

# EFFICACY OF HYPERTONIC SALINE NEBULIZATION IN CHILDREN WITH ACUTE BRONCHIOLITIS.

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## **ABSTRACT**

**Background;** A substantial proportion of children will experience at least one episode with bronchiolitis, and as much as 2-3% of all children was hospitalized with bronchiolitis during their first year of life. Bronchiolitis is the most common reason for hospitalization of children in many countries, challenging both economy, area and staffing in paediatric departments. **Objective;** To Compare outcome of hypertonic saline versus normal saline in children with acute bronchiolitis. **Material and Methods;** All children fulfilling inclusion criteria were registered in this study from Emergency Department of Pediatric Medicine, Nishtar Hospital, Multan. In Group A, each child was nebulized with 4 ml of 3 % of hypertonic saline while group B was nebulized with 4 ml of 0.9% saline solution for 3 times at interval of 20 minutes. **Results;** Of these 302 study cases, 178 (58.9 %) were male patients while 124 (41.1 %) were female patients. Mean age of our study cases was  $7.60 \pm 6.19$  months (ranging from 2 months to 24 months). Mean age of the male patients was noted to be  $5.71 \pm 3.22$  months while that female patients was  $10.32 \pm 8.14$  months ( $p=0.000$ ). Mean baseline clinical severity score was  $7.15 \pm 1.63$  while 228 (75.5%) had baseline severity score up to 8. Of these 302 study cases, need for hospitalization was noted in 122 (40.4%). Need for hospitalization in group A was 41 (27.2%) while in group B it was 81 (53.6%). ( $p = 0.000$ ). **Conclusion;** Our study results support the use hypertonic saline solution nebulization in children with acute bronchiolitis as compared with normal saline nebulization. Hypertonic solution was found to be more effective in improving clinical severity score and reducing need of hospitalization significantly. All clinicians treating such patients should employ hypertonic solution to get desired clinical outcomes.

**Keywords;** Hypertonic solution, acute bronchiolitis, normal saline.

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## **INTRODUCTION;**

Acute bronchiolitis is a leading cause of hospitalization in infants and leads to at least one office visit in approximately 10% of children less than 2 years <sup>1</sup>. Despite a lack of supporting evidence, many interventions continue to be used excessively, prompting efforts to curb unnecessary testing and treatments. While there have been some signs of success on reducing excessive care in bronchiolitis, substantial overuse and practice variation persist <sup>2-4</sup>.

In Pakistan, acute respiratory illness (ARI) is one of the leading causes of death in young children responsible for 20-30% of all child death under age 5 years. It occurs in a seasonal pattern, with peak incidence in the winter to spring months. Risk factors for early onset disease and subsequent hospitalization include low birth weight, prematurity, lower socioeconomic group, crowded living conditions, parental smoking, absence of breast-feeding, and day care centers. Majority of the children present with respiratory distress and wheezing<sup>5-8</sup>.

Infants with bronchiolitis often undergo extensive and largely needless, diagnostic evaluation. The 2006 American Academy of Pediatrics (AAP) bronchiolitis clinical practice guideline (CPG) recommended no routine laboratory or radiologic studies in bronchiolitis, but there is evidence that a substantial amount of testing is still performed. Bronchiolitis is usually a mild, self-limiting disease, but many children require hospitalisation, while 1–2.7% need critical care support<sup>9</sup>. Despite its high incidence and morbidity, there are few effective therapies for acute bronchiolitis in infancy, and the mainstay of treatment remains supportive care. Given the theoretical effects of hypertonic saline (HS) in reducing airway edema, unblocking mucus plugging, and improving mucociliary clearance, HS administered via nebulizer has been proposed as a potentially effective therapy for acute bronchiolitis in infants. The first randomized trial, published in 2002, the percentage decrease in the clinical score after inhalation therapy was significantly better for hypertonic nebulization (33%) than for normal saline nebulization (13%) [ $p < 0.005$ ].<sup>10</sup>

Over the past decades, a growing number of randomized trials have been undertaken to assess the effects and safety of nebulized HS in infants with acute bronchiolitis.<sup>11</sup> A study conducted by Wu et al<sup>12</sup> reported 28.9% hospitalization in children nebulized with hypertonic saline compared with 42.6 % with normal saline.

### **MATERIAL AND METHODS:**

Patients with underlying broncho-pulmonary dysplasia, chronic lung diseases, neuromuscular impairment, immunodeficiency or congenital heart disease were excluded from our study. A specialized proforma has been developed to record the findings of this study. All children fulfilling inclusion criteria were registered in this study from Emergency Department of Pediatric Medicine, Nishtar Hospital, Multan. Prior permission was taken from Institutional Ethical Committee to conduct this study. Informed consent was taken from the parents of each child, describing them objectives of the study, ensuring them confidentiality of the information provided and fact that there is no risk involved to the patient while taking part in this study. Baseline information like heart rate, respiratory rate, wheeze score and clinical severity score was taken. These study cases were randomly divided into 2 groups by draws methods. Parents were given sealed envelopes marked with letters A and B, those who pick envelope marked with A, was placed in group A while those who pick envelope marked with B was placed in Group B. In Group A, each child was nebulized with 4 ml of 3 % of hypertonic saline while group B was nebulized with 4 ml of 0.9% saline solution for 3 times at interval of 20 minutes. The ED physicians prescribed 2 additional treatments every 20 minutes to a maximum of 3 inhaled doses. Other care was provided per local clinical practice of hospital. Criteria for admission in these guidelines included a persistent oxygen saturation level of less than 92%, increased work of breathing, or inadequate oral intake<sup>12</sup>. All the data was entered and analyzed using SPSS-18. Descriptive statistics was applied to calculate mean and standard deviation for age of patients and duration of hospital stays. Frequencies and percentage were tabulated for the categorical variables like gender, residential status, family income, mother's education, hospitalization and age groups. Chi – square test was applied to compare need for hospitalization in both groups.

