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**RESEARCH ARTICLE**

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**EFFICACY OF SALBUTAMOL AND LASIX IN EARLY RESOLUTION OF TRANSIENT TACHYPNEA OF NEWBORN**

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**Abstract**

**Objective:** To determine the efficacy of Salbutamol and Lasix in early resolution of transient tachypnea in newborns.

**Methodology:** It was a randomized clinical trial. The study was conducted in Combined Military Hospital (CMH) during the period between September 2023 and February 2024. In this study, we enrolled 120 neonates; they were randomly divided into two groups.

Salbutamol (Group A), 0.20 ml 0.9% Salbutamol added to each nebulizer cap after a total of 2.5 ml; Lasix (Group B), Furosemide at a dose rate of 2 mg / kg. Both groups received the same basic treatment, which consisted of intravenous supplementation with fluids, parenteral nutrition, and supplementary oxygen as needed; analgesia for patient comfort, as requested; and appropriate antibiotic therapy. SPSS version 26.0 was used to analyze the data.

**Results:** The average ages for the infants under Salbutamol and Lasix were 8.92 ± 5.24 and 10.55 ± 5.11 days, respectively. In the Salbutamol group, 41.7% were males, while 58.3% were females; in the Lasix group, 46.7% were males, compared to 53.3% female.

The breathing rate for the Salbutamol versus Lasix groups was 32.55 ± 4.14 bpm versus 33.88 ± 3.79 bpm, respectively (p = 0.068); the heart rate was 114.83 ± 11.41 bpm versus 121.22 ± 17.83 bpm, respectively (p = 0.021). Oxygen saturation was 88.20 ± 3.89% and 86.53 ± 5.46% in the Salbutamol and Lasix groups, respectively (p = 0.057). The general blood count was 9.0 ± 4.21 cells/mcL for Salbutamol and 9.81 ± 4.57 cells/mcL for Lasix (p = 0.317). Blood sugar was 113.82 ± 21.35 mg/dL for Salbutamol as opposed to 124.20 ± 19.74 mg/dL for Lasix (p = 0.007).

**Conclusion:** It is to be concluded that both Salbutamol and Lasix demonstrated notable impacts on clinical markers and aided in managing transient tachypnea of the newborn. Salbutamol showcased advantages for certain parameters, while Lasix proved more efficacious for others. These discoveries imply that either drug serves as an effective therapeutic alternative, with treatment selection dependent on the patient's clinical presentation and response over time. Further investigation could optimize regimens and enhance neonatal prognosis moving forward.

**Keywords:** Early Resolution, Lasix, Newborn, Salbutamol, Transient Tachypnea

**Introduction**

Transient tachypnea of the newborn (TTN) commonly affects infants in their first few hours, especially those delivered via Cesarean section or whose mothers had diabetes [1]. While typically resolving within two to three days with support, some seek faster recovery and shorter hospitalization[2].

The beta-agonist bronchodilator salbutamol, used for asthma and other conditions involving constricted airways, works by relaxing muscles and expanding airflow [3]. Its potential for managing TTN stems from boosting fluid evacuation from the lungs through beta-adrenergic stimulation, thereby perhaps hastening symptom resolution. Some infants displayed complex clinical presentations confounding diagnosis or profound respiratory distress necessitating intubation and mechanical support[4].

However, salbutamol's bronchodilation and lung fluid clearance promised swift relief of symptoms. Additional study remains essential to substantiate whether expediting convalescence through this or other means safely truncates time necessitating medical observation[5]. Lasix, a diuretic renowned for draining fluid overload throughout the body by inducing diuresis, theoretically could assist in eliminating surplus pulmonary liquid, thereby bettering respiratory function [6].

In developing nations such as Pakistan with constrained resources and overburdened NICUs, shortening the duration of stay for neonates is imperative.

Though typically benign, TTN demands close monitoring and supportive care often spanning various days [7]. To address this, we implemented a randomized controlled experiment to assess the effectiveness of Salbutamol and Lasix in reducing oxygen reliance and hospital stay length for infants alongside early resolution of TTN in newborns.

**Methods and Materials**

A randomized control trial was conducted at Combined Military Hospital (CMH) Quetta from September 2023 and February 2024. Prior to the conduction of the study, informed consent was obtained from the parents of the newborns. After informed consent from the parents, data collection was initiated.

