during follow-up [7].

The aim of this study was to study the effect of inhaled salbutamol on the outcome of transient tachypnea of newborn.

Methods

This prospective study was attended at department of neonatology at Assuit El Azhar University Hospital & Sohag Teaching Hospital: Group I (50 cases): infants in this group receive salbutamol inhalation. Group II (50 cases): infants in this group don`t receive salbutamol inhalation.

Inclusion criteria: Completed >36 weeks and diagnosed as having TTN according to clinical and radiological findings.

Exclusion Criteria: cases having congenital heart diseases, Meconium aspiration, Sepsis and pneumonia.

Research Methodology: Selection method: randomized.

All participants were subjected to the following: Clinical examination: inspection of chest, counting respiratory rate, auscultation of air entry, abnormal sounds, heart rate and murmures, Blood oxygen saturation, Fraction of inspired oxygen (Fio2), Complete blood count and arterial blood gases, chest X ray. TTN clinical scorings are extracted from the recordings. The scoring system for respiratory distress used in the hospital as follow [4]:

Item	0 point	1 point	2 point	3 point
Expiratory grunting	None	Intermittent	Continuous	____
Supraclavicular retraction	None	Mild	Moderate	Severe
Subcostal retraction	None	Mild	Moderate	Severe
Cyanosis	None	At extremities	Central	_____
Nasal flaring	None	Mild	Moderate	Severe

Treatment: Salbutamol inhalation with dose of 0.15 mg/ kg / day given every 6 hours for 72 hours.

Ethical consideration: A written consent was obtained from parents of all cases prior to treatment plan, and benefits from participation in the research were explained to parents of cases.

Statistical analysis

Data were fed to the computer and analyzed using IBM SPSS software package version 20.0. (Armonk, NY: IBM Corp). Qualitative data were described using number and percent. The Kolmogorov-Smirnov test was used to verify the normality of distribution Quantitative data were described using range (minimum and maximum), mean, standard deviation, median and interquartile range (IQR). Significance of the obtained results was judged at the 5% level. The used tests were: Chi-square test. For categorical variables, to compare between different groups, Fisher's Exact or Monte Carlo correction, correction for chi-square when more than 20% of the cells have expected count less than 5 and Student t-test used for normally distributed quantitative variables, to compare between two studied groups. Mann Whitney test used for abnormally distributed quantitative variables, to compare between two studied groups while Wilcoxon signed ranks test for abnormally distributed quantitative variables, to compare between two periods.

Results

Table (1): This table shows that there were insignificant differences

between two groups as regard demographic data.

Table (2) This table shows that the most common risk factors in studied cases according to maternal history: were born by CS in 82% in salbutamol group and 88% in non- salbutamol group followed by premature delivery in 42% and 48% respectively, SGA in 40% and 38% respectively but there was insignificant differences between two groups as regard maternal risk factors.

Table (3) This table shows that there were insignificant differences between two groups as regard APGAR score 1,5 mins p-value 0.709, 0.666 respectively.

Table (4):This table shows that there were insignificant differences between two groups as regard Grade of distress and Echo findings.

Table (5): This table shows that there were significant differences between two groups as regard Grade of distress between two groups p-value<0.0005.

Table (6): This table shows that there was significant decreased in enteral feeding initiation time among cases received salbutamol versus no salbutamol p-value <0.001.

Table (7): This table shows that there was significant improvement in both groups with higher improvement in Salbutamol group.

Table (8): This table shows that 92% of cases received salbutamol needs oxygen therapy and 8% needs CPAP in comparison to other group with no salbutamol 60% needs oxygen therapy and 40% needs CPAP

Table (9): This table shows that there was significant decreased in hospital stay among cases received salbutamol versus no salbutamol p-value <0.0001.

Discussion

In the current study we found that there were insignificant differences between two groups as according to Gestational age and type of delivery (p-value 0.814, 0.799 respectively), there were insignificant differences between two groups as regard maternal diseases during pregnancy p-value 0.964, there

were insignificant differences between two groups as regard APGAR score 1,5mins p-value 0.709, 0.666 respectively.