### **RESULTS:**

Our study comprised of a total of 302 patients meeting inclusion criteria of our study. Of these 302 study cases, 178 (58.9 %) were male patients while 124 (41.1 %) were female patients. Mean age of our study cases was  $7.60 \pm 6.19$  months (with minimum age of our study cases was 2 months while maximum age was 24 months). Mean age of the male patients was noted to be  $5.71 \pm 3.22$  months while that female patients was  $10.32 \pm 8.14$  months ( $p=0.000$ ). Our study results have indicated that majority of our study cases i.e. 253 (83.8 %) were aged up to 12 months. Of these 302 study cases, 82 (27.2 %) belonged to rural areas and 220 (72.8 %) belonged to urban areas. Monthly family income up to Rs. 35000 was noted in 105 (34.8%) while more than Rs. 35000 was noted in 197 (65.2%) of our study cases. Of these 302 study cases, 139 (46.0%) mothers were illiterate while 163 (54.0%) were literate. Mean baseline clinical severity score was  $7.15 \pm 1.63$  while after treatment it was  $5.02 \pm 3.01$ , mean clinical severity score after treatment in group A was  $4.18 \pm 2.91$  whereas in group B was  $5.87 \pm 2.87$  ( $p = 0.001$ ). Of these 302 study cases, 228 (75.5%) had baseline severity score up to 8. Of these 302 study cases,

need for hospitalization was noted in 122 (40.4%). Need for hospitalization in group A was 41 (27.2%) while in group B it was 81 (53.6%). ( $p = 0.000$ ).

### **DISCUSSION:**

Our study comprised of a total of 302 patients meeting inclusion criteria of our study. Of these 302 study cases, 178 (58.9 %) were male patients while 124 (41.1 %) were female patients. Different studies have documented male gender predominance in patients with acute bronchiolitis. A study conducted by Arif et al <sup>13</sup> from Lahore reported 68 % boys with acute bronchiolitis which is similar to our study results. Another study from Faisalabad by Ahmed et al <sup>14</sup> reported 1.4:1 male to female ratio which is showing male gender predominance. These findings of Ahmed et al <sup>14</sup> are in compliance with that of our study results. Jacobs et al <sup>15</sup> reported 69 % boys with acute bronchiolitis showing male gender predominance which is in compliance with our findings. However Naz et al <sup>6</sup> from Lahore reported 40 % boys with acute bronchiolitis and 60 % girls which is quite different from our study results.

Mean age of our study cases was  $7.60 \pm 6.19$  months (with minimum age of our study cases was 2 months while maximum age was 24 months). Mean age of the male patients was noted to be  $5.71 \pm 3.22$  months while that female patients was  $10.32 \pm 8.14$  months ( $p=0.000$ ). Our study results have indicated that majority of our study cases i.e. 253 (83.8 %) were aged up to 12 months. Airf et al <sup>13</sup> from Lahore reported  $5.43 \pm 9.44$  months mean age of the children with acute bronchiolitis which is close to our study results. Ahmed et al <sup>14</sup> from Faisalabad reported  $7.6 \pm 4.7$  months mean age which is close to our study results. Jacobs et al <sup>15</sup> reported  $6.0 \pm 3.9$  months mean age which is similar to our study results. Naz et al <sup>6</sup> reported 3 months mean age which is a bit lower than that of our study results.

Of these 302 study cases, 82 (27.2 %) belonged to rural areas and 220 (72.8 %) belonged to urban areas. Monthly family income up to Rs. 35000 was noted in 105 (34.8%) while more than Rs. 35000 was noted in 197 (65.2%) of our study cases. Of these 302 study cases, 139 (46.0%) mothers were illiterate while 163 (54.0%) were literate. Similar findings have been reported by Ahmed et al <sup>14</sup> from Faisalabad.

Mean baseline clinical severity score was  $7.15 \pm 1.63$  while after treatment it was  $5.02 \pm 3.01$ , mean clinical severity score after treatment in group A was  $4.18 \pm 2.91$  whereas in group B was  $5.87 \pm 2.87$  ( $p = 0.001$ ). Of these 302 study cases, 228 (75.5%) had baseline severity score up to 8. A study conducted in Lahore by Ejaz et al <sup>16</sup> reported  $5.68 \pm 0.73$  clinical severity score which is in compliance with our study results. Jacobs et al <sup>15</sup> reported  $5.7 \pm 1.8$  mean score which is similar to that of our study results.

Of these 302 study cases, need for hospitalization was noted in 122 (40.4%). Need for hospitalization in group A was 41 (27.2%) while in group B it was 81 (53.6%). ( $p = 0.000$ ). A study conducted by Wu et al <sup>12</sup> reported 28.9% hospitalization in children nebulized with hypertonic saline compared with 42.6 % with normal saline. These findings are close to our study results.

### **CONCLUSION:**

Our study results support the use hypertonic saline solution nebulization in children with acute bronchiolitis as compared with normal saline nebulization. Hypertonic solution was found to be more effective in improving clinical severity score and reducing need of hospitalization significantly. Its use was safe, reliable and no adverse side effects were noted. All clinicians treating such patients should employ hypertonic solution to achieve desired clinical outcomes.

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