A non-probability consecutive sampling technique was applied to perform patient recruitment into the study. A total of 120 newborns aged below 01 month were enrolled in the study. All neonates diagnosed with TTN subject to the clinical and radiological features by the consultant neonatologist were included. Those who had a history of meconium aspiration, early onset neonatal sepsis, born through vaginal delivery and those had congenital heart disease were excluded from the study.

Babies were randomly assigned to two groups. Group A was administered 0.2 ml Salbutamol in 2 ml of 0.9% normal saline by nebulizer, while group B received 2 mg/kg intravenous Furosemide. Both sets of neonates received IV fluids, oxygen, and antibiotics.

Upon admission, respiratory rate, heart rate, oxygen saturation, capillary blood gases, and baseline investigations including complete blood count, blood sugar, and serum electrolytes were assessed. Moreover, a chest X-ray and TTN scores (determined using the respiratory distress assessment instrument) were obtained at admission and at 1, 2, 4, and 6 hours post-admission.

Data entry and analysis were performed through Statistical Package for Social Sciences (SPSS) version 26. Descriptive statics were calculated. The independent sample t-test was used to compare the salbutamol and lasix group at 5% level of significance.

**Results**

The study included a total of 120 newborns treated for transient tachypnea of the newborn (TTN), divided into two groups: 60 received salbutamol and 60 received furosemide (Lasix). The mean age of infants in the salbutamol group was 8.92 ± 5.24 days, while in the Lasix group, it was 10.55 ± 5.11 days.

Further, a similar gender distribution was evident in the treatment groups, with 41.7% males and 58.3% females in the salbutamol group, and 46.7% males and 53.3% females in the Lasix group.

The average gestational age was 38.47 ± 2.48 weeks for the salbutamol group and 38.12 ± 2.61 weeks for the Lasix group. Birth weights were similar, at 2.56 ± 0.53 kg for the salbutamol group and 2.60 ± 0.52 kg in the Lasix group. Also, within both groups, the division between elective and emergency C-sections was similar: 61.7% elective versus 38.3% emergency (Table 2).

The study investigated the efficacy of administration of salbutamol and IV furosemide (Lasix) in treating TTN. There was no difference between both groups in the respiratory rate (32.55 ± 4.14 bpm for salbutamol vs 33.88 ± 3.79bpm for Lasix; p=0.068).

Heart rate was significantly lower in the salbutamol group (114.83 ± 11.41 bpm) compared to the Lasix group (121.22 ± 17.83 bpm, p=0.021). Oxygen saturation was slightly higher in the salbutamol group (88.20 ± 3.89%) compared to the Lasix group (86.53 ± 5.46%, p=0.057).

Complete blood count showed no significant difference (9.00 ± 4.21 cells/mcL for salbutamol vs. 9.81 ± 4.57 cells/mcL for Lasix, p=0.317). Blood sugar levels were significantly lower in the salbutamol group (113.82 ± 21.35 mg/dL) compared to the Lasix group (124.20 ± 19.74 mg/dL, p=0.007). (TABLE 3)

**Table I.** Clinical scoring of TTN

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Score | 0 Point | 1 Point | 2 Point | 3 Point |
| Expiratory grunting | None | Intermittent | Continuous |  |
| Supraclavicular retractions | None | Mild | Moderate | Severe |
| Subcostal retractions | None | Mild | Moderate | Severe |
| Cyanosis | None | At Extremities | Central |  |
| Nasal flaring | None | Mild | Moderate | Severe |

**Table 2:** Demographic Parameters of Participants (n=120)

|  |  |  |
| --- | --- | --- |
| **VARIABLES** | **GROUP** | |
| Salbutamol  (n=60) | Lasix  (n=60) |
| **Age** (days)  Mean ± SD | 8.92±5.24 | 10.55±5.11 |
| **Gender**  Male  Female | 25 (41.7%)  35 (58.3%) | 28 (46.7%)  32 (53.3%) |
| **Gestational Age** (weeks)  Mean ± SD | 38.47±2.48 | 38.12±2.61 |
| **Birth Weight** (kg)  Mean ± SD | 2.56±0.53 | 2.60±0.52 |
| **Type of C-Section**  Elective  Emergency | 37 (61.7%)  23 (38.3%) | 37 (61.7%)  23 (38.3%) |