Salama et al [8] also agree with our result and showed that There was no a significant difference between the salbutamol and control groups in gender, gestational age, weight at birth, maternal history of asthma, delivery type, and 1st - and 5th -minute Apgar score.

In current study the most common risk factors in studied cases was born by CS in 82% in salbutamol group and 88% in non-salbutamol group followed by premature delivery in 42% and 48% respectively, SGA in 40% and 38% respectively but there was insignificant differences between two groups as regard maternal risk factors

According to Hansen et al. [9] data from 34,458 newborns in Denmark at a single university hospital, which showed that infants delivered by ECS at 37 weeks had a 10% incidence of respiratory morbidity (defined as TTN, RDS or pulmonary hypertension of the newborn [PPHN]) compared with 2.8% among infants delivered vaginally (OR: 3.7; 95% CI: 2.2–6.1). At 40 weeks, the rate of respiratory morbidity with ECS decreased to 1.5% and there was no significantly different from the respiratory rate seen in babies with vaginal deliveries.

When the risk of respiratory morbidity after ECS in each gestational week was compared with the risk after intended vaginal delivery at 40 weeks' gestation, the risk decreased from seven-times higher at 37 weeks, to three-times higher at 38 weeks, whereas the relative risk at 39 weeks was no longer statistically significant, suggesting that a reduction in neonatal respiratory morbidity may be obtained if we delayed ECS until 39 completed gestational weeks [9,10].

In the current study we found that there was a significant improvement in grade of distress after treatment in salbutamol group versus no salbutamol (p-value 0.001).

In agreement with our result Babaei et al [11] showed that According to the results, there were significant differences between the two groups at different time periods in terms of the distress scores (P<0.05).

In the current study we found that there was significant decreased in enteral feeding initiation time among cases received salbutamol versus no salbutamol (p-value <0.001).

Kim et al reported on initiation of oral feeding and found no significant diHerence between salbutamol and placebo (MD -16.40 days, 95% CI -43.40 to 10.60; 1 study, 40 infants) [10].

In the current study we found that there were insignificant differences between two groups as regard TTN score before treatment p value 0.77 but after there was significant improvement in both groups with higher improvement in Salbutamol group p-value <0.001.

Mousavi et al. showed that salbutamol administration can result in the significant reduction of respiratory distress score which was in agreement with the results obtained from this study (P<0.05) [12].

In the current study we found that there was significant differences between two groups as regard needing of oxygen support and duration of oxygen as in salbutamol group lower number of cases needs oxygen support and cases who needs it had lower duration versus no salbutamol group p value < 0.001.

Kim et al reported that there is significant reduction in the duration of oxygen therapy in the salbutamol group compared to the placebo group (MD -43.10 hours, 95% CI -81.60 to -4.60; 1 study, 40 infants; P value < 0.01) [10].

In the current study we found that there was significant decreased in hospital stay among cases received salbutamol versus no salbutamol p-value< 0.0001.

Kim et al reported on duration of hospital stay and found no significant difference between salbutamol and placebo (MD -0.30 days, 95% CI -2.62 to 2.02; 1 study, 40 infants) [10].

Conclusions

The results of the our study indicated that use of salbutamol in treatment of TTN patients causes improvement in the clinical parameters, as well as the initiation of oral feeding, reduction in the need for oxygen therapy, a reduction in advanced respiratory support need and the duration of hospitalization

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Author's contributions

AH conceptualized the work and designed the study and participated in data analysis, interpretation of data as well as drafting of the article. IL approved the final the version to be published. KH conceptualization and study design, data collection, interpretation of data, revision of draft critically for important intellectual content; and final approval of the version to be published. AH and KH study design, interpretation of data, revision of draft critically for important intellectual content and final approval of the version to be published

Conflict of interest

The authors declare that they have no competing interests

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References

1. Thomas A. Parker, John P. Kinsella, 2018, Avery`s Diseases of Newborn, Tenth Edition, page 668e3.
2. Raimondi, F., Yousef N., et al. "A multicenter lung ultrasound study on transient tachypnea of the neonate." Neonatology 2019; 115(3): 263-268.

