

## Original Research Article

# Comparison of the efficiency of the nebulization of salbutamol, epinephrine and normal saline on treatment of bronchiolitis

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## ABSTRACT

**Background:** Bronchiolitis is a frequent cause of hospitalization. Despite the frequency of this pathology, there is not a single, widely practiced evidence-driven treatment especially using of nebulization. Present purpose was to compare which is efficient: nebulized salbutamol, epinephrine or normal saline.

**Methods:** We have preceded to a prospective study from January 1<sup>st</sup> 2011 to March 31<sup>st</sup> 2012 including children between 29 days old and 2 years old.

**Results:** We have included 90 patients divided in three groups and received nebulized salbutamol, epinephrine or normal saline. There was no real difference in the variables of the groups: clinical score, oxygen saturation, heart rate, temperature and weight but the hospitalization duration was shorter in the group who have been cured by normal saline

**Conclusions:** This study shows that salbutamol, epinephrine and normal saline can be used in the same situation but the normal saline has more advantages because of his low coast and the absence of risk of side effects.

**Keywords:** Bronchiolitis, Bronchodilatator, Epinephrine, Normal saline, Salbutamol

## INTRODUCTION

Acute bronchiolitis, mostly secondary to infection due to Respiratory syncytial virus (RSV) is very common in infants under two years old.<sup>1,2</sup> It is usually benign. However, the dyspnea it causes is a big concern for parents and this disease can take a severe form on certain particular ground thus constituting a frequent reason for hospitalization in pediatrics.<sup>3,4</sup>

In addition, practitioners are not unanimous on certain aspects of its management, particularly in prescription drugs used for aerosol; some authors claim that bronchodilators are not effective in bronchiolitis; other studies have shown that  $\beta_2$  mimetics are effective especially after the age of six months and if the child has

already had episodes of wheezing dyspnea or history of personal or familial atopy.<sup>5-7</sup>

Other authors have reported the efficiency of nebulized epinephrine and more recent studies have shown that nebulization of isotonic saline and hypertonic saline at 3% seems to be more effective than  $\beta_2$ mimetics and epinephrine.<sup>8-10</sup>

## METHODS

A prospective descriptive and analytical study was conducted in the pediatric ward of the University Hospital for Mother and Child of Ambohimandra in January 1st 2011 to March 31st 2012. We recruited children admitted to the department with as diagnosis a

first or second episode of bronchiolitis. Were included in our study children aged of 29 days old to 2 years old .The non-inclusion criteria were: age less than 29 days old and the age of more than 2 years old. We excluded children admitted with bronchiolitis at 3rd episode (infant asthma), children with history of prematurity, heart disorder or any other associated defects, secondarily infected bronchiolitis or associated with other pathologies. Children left without medical advice for which we have not been able to follow the evolution of the disease were removed from the protocol.

Individual record form for each patient was filled at the inclusion by the doctor on duty for the following clinical characteristics: age, sex, family history of atopy, oxygen saturation, temperature, heart rate, and clinical score of Wang.

Children who met the inclusion criteria were alternately distributed in three groups according to their rank of admission:

- Group 1 received salbutamol at a dose of 100 to 150 mcg / kg
- Group 2 received epinephrine at a dose of 3 mg
- Group 3 received 5 cc of saline

All admitted patients received aerosol every 20 minutes three times and after, depending on the clinical status of the patients, they were given oxygen therapy at 1.5 liters / minute at the admission till the normalization of the oxygen saturation.

Clinical parameters such as clinical score Wang, oxygen saturation with pulse oximetry, heart rate, temperature were measured at the admission, at H1 to H12 and then every 24 hours until they leave. Weight gain and the length of the hospital stay was also estimated at the end of the disease.

### Statistical analysis

For statistical analysis, the comparative study of different variables was made by the Chi square test and the significance threshold was holding the value of "p" <0.05.

## RESULTS

We included 90 patients in the study. The average age of our patients was  $7.45 \pm 5.58$  months. Of the 90 patients included in the study, 53, 33% are boys and more than half of our patients 45.55% had a history of family atopy.

Socio-demographic, epidemiological: age (p=0.75), gender (p=0.39) concept family atopy (p=0.95) and clinics: clinical score (p=0.24), arterial oxygen saturation (p=0.46), heart rate (p=0.62), temperature (p=0.89) of the 3 groups of patients were comparable at admission. The average weight gain was 3.41 grams / Kg / day for groups

of patients who received salbutamol, 4.28 grams / Kg / day for patients treated with adrenaline and 4.6 grams / Kg / day for patients receiving saline but without significant difference between the 3 groups (salbutamol versus adrenaline: p=0.06 versus salbutamol versus normal saline solution 9% p=0.89, adrenaline versus normal saline solution 9% p=0.10).