**Table 3:** Comparison of Clinical Parameters between Groups (n=120)

|  |  |  |  |
| --- | --- | --- | --- |
| **VARIABLES**  (Mean ± SD) | **GROUP** | | **P-VALUE** |
| Salbutamol  (n=60) | Lasix  (n=60) |
| **Respiratory Rate** (bpm) | 32.55±4.14 | 33.88±3.79 | 0.068 |
| **Heart Rate** (bpm) | 114.83±11.41 | 121.22±17.83 | 0.021 |
| **Oxygen Saturation** (%) | 88.20±3.89 | 86.53±5.46 | 0.057 |
| **Complete Blood Count** (cells/mcL) | 9.00±4.21 | 9.81±4.57 | 0.317 |
| **Blood Sugar** (mg/dL) | 113.82±21.35 | 124.20±19.74 | 0.007 |

**Discussion**

Transient tachypnea of the newborn is a common respiratory disease that is manifested by increased respiratory rate and that usually resolves in 48-72 hours after birth. TTN develops as a result of a delay in fetal lung fluid clearance [8]. Tissue and circulating lung fluid retention usually result in mildly elevated pressure and cause mild pulmonary edema [9]. The disorder is treated supportively. Neonatal respiratory diseases often cause the use of additional medications for treatment, especially Salbutamol, and Lasix. The effectiveness of these agents and their influence on newborns is still debatable [10].

Salbutamol is a short-acting beta-2 adrenoceptor agonist, which causes bronchodilatation by stimulating intracellular adenylyl cyclase and subsequent accumulation of cyclic adenosine monophosphate at beta-2 receptors [11]. It relaxes the bronchial smooth muscle and stimulates the production of mucus [12]. It has been suggested that salbutamol can help improve airway obstruction and thus may facilitate quicker detection of resolution of the disease [13].

Lasix is a loop diuretic that inhibits the reabsorption of sodium and chloride in the proximal and distal tubules [14]. It is usually used for symptomatic treatment of pulmonary extravascular fluid overload that occurs in the presence of elevated pulmonary venous pressure. The use of furosemide has been suggested because it results in increased venous capacitance and sample perfusion in peripheral vasculatures, a decrease in fluid overload, and a reduction in pulmonary pressures in neonates [15]. Overall response to furosemide differs widely among neonates [16].

This study compared the effectiveness of salbutamol and furosemide (Lasix) in treating transient tachypnea of the newborn as; the respiratory rate was similar between the groups (32.55 ± 4.14 bpm for salbutamol vs. 33.88 ± 3.79 bpm for Lasix, p=0.068). Heart rate was significantly lower in the salbutamol group (114.83 ± 11.41 bpm) compared to the Lasix group (121.22 ± 17.83 bpm, p=0.021). Oxygen saturation was slightly higher in the salbutamol group (88.20 ± 3.89%) compared to the Lasix group (86.53 ± 5.46%, p=0.057). Complete blood count showed no significant difference (9.0 ± 4.21 cells/mcL for salbutamol vs. 9.81 ± 4.57 cells/mcL for Lasix, p=0.317). Blood sugar levels were significantly lower in the salbutamol group (113.82 ± 21.35 mg/dL) compared to the Lasix group (124.20 ± 19.74 mg/dL, p=0.007).

In the study of Khushdil A, et al the mean duration of oxygen dependency between the salbutamol and furosemide groups was 58.00 ± 53.50 (p =0.283) and 54.04 ± 51.560 (p=0.171) [17]. The study by Armangil D, et al recorded respiratory rate as 62 ± 14 (p=0.01) and heart rate as 139.6 ± 12.3 (p=0.05) in the salbutamol group [18] whereas Ali S, et al reported as oxygen requirement as 53.7 ± 6.6 (p=0.001) in the furosemide group [19].

The contrasting findings highlight the variability in outcomes, supporting the fact that the use of furosemide and salbutamol in treating TTN remains debatable. Consequently, more research is required to clarify the optimal treatment of this disease.

**Conclusion**

It is to be concluded that both Salbutamol and Lasix demonstrated notable impacts on clinical markers and aided in managing transient tachypnea of the newborn. Salbutamol showcased advantages for certain parameters, while Lasix proved more efficacious for others. These discoveries imply that either drug serves as an effective therapeutic alternative, with treatment selection dependent on the patient's clinical presentation and response over time. Further investigation could optimize regimens and enhance neonatal prognosis moving forward.

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