3. Hagen, E., Chu A, Lew C, et al. "Transient tachypnea of the newborn."2017; 18 (3): e141-e148.
4. Malakian A, Dehdashtian M, Aramesh MR, Aletayeb MH, Heidari S, The effect of salbutamol on TTN , Journal of chienese Medical Association 2018; 81(11): 990 – 997.
5. Li J, Wu J, Du L, Hu Y, Yang X, Mu D, Xia B. Different antibiotic strategies in transient tachypnea of the newborn , European Journal of Pediatrics 2015:1217–1223.
6. Moresco L, Bruschettini M, Cohen A, et al. Salbutamol for transient tachypnea of the newborn. Cochrane Database Syst Rev 2016; (5): 53-58 CD011878.
7. Mohammadzadeh I, Akbarian-Rad Z, Heidari F, et al 2017. "The effect of inhaled salbutamol in transient of tachypnea of the newborn: a randomized clinical trial." Iranian Journal of Pediatrics.2017; 27 (5): 27-33
8. Salama AA, El-Seheimy LA, Elsamanoudy MI 2020. Inhaled Salbutamol for the Treatment of Transient Tachypnea of the Newborn. IJMA 2020; 2(2): 457-461.
9. Hansen AK, Wisborg K, Uldbjerg N, et al 2008. Risk of respiratory morbidity interm infants delivered by elective caesarean section: cohort study. BMJ 2008; 336:85–87.
10. Kim M.-J, Yoo JH, Jung JA, et al. "The effects of inhaled albuterol in transient tachypnea of the newborn." Allergy, asthma & immunology research.2014; 6 (2): 126-130.
11. Babaei H, Dabiri S, Mohammadi Pirkashani L, et al. Effects of Salbutamol on the Treatment of Transient Tachypnea of the Newborn. Iranian Journal of Neonatology2019; 10 (1): 23-28
12. Mussavi M, Asadollahi K, Kayvan M, et al. "Effects of nebulized albuterol in transient tachypnea of the newborn a clinical trial." Iran J Pediatr 2017; 27 (3): 79-87

Table (1): Comparison between the two studied groups according to demographic data

	Group I Salbutamol (n = 50)		**Group II No salbutamol (n = 50)**		**Test of Sig.**	**P**
	No.	**%**	**No.**	**%**		
Sex						
Male	26	52.0	28	56.0	χ^2= 0.161	0.688
Female	24	48.0	22	44.0		
Mother's age						
Min. – Max.	25.0 – 34.0		25.0 – 38.0		t= 0.270	0.788
Mean ± SD.	29.04 ± 2.86		29.20 ± 3.06			
Median (IQR)	29.0 (26.0 – 32.0)		29.0 (26.0 – 32.0)			
Weight (kg)						
Min. – Max.	2.10 – 4.30		2.10 – 5.0		t= 0.289	0.773
Mean ± SD.	3.04 ± 0.64		3.08 ± 0.68			
Median (IQR)	2.90 (2.50 – 3.50)		2.90 (2.50 – 3.70)			

χ^2: Chi square test t: Student t-test
p: p value for comparing between the studied groups

Table (2): Comparison between the two studied groups according to maternal risk factors

Maternal history	**Group I Salbutamol (n = 50)**		**Group II No salbutamol (n = 50)**		χ^2	**P**
	No.	**%**	**No.**	**%**		
Premature	21	42.0	24	48.0	0.364	0.546
Born by CS	41	82.0	44	88.0	0.706	0.401
Asthmatic mother	6	12.0	8	16.0	0.332	0.564
Perinatal asphyxia	11	22.0	8	16.0	0.585	0.444
DM	9	18.0	8	16.0	0.071	0.790
HTN	6	12.0	6	12.0	0.0	1.000
SGA	20	40.0	19	38.0	0.042	0.838

χ2: Chi square test
p: p value for comparing between the studied groups

Table (3): Comparison between the two studied groups according to APGAR score

APGAR score	Group I Salbutamol (n = 50)	Group II No salbutamol (n = 50)	T	P
1 minute				
Min. – Max.	4.0 – 6.0	4.0 – 6.0		
Mean ± SD.	5.04 ± 0.53	5.0 ± 0.53	0.375	0.709
Median (IQR)	5.0 (5.0 – 5.0)	5.0 (5.0 – 5.0)		
5 minutes				
Min. – Max.	8.0 – 9.0	8.0 – 9.0		
Mean ± SD.	8.32 ± 0.47	8.28 ± 0.45	0.432	0.666
Median (IQR)	8.0 (8.0 – 9.0)	8.0 (8.0 – 9.0)		

t: Student t-test
p: p value for comparing between the studied groups
*: Statistically significant at $p \leq 0.05$

