

# DURATION OF HOSPITAL STAY IN CHILDREN NEBULIZED WITH 3% HYPERTONIC SALINE VERSUS 0.9% SALINE FOR MODERATE TO SEVERE ACUTE BRONCHIOLITIS

Kiran Kanwal,<sup>1</sup> Asma Akbar,<sup>1</sup> Mukhtar Ahmad<sup>1</sup>

## ABSTRACT

**Background:** Bronchiolitis is a frequent lower respiratory tract ailment commonly seen amongst children. Common form of presentation includes coughing as well as wheezing and shortness of breath that creates difficulty in terms of feeding especially in infants. Nebulized hypertonic saline with or without bronchodilators have been documented to minimize the length of stay in hospital but controversies exist regarding the effect of hypertonic solution.

**Objective:** To evaluate the mean length of hospital stay with 3% hypertonic saline in comparison to 0.9% normal saline for nebulization in children with bronchiolitis.

**Methodology:** This comparative study was conducted at DHQ Teaching Hospital, Dera Ghazi Khan from 1<sup>st</sup> September 2018 to 1<sup>st</sup> March 2019. Overall 200 patients were included, with hundred in each group. Children in HS group were nebulized using 3% hypertonic solution whereas NS group got nebulized using 0.9% normal saline solution. Children were monitored and followed up in the ward till resolution of symptoms. Mean hospital stay in days was calculated in both groups. Data analysis was done by SPSS 21.

**Results:** The mean age of children in hypertonic 3% saline group was 12.97±6.18 months and the mean age of children in normal 0.9% saline group was 12.83±6.10 months. There were 69.5% male and 30.5% females. The mean hospital stay of the patients in Hypertonic 3% saline group was 4.1±0.92 days while in Normal Saline 0.9% it was 6.11 ± 1 days (p value = 0.001).

**Conclusion:** It was concluded that children presented with bronchiolitis using 3% Hypertonic Saline for nebulization have shorter length of study in hospital in comparison to 0.9% Normal Saline.

**Keywords:** Hospital Stay, Hypertonic Saline, Nebulization, Bronchiolitis, Normal Saline solution

## INTRODUCTION

Bronchiolitis is a commonly seen ailment amongst children.<sup>1</sup> Airway support along with supplemental oxygen, fluids and nutrition remain the mainstays of therapy.<sup>2</sup> Bronchiolitis is described as inflammatory disease of the lower respiratory tract resulting commonly due to small airways obstruction. It usually starts depicting infection of the upper respiratory tract.<sup>3-6</sup>

Nebulized HS either single drug or combined with bronchodilators are noticed to minimize the duration of hospitalization.<sup>7-8</sup> Mean length of study in hospital in children with acute bronchiolitis with the use of NS in comparison to HS group is variable.<sup>7</sup> It was noted in the same study that frequently inhaled HS not only comforted symptoms but also resulted in minimizing LOS. On the other hand, Sharma BS et al<sup>8</sup> from India found no significant difference in mean LOS when they compared NS with HS (P=0.878).

NS solution as 0.9% concentration is regularly used in tertiary care settings. Work done on 3% HS have found variety in results. By conducting this

study, we aimed to evaluate the mean LOS with both solution types that may go on to assist us in advancing to better practice for the management of these cases which will ultimately go on to minimize the burden of this disease on pediatrics healthcare facilities.

The objective of the study was to evaluate the mean length of the study in hospital using 3% Hypertonic Saline for nebulization in comparison to 0.9% normal saline in children with bronchiolitis.

## METHODOLOGY

**Study Design:** This was a comparative study.

**Setting:** This study was conducted at the department of Pediatrics, DHQ Teaching Hospital, Dera Ghazi Khan.

**Duration of Study:** This study was conducted from 1<sup>st</sup> September 2018 to 1<sup>st</sup> March 2019.

By taking 95% confidence level, having power of test as 80% and considering mean LOS as 4.8 ± 1.2 day with HS and 6.4 ± 1.4 with NS,<sup>7</sup> a sample containing 200 children (100 in each groups) with bronchiolitis was calculated.

1. Department of Pediatrics, D.G.Khan Medical College and Teaching Hospital D. G. Khan, UHS, Lahore, Pakistan.

### Correspondence:

**Dr. Mukhtar Ahmad**, Associate Professor and Head of Pediatrics. D.G.Khan Medical College and Teaching Hospital, D. G. Khan, Pakistan.

