

## COMPARISON BETWEEN THE EFFICACY OF NEBULIZED MAGNESIUM SULFATE WITH ADRENALINE VERSUS ADRENALINE ALONE IN THE TREATMENT OF ACUTE BRONCHIOLITIS

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### ABSTRACT

- ✓ **Background:** Acute bronchiolitis is the most common lower respiratory disease, requiring hospitalization in children under the age of two years. Several therapeutic approaches have been proposed to treat acute bronchiolitis, but so far supportive treatment remains the primary.
- ✓ **Objective:** The current study aims to evaluate the efficacy of magnesium sulfate and epinephrine nebulization in reducing the duration of hospitalization and improving the symptoms of acute respiratory distress caused by acute bronchiolitis in comparison with adrenaline nebulization.
- ✓ **Methods:** In a randomized controlled trials study that included 130 patients with acute bronchiolitis with moderate and severe respiratory distress (RDAI greater or equal to 5) aged between 3 months and 2 years, who were admitted to the pediatric department in Tishreen University Hospital at the period between January 2020 to January 2021. The patients were divided into two groups, each containing 65 patients, according to the randomization schedule, one of which was treated with adrenaline nebulization and the other with magnesium sulfate combined with adrenaline nebulization, with the patients being monitored and the development of the RDAI indicator recorded at admission to discharge.
- ✓ **Results:** The results showed an improvement in the duration of hospitalization and RDAI in patients with magnesium sulfate and adrenaline nebulization compared with adrenaline nebulization from the second day of treatment, with fewer side effects resulting from the treatment.
- ✓ **Conclusion:** The current study confirmed the possibility of using magnesium sulfate with adrenaline nebulization to reduce the duration of hospitalization and to improve and improve the RDAI in children with acute bronchiolitis.

❖ **KEYWORDS:** acute bronchiolitis, duration of hospitalization, adrenaline, magnesium sulfate.

### INTRODUCTION

Acute bronchiolitis is a serious health problem in infants under the age of two years, associated with increased morbidity and hospitalization rates in this age group.<sup>[1]</sup> The incidence rate is estimated at 3 per 1000 children annually during the first two years of life, with an increased incidence in males less than 18 months 4.7 per

1,000 children.<sup>[2]</sup>

Acute bronchiolitis in children is associated with many life-threatening complications such as cyanosis, dehydration, acute respiratory failure, and secondary bacterial infections.<sup>[3]</sup> Currently, there is no specific available treatment approved for acute bronchiolitis in children, supportive treatment such as rehydration,

oxygen supply, physical therapy, and other treatment options (nebulization of adrenaline, hypertonic saline serums (HS 3%), and bronchodilators) have been proposed.<sup>[4]</sup> The role of magnesium sulfate as a bronchodilator was discovered in 1912, and studies then began to clarify its role in the treatment of asthma until it was included in the protocols for treating asthma (GINA; Global Initiative for Asthma). Because of the similarity of pathological mechanisms between asthma and acute bronchiolitis, magnesium sulfate has been suggested as a treatment for patients with acute bronchiolitis.<sup>[5]</sup>

There is just one research on the effectiveness of magnesium sulfate in acute bronchiolitis in our country. Therefore, the recent study aimed to compare the efficacy of nebulization magnesium sulfate with adrenaline in reducing the duration of hospitalization and improving symptoms of severe and moderate severity of acute bronchiolitis.

#### ❖ MATERIAL AND METHODS

Randomized Open-Label, controlled trials included patients less than 24 months with the first episode of severe and moderate severity of acute bronchiolitis according to respiratory distress assessment instrument (RDAI) who referred pediatric department at Tishreen University Hospital between January 2020 to January 2021. We excluded patients if any of the following conditions were present: secondary bacterial infections or pneumonia, chronic cardiac, pulmonary, neurologic disorder, use of corticosteroids and bronchodilators during the last 24 hour, RDAI less than 4, cardiac rates more than 211 beats/min or respiratory rate more than 111/min.

On admission, a detailed history was taken and a clinical examination was performed to ruled out any associated illness. Pulse, respiratory rate, saturation O<sub>2</sub> (So<sub>2</sub>) were recorded. Patient supplied with O<sub>2</sub> when So<sub>2</sub> less than 93%. Complete blood cells, C- reactive protein (Crp), chest-X- ray were performed at the admission. The severity of acute bronchiolitis in patients is assessed by RDAI, which includes (respiratory rate, patient color, use of auxiliary respiratory muscles, and findings by examining the chest). Each component is given a score ranging from 0 to 3 according to the severity and according to the total. The severity of bronchiolitis is classified into(mild 0-4, medium 5-8, severe 9-12).<sup>[2]</sup>

Depending on the random number of tablet for the randomization, the patients were divided into two groups

(group A received magnesium sulfate(40 mg/kg) with adrenaline (0.1 mg/kg) and normal saline (0.9%) to the volume of 4 ml, group B treated with nebulization adrenaline (0.1 mg/kg) with normal saline to the volume of 4 ml). Patients in both groups received nebulization three times at 0,20,40 minutes and then every 4 hours. RDAI was assessment at the admission and the end of every day until discharged with record side effects.