Table (4): Comparison between the two studied groups according to examination before treatment:

	Group I Salbutamol (n = 50)		Group II No salbutamol (n = 50)		χ^2	P
	No.	%	No.	%		
Heart examination (normal)	50	100.0	50	100.0	–	–
Chest examination (Tachypnea)	50	100.0	50	100.0	–	–
Grade of distress						
RD II	31	32	30	60		
RD III	19	38	20	40	0.04	0.8
Echo						
Normal	45	90.0	46	92.0	0.122	$^{FE}p=$ 1.000
PFO	5	10.0	4	8.0		

$\chi 2$: Chi square test FE: Fisher Exact
p: p value for comparing between the studied groups

Table (5): Comparison between the two studied groups according to examination After 3 days

After 3 days	Group I Salbutamol (n = 50)		Group II No salbutamol (n = 50)		χ^2	P
	No.	%	No.	%		
Heart examination (normal)	50	100.0	50	100.0	–	–
Chest examination (Tachypnea)	50	100.0	50	100.0	–	–
Grade of distress						
No distress	46	92	2	4	79.5	< 0.0005
RD II	0	0.00	32	64		
RD III	4	8.00	16	32		

χ2: Chi square test FE: Fisher Exact
p: p value for comparing between the studied groups
*: Statistically significant at $p \leq 0.05$

Table (6): Comparison between the two studied groups according to enteral feeding initiation:

	Group I Salbutamol (n = 50)	Group II No salbutamol (n = 50)	Test of Sig	P
Min. – Max.	22.0 – 34.0	**23.0 – 41.0**	t = 7.661*	<0.001*
Mean ± SD.	26.60 ± 3.72	**32.74 ± 4.28**		
Median (IQR)	25.0 (24.0 – 28.0)	**33.0 (29.0 – 35.0)**		

t: Student t-test

Table (7): Comparison between the two studied groups according to TTN score after treatment (3 days):

TTN score	Group I Salbutamol (n = 50)	Group II No salbutamol (n = 50)	U	P
Min. – Max.	0.0 – 5.0	2.0 – 7.0		
Mean ± SD.	3.68 ± 1.06	4.78 ± 1.06	589.50*	<0.001*
Median (IQR)	4.0 (3.0 – 4.0)	5.0 (4.0 – 5.0)		

U: Mann Whitney test
p: p value for comparing between the studied group

Table (8): Comparison between the two studied groups according to different parameters

	Group I Salbutamol (n = 50)		**Group II No salbutamol (n = 50)**		**Test of Sig.**	**P**
	No.	**%**	**No.**	**%**		
Respiratory support						
Oxygen cannula	46	92.0	30	60.0	χ^2= 14.035*	<0.001*
NCPAP	4	8.0	20	40.0		
Duration of need for oxygen therapy (hour)	**(n = 46)**		**(n = 30)**			
Min. – Max.	12.0 – 35.0		45.0 – 90.0		U= 0.0*	<0.001*
Mean ± SD.	23.42 ± 6.71		67.40 ± 12.69			
Median (IQR)	23.50 (18.0 – 28.50)		65.0 (56.0 – 76.0)			

χ2: Chi square test U: Mann Whitney test
p: p value for comparing between the studied groups
*: Statistically significant at $p \leq 0.05$

Table (9): Comparison between the two studied groups according to hospital stay:

Hospital stay (days)	No salbutamol group n=50	Salbutamol group n= 50	Test	P-value
Mean ± SD	5.08 ± 1.14	3.12 ± o.43	-11.358	<0.0001