**Inclusion Criteria:** Children who were aged 3 to 24 months, with diagnosis of acute bronchiolitis (when all of the following were present; prodrome of upper respiratory tract infection i-e rhinorrhea, mild fever 99-100F and cough followed by sudden onset of wheezing & dyspnea (respiratory rate more than for that age with subcostal and intercostal recessions).

**Exclusion Criteria:** Children having congenital heart disease or any sort of other respiratory disorders assessed on history as well as medical record, or those who were having nebulization prior to presenting in emergency ward were excluded.

**Data Collection Procedure:** Approval from institute's ethical committee was sought and a total of 200 children as per inclusion and exclusion criteria were enrolled from pediatric emergency. Informed consent was acquired from parents / guardians of all the study participants. Patients were randomly divided in two groups by using lottery method. Nebulization in HS group was done using 3% hypertonic solution, prepared by addition of 3g of NaCl in distilled water (100ml). Nebulization in NS group was done using 0.9% NS solution, prepared by adding 0.9g of NaCl distilled water (100ml). Other medical management as same in both groups. Children were monitored and followed up in the ward till resolution of symptoms was achieved (relief from wheezing, fever & dyspnea for a duration of minimum 24 hours). Total LOS was calculated at the time of discharge of children (total duration from the date of admission to the date of discharge).

**Data Analysis:** SPSS version 21 was used for data handling and analysis. Age, weight of children and LOS were calculated in terms of mean and standard deviation while gender was highlighted as frequency and percentage. A comparison was done among both the study groups using student t test whereas p value < 0.05 was taken as of statistical significance.

## RESULTS

Out of a total of 200 patients, the mean age of children in hypertonic 3% saline group was  $12.97 \pm 6.18$  months with range 3-24 months. The mean age of children in normal 0.9% saline group was  $12.83 \pm 6.10$  months with range 3-24 months. The mean weight of children in hypertonic 3% saline group was  $6.35 \pm 2.23$  kg with range 2-11 kg.

The mean weight of children in normal 0.9% saline group was  $6.26 \pm 1.98$  with range 3-11 kg. In hypertonic saline, there were 77 males and 23 were females. In normal saline solution, there were 62 males and 38 females. (Table I)

**Table I: Demographics details of patients**

Variables	Study group	
	Hypertonic 3% saline	Normal Saline 0.9%
N	100	100
Age (months)	$12.97 \pm 6.18$	$12.83 \pm 6.10$
Male	77	62
Female	23	38
Weight (kg)	$6.35 \pm 2.23$	$6.26 \pm 1.98$

In our study, the mean hospital stay of the patients in Hypertonic 3% saline group was  $4.12 \pm 0.92$  days while in Normal Saline 0.9% it was  $6.16 \pm 1.10$  days (p value = 0.001). (Table II)

**Table II: Comparison of Hospital stay in both study groups**

Variables		Hypertonic 3% saline	Normal Saline 0.9%
Hospital Stay	n	100	100
	Mean	4.12	6.16
	SD	0.92	1.10

(T-test value = 14.211, p-value = 0.001)

## DISCUSSION

Bronchiolitis is commonly noted as seasonal whereas need for hospital stay is at its highest between 3 to 6 months of age.<sup>9-11</sup> According to our study results the overall mean LOS in hospital was  $5.14 \pm 1.44$  days. While in group wise the mean LOS in hospital in HS group was  $4.12 \pm 0.92$  days and in NS group as  $6.16 \pm 1.10$  days (p value = 0.001).

In the Cochrane meta-analysis involving 4 studies showed 24% lesser LOS in hospital (mean 1.2 days) with HS.<sup>12</sup> However, one study among these noted longer LOS (nearly 2 times in comparison to other three studies) in both cohorts that represented the variation in data.<sup>6</sup> Sharma et al<sup>8</sup> documented no major adverse effects with both study groups. Zhang et al<sup>13</sup> recorded that 3% NS was shown to have shorter mean LOS in hospital in comparison to 0.9% NS while this difference was of statistical significance (P = 0.0006) amongst children with acute viral bronchiolitis.

Three inpatient trials,<sup>14-16</sup> involving 189 infants, noted reduction in LOS in hospital with use of 3% HS as nebulizing solution in comparison to 0.9% NS (p value = 0.0006). Sarrel EM et al found HS to be beneficial in minimizing the LOS (33% reduction) in a trial that had outpatient pool although the difference in comparison to NS was not of statistical significance.. However, this reduction was not statistically significant.<sup>17</sup>

## CONCLUSION

It was concluded that children presented with bronchiolitis using 3% Hypertonic Saline for nebulization have shorter length of stay in hospital in comparison to 0.9% Normal Saline.