**Table 1: Comparative data of the evolution of patients on treatment according to clinical score Wang.**

	Salbutamol n= 30	Epinephrine n= 30	Normal saline n=30
<b>Hour</b>			
H0	8.3	8.7	7.46
H1	7.2	7.55	6.71
H12	6.1	6.14	5.71
H24	4.76	5	4.78
H48	4	4.30	3.75
H72	3.35	3.5	2.74
H96	2.08	3.05	2.88
H120	1.06	3.12	2.56
H144	1.76	2.30	2.42
H168	1.33	1.36	1.66
H192	4	1.5	0.75
H216	3	2.5	
H240	0	0	

Salbutamol versus epinephrine: p = 0.85; salbutamol versus normal saline: p=0.53; epinephrine versus normal saline: p=0.58

**Table 2: Comparative data of the evolution of patients on treatment depending on the oxygen saturation.**

	Salbutamol (n= 30)	Epinephrine (n= 30)	Normal saline (n=30)
<b>Hour</b>			
H0	95.2	95.81	96.25
H1	96.5	96.66	96.57
H12	97.4	97.37	97.32
H24	97.3	97.81	97.89
H48	98.34	98.11	98.42
H72	98.53	98.39	98.53
H96	98.75	98.65	98.65
H120	98.73	98.62	98.77
H144	98.5	98.76	98.71
H168	98	98.75	99
H192	98	99	99
H216	98	99	
H240			

Salbutamol versus adrenaline: p=0.87 salbutamol versus normal saline: p=0.29; epinephrine versus normal saline:p=0.30

## DISCUSSION

This study showed that children hospitalized for bronchiolitis were mostly younger than 12 months old with an average age of  $7.45 \pm 5.58$  months old, which is similar to the peak of usual age of occurrence of

bronchiolitis with a male predominance and a family history of atopy found in 45.55% of cases.<sup>1</sup> Regarding the clinical score for Wang, it is a good parameter for evaluating the evolution of bronchiolitis: an improvement in clinical scores was observed in each group of patients without significant difference. This could be due to the small size of the sample of our study population. However, the same observation has been previously reported in other studies.<sup>6,10,11</sup>

**Table 3: Comparative data of the evolution of patients on treatment according to the heart rate.**

Hour	Salbutamol n= 30	Epinephrine n= 30	Normal saline n= 30
H0	142.4	143.48	150.82
H1	140	142.92	140.39
H12	141.7	140.25	141.14
H24	137.26	140.37	139.42
H48	132.64	138.57	136.57
H72	133.04	141.82	135.69
H96	133.73	139.55	136.06
H120	125.25	137.62	135.33
H144	128.33	134.76	135.28
H168	138	134.63	138
H192	135	134.75	135.5
H216	120	125	
H240			

Salbutamol versus epinephrine: p=0.49 salbutamol versus normal saline: p=0.33; epinephrine versus normal: p=0.37.

**Table 4: Comparative data of the evolution of patients on treatment depending on the temperature.**

Hour	Salbutamol n= 30	Epinephrine n= 30	Normal saline n=30
H0	37.83	37.82	38
H1	37.63	37.7	37.5
H12	37.29	37.45	37.3
H24	37.34	37.48	37.2
H48	36.97	37.38	37.1
H72	36.61	37.29	37.8
H96	36.9	37	37.1
H120	36.92	36.39	37.6
H144	37.12	36.94	37.1
H168	36.93	37.02	37.1
H192	37.6	36.8	37.02
H216	36.5	37.5	
H240	36.6	36.7	

Salbutamol versus adrenaline: p=0.47; Salbutamol versus normal: p=0.37; Epinephrine versus normal saline: p=0.31.

It is the same for oxygen saturation: it is also an important element that can predict the patient's clinical improvement. Thus, we have noted an improvement in oxygen saturation in all patients after 24 hours of

treatment with a faster but not significant improvement in patients who received aerosol of physiological salt solution. Moreover, some authors have argued that bronchodilators have no impact on patient oxygen saturation during bronchiolitis.<sup>6,10,12,13</sup>

Some side effects are reported with the use of bronchodilators such as tachycardia, oxygen desaturation, a prolonged cough and tremors.<sup>11-16</sup> In present case, we especially appreciated the heart rate of patients; no tachycardia effect was found for the three types of molecules. This was also reported by Anil and his colleagues in their study.<sup>12</sup>

**Table 5: Comparative data of the evolution of patients on treatment depending on the hospitalization duration.**

Type of nebulization	Hospitalization (day)	Duration
salbutamol	4.53±0.4	at the least : 1 at the most : 10
epinephrine	5.29±0.2	at the least : 1 at the most : 10
normal saline	4.42±0.7	at the least : 2 at the most : 8

p = 0.009.

In present study, we found a faster but non-significant regression of the heart rate in patients who received aerosol of physiological salt solution 9%. Fever can be a complication of the use of bronchodilators; a slight temperature rise was noted in some patients but it did not influence statistically the results of our study. The same result was found by Anil and his collaborators.<sup>12</sup>

Besides, the duration of hospitalization often allows to judge the efficiency of a treatment; the shorter it is, the more the treatment is considered as effective. Hospital stay was shorter in children who received saline aerosols in our study with a significant difference. In a study by Anil comparing the efficiency of salbutamol, adrenaline, saline and hypertonic saline no significant difference was found regarding duration of hospitalization.<sup>12</sup> So in front of the shorter hospital stay with the use of aerosol with normal saline solution found in our study, wouldn't it be better to use the saline, considering its low cost and lack of side effects? Additional studies are needed to confirm the benefits of using saline.

Finally, the weight is also an interesting parameter allowing estimating efficiency of the treatment. Thus, loss or excessive weight gain can be a sign of poor tolerance of any drug. No other study comparing the efficiency of bronchodilators has estimated the weight in the treatment of bronchiolitis. In our case, we have not noted any weight loss. Weight gain ranging from 3.41 grams / kg / day to 4.6 grams / kg / day was noticed during hospitalization no significant difference between the three groups of patients.

## CONCLUSION

This work showed that the three molecules: the salbutamol, the adrenaline and the normal saline solution can be used interchangeably but a study with a larger sample might reveal a possible difference. Anyway, apart from the nebulization, the basis of treatment of bronchiolitis is essentially symptomatic: disinfection rhino pharynx, the Trendelenburg position, fractionated feeding with other simple hygiene measures.

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