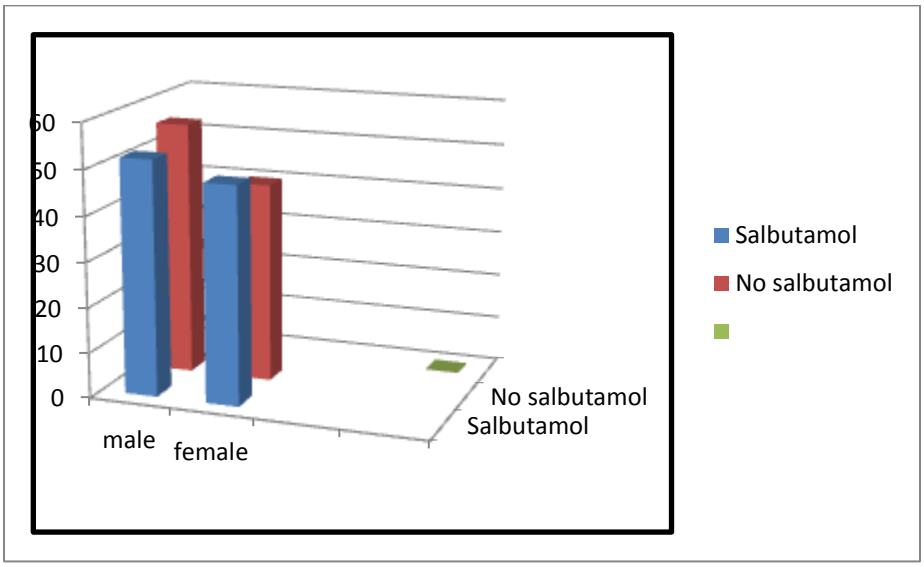

Figure (1): Comparison between the two studied groups according to sex.

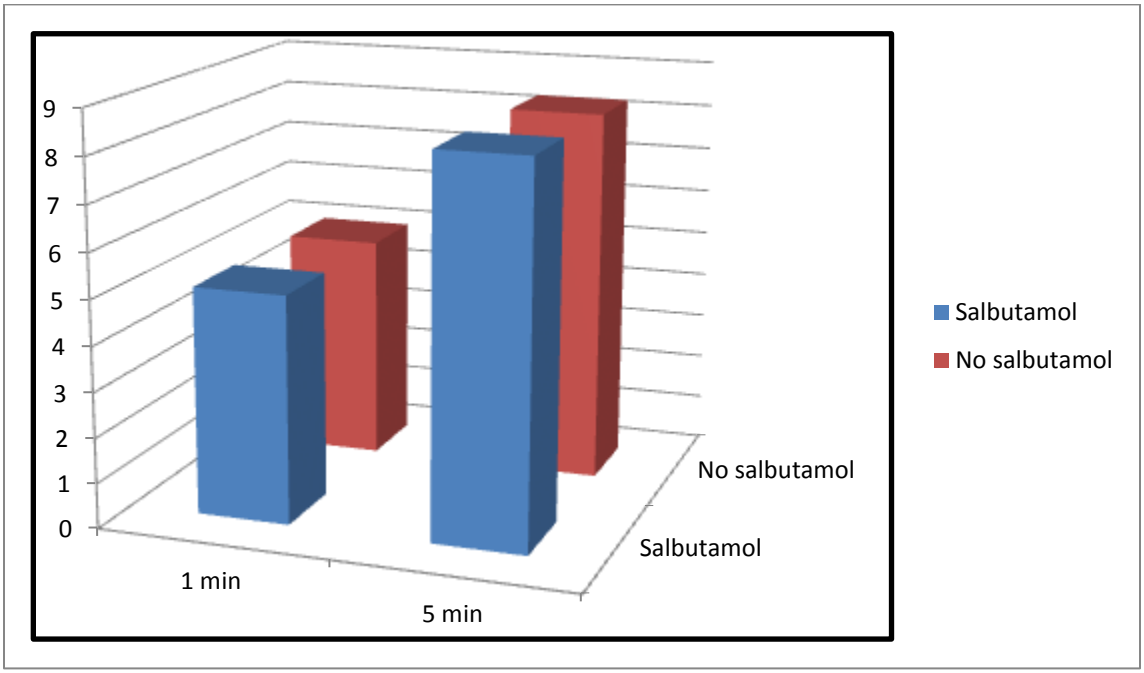

Figure (2): Comparison between the two studied groups according to Apgar score.

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