**Authors Contribution:** MA: Writeup, data analysis, Idea generation. KK: Writeup, data analysis, interpretation and supervision of study. AA: Helps to acquired the data. All authors critically revised and approved its final version.

**Conflict of Interest:** None

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## REFERENCES

1. Team BG. Cincinnati Children's Hospital Medical Center. Evidence based clinical practice guideline for medical management of bronchiolitis in infants year of age or less presenting with a first time episode Cincinnati: Cincinnati Children's Hospital Medical Center 2010.
2. Mandelberg A, Amirav I. Hypertonic saline or high volume normal saline for viral bronchiolitis: mechanisms and rationale. *Pediatric pulmonology* 2010;45(1):36-40.
3. Gupta N, Puliye A, Manchanda A, Puliye J. Nebulized hypertonic-saline vs epinephrine for bronchiolitis: Proof of concept study of cumulative sum (CUSUM) analysis. *Indian pediatrics* 2012;49(7):543-7.
4. Zhang L, Mendoza-Sassi RA, Wainwright C, Klassen TP. Nebulized hypertonic saline solution for acute bronchiolitis in infants. *The Cochrane Library* 2008.
5. Zhang L, Mendoza-Sassi R, Wainwright C, Klassen T. Nebulized hypertonic saline solution for acute bronchiolitis in infants. *Ann Emerg Med* 2010;55(1):120-2.
6. Luo Z, Liu E, Luo J, Li S, Zeng F, Yang X, et al. Nebulized hypertonic saline/salbutamol solution treatment in hospitalized children with mild to moderate bronchiolitis. *Pediatrics International* 2010;52(2):199-202.
7. Luo Z, Fu Z, Liu E, Xu X, Fu X, Peng D, et al. Nebulized hypertonic saline treatment in hospitalized children with moderate to severe viral bronchiolitis. *Clinical Microbiology and Infection* 2011;17(12):1829-33.
8. Sharma BS, Gupta MK, Rafik SP. Hypertonic (3%) saline vs 0.9% saline nebulization for acute viral bronchiolitis: a randomized controlled trial. *Indian pediatrics* 2013;50(8):743-7.
9. Spencer H. Pathology of the lung. Vol. 1. Pathology of the lung Vol 1 1985(Ed. 4).
10. Christensen KLY, Holman RC, Steiner CA, Sejvar JJ, Stoll BJ, Schonberger LB. Infectious disease hospitalizations in the United States. *Clinical infectious diseases* 2009;49(7):1025-35.
11. Deshpande S, Northern V. The clinical and health economic burden of respiratory syncytial virus disease among children under 2 years of age in a defined geographical area. *Archives of disease in childhood* 2003;88(12):1065-9.
12. Wainwright C, Altamirano L, Cheney M, Cheney J, Barber S, Price D, et al. A multicenter, randomized, double-blind, controlled trial of nebulized epinephrine in infants with acute bronchiolitis. *New England Journal of Medicine* 2003;349(1):27-35.
13. Zhang L, Mendoza-Sassi RA, Wainwright C, Klassen TP. Nebulised hypertonic saline solution for acute bronchiolitis in infants. *The Cochrane Library* 2013.
14. Kuzik BA, Al Qadhi SA, Kent S, Flavin MP, Hopman W, Hotte S, et al. Nebulized hypertonic saline in the treatment of viral bronchiolitis in infants. *The Journal of pediatrics* 2007;151(3):266-70. e1.
15. Mandelberg A, Tal G, Witzling M, Someck E, Houry S, Balin A, et al. Nebulized 3% hypertonic saline solution treatment in hospitalized infants with viral bronchiolitis. *CHEST Journal* 2003;123(2):481-7.
16. Tal G, Cesar K, Oron A, Houry S, Ballin A, Mandelberg A. Hypertonic saline/epinephrine treatment in hospitalized infants with viral bronchiolitis reduces hospitalization stay: 2 years experience. *IMAJ-RAMAT GAN* 2006;8(3):169.
17. Sarrell EM, Tal G, Witzling M, Someck E, Houry S, Cohen HA, et al. Nebulized 3% hypertonic saline solution treatment in ambulatory children with viral bronchiolitis decreases symptoms. *CHEST Journal* 2002;122(6):2015-20.

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