All data were analyzed using the Statistical Package for Social Sciences (SPSS Version 20). Data were presented in simple measures of frequency, percentage, mean, standard deviation. The significance of the difference between different means (quantitative data) was tested using Student's t-test for the difference between two independent means, while different percentages (qualitative data) were tested using Pearson's Chi-square test. Results were considered statistically significant with a p-value<5%.

This study was reviewed and approved by the ethical Committee of Tishreen University Hospital. Informed consent was obtained from the patient's parents.

#### ❖ RESULTS

The current study was carried out on 130 patients with severe and moderate severity of acute bronchiolitis after 36 patients excluded as they did not achieve the inclusion criteria. The mean age of the study patients was 10.9±6.2 months. 95.3% of them were moderate severity of acute bronchiolitis. Patients were divided into 2 groups (A, B), each one contained 65 patients. Both studied groups were matched regarding sex and age group with no statistically significant difference (**Table 1**).

While there was no statistically significant difference between studied groups regarding RDAI at admission and the first day of treatment, there was statistically significant difference in the RDAI values after treatment begun at the second day of treatment in the Mg sulfate group(group A) compared to the adrenaline group (group B (Table 2).

The duration of hospitalization was 107.51±13.53 hours in the adrenaline group compared to the Mg sulfate group (group A) with a statistically significant difference between the two studied groups (p=0.002).

On the other hand, there was no statistically significant difference between the two studied groups according to the adverse effects (p=0.61). (**Table 3**)

**Table (1): Comparison of sex and age between both studied group.**

	variable	Group A n=65	Group B n=65	p-value
Sex	Male, n(%)	34(52.3)	37(57)	0.59
	Female, n(%)	31(47.7)	28(43)	
Age	≥one year, n(%)	30(46.2)	28(43)	0.72
	< one year, n(%)	35(53.8)	37(57)	

**Table (2): Comparison of RDAI between both studied group.**

RDAI	Group A n=65	Group B n=65	p-value
Admission, (n±SD)	7.08±1.11	6.9±1.38	0.44
1 <sup>st</sup> day, (n±SD)	6.74±1.45	6.78±1.25	0.83
2 <sup>nd</sup> day, (n±SD)	5.71±1.22	6.4±1.10	0.02
3 <sup>rd</sup> day, (n±SD)	3.2±1.2	5.48±1	0.001
4 <sup>th</sup> day, (n±SD)	2.84±0.89	4.63±0.89	0.001

**Table (3): Comparison of side effects between both studied group.**

Side effects	Group A n=65	Group B n=65	p-value
Excitement, n(%)	3(4.6)	1(1.5)	
Diarrhea, n(%)	2(3.1)	0(0)	0.61
Vomiting, n(%)	3(4.6)	2(3.1)	
Tachycardia, n(%)	0(0)	7(10.8)	

### ❖ DISCUSSION AND CONCLUSION

Our study revealed that in moderate and severe severity of acute bronchiolitis nebulization Mg sulfate with adrenaline is more effective than adrenaline nebulization in improving the RDAI scores and duration of the hospitalization. Although side effects had happened with both groups were higher in the adrenaline- treated group, accordingly both groups were well tolerated by the patients.

Both airway edema and bronchospasm are potential factors in causing acute bronchiolitis, hence many studies suggested treatments with bronchodilators such as salbutamol and adrenaline to reduce bronchial obstruction and improve the clinical development of the disease, but none of them succeeded in affecting the length of hospitalization.<sup>[6]</sup>

The current study is the first at the local researches and the second at the global after Modaresi study that compared the effectiveness of the combination of adrenaline and Mg sulfate compared to the inhaled adrenaline, where most other studies compared the effectiveness of salbutamol in combination with magnesium sulfate versus salbutamol, as well as its effect compared with the high-tension saline serum (HS3) %.<sup>[5-6]</sup>

Modaresi et al conducted that the combination of Mg sulfate and adrenaline nebulization in children with severe and moderate severity of acute bronchiolitis improved RDAI during the hospitalization period starting from the second day compared with the adrenaline nebulization group.<sup>[7]</sup> As a result of the current study, while the Modaresi study did not find any effect on the duration of hospitalization, this may be because the majority of patients had severe acute bronchiolitis (RDAI =9-11), in contrast to our study, in which most patients were of moderate severity. The

current study found the absence of significant differences between the two groups of patients regarding side effects of treatment, and this was not investigated by the Modaresi study. The current study was an open label study with a small size that was a limitation of data collected for this study.

The current study found that the combination of adrenaline and inhaled Mg sulfate played a major role in reducing the severity of symptoms, improving the RADI and duration of hospitalization in children under the age of 2 with severe and moderate severity of acute bronchiolitis.

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