

Effectiveness of Salbutamol vs Hypertonic Saline Nebulisation on Breathing Pattern among the Children with Lower Respiratory Tract Infection Admitted to the Selected Hospitals, Puducherry

Catherine R^{1*} and Manju Bala Dash^{2**}

¹M.Sc Nursing Student, Mother Theresa Post Graduate and Research Institute of Health Sciences, Pondicherry, India

²Professor in Nursing, Obstetrics and Gynecology Department, Mother Theresa Post Graduate and Research Institute of Health Sciences, Pondicherry, India

*Corresponding Author: Manju Bala Dash, Professor in Nursing, Obstetrics and Gynecology Department, Mother Theresa Post Graduate and Research Institute of Health Sciences, Pondicherry, India.

Received: December 15, 2017; Published: January 17, 2018

"When I am having a breathing difficulty I feel like a fish in the pond without water"
Jessie P

Abstract

Lower Respiratory Tract Infections place a considerable strain on the health budget and are generally more serious than Upper Respiratory Infections. In developed countries the yearly incidence of pneumonia is estimated to be 33 per 10000 in children below 5 years and 14/5 per 10000 in children 0 to 16 years old.

Objectives: To assess the respiratory pattern of children in group I (Salbutamol) and group II (Hypertonic saline) before and after intervention.

To evaluate the effectiveness of salbutamol vs hypertonic saline nebulisation for children with lower respiratory tract infections.

Methodology: Quantitative approach and pre and post with two group research design was used. Setting of this study is the selected hospitals, Puducherry. The study samples were 1 month to 12 years children. Salbutamol and Hypertonic Saline nebulisation were given and children were assessed before and at 1 hour after intervention using oxygen saturation level, heart rate and respiratory pattern.

Result: The results showed that the posttest mean oxygen saturation level was 1.15 ± 0.36 and 1.00 ± 0.00 in group I and II respectively with 't' value of 2.623 ($p < 0.05$) shows that there is a statistically significant difference between group I and II nebulisation toward oxygen saturation level. The posttest mean level of heart rate was 4.45 ± 2.77 and 2.82 ± 1.61 in group I and II respectively with 't' value of 3.034 ($p < 0.05$) shows that there is a statistically significant difference between group I and II nebulisation toward Heart rate. The posttest mean level of respiratory pattern 1.95 ± 0.22 and 1.28 ± 0.45 in group I and II respectively with 't' value of 9.000 ($p < 0.05$) shows that there is a statistically significant difference between group I and II nebulisation in maintenance of respiratory pattern of the children.

Conclusion: Each method of nebulisation i.e. Salbutamol and Hypertonic saline shows significant difference in the post -test oxygen saturation level, heart rate and respiratory pattern of the children than pre- test but salbutamol shows better result compared to Hypertonic saline nebulisation.

Keywords: LRTI; Lower Respiratory Tract Infection; Inhalation; Salbutamol; Hypertonic Saline

Introduction

Young children are precious in their own right and they are the future of the nation [1]. Illness of the child engulfs the whole family in a vicious cycle of apprehension, anxiety, helplessness and disturbed lifestyle [2]. Lower Respiratory Tract Infections place a considerable strain on the health budget and are generally more serious than Upper Respiratory Infections [3]. The common LRIs in children are pneumonia and bronchiolitis. The respiratory rate is a valuable clinical sign for diagnosing acute LRI in children who are coughing and breathing rapidly. The presence of lower chest wall in drawing identifies more severe disease. In developed countries the yearly incidence of pneumonia is estimated to be 33 per 10000 in children below 5 years and 14/5 per 10000 in children 0 to 16 years old. Currently, the most common causes of viral LRIs are Respiratory Syncytial Viruses (Rsvs). They tend to be highly seasonal, unlike Para influenza viruses, the next most common cause of viral LRIs [4,5]. The risk factors for acute respiratory infections were passive exposure to cigarette-smoke and atopic manifestation [6]. The morbidity and mortality rate due to Lower Respiratory Tract Infections in children is more. In addition with review of literatures, the researcher's own experience while being posted in clinical settings shows the importance of effects of hypertonic saline nebulisation on relieving congestion and enhancing normal breathing pattern for children. Hence, the researcher felt that there is a need to evaluate the effectiveness of Salbutamol vs Hypertonic saline nebulisation for Lower Respiratory Tract Infections among children in the selected hospitals in Puducherry.

Methodology

The data was collected for a period of 1 month from December 15th to January 15th 2013. The research approach used for this study is quantitative approach. The research design selected for this study was Pre and post with two groups research design. In this study the dependent variable is Respiratory Tract Infections in children and the independent variables are Salbutamol and Hypertonic saline nebulisation. The researcher selected Rajiv Gandhi Government Women and Children Hospital and St. Joseph's Hospital, Puducherry. The pediatric in-patients with Lower Respiratory Tract Infections in selected hospitals, Puducherry were the target population. The sample size is 80 children (40 samples in each group) as per inclusion criteria. Children with the age group of 1 month to 12 years were the study samples. The sampling technique used was simple random sampling. The inclusion criteria are Pediatric inpatients with Lower Respiratory Tract Infection in selected hospitals, Pediatric inpatients receiving Salbutamol and Hypertonic Saline Nebulisation and Mother and the children who are cooperative. The exclusion criteria are Children who are seriously ill, Children with life threatening asthma and Children admitted with doubtful/alternative diagnosis. An informed consent was obtained from the care giver by explaining the study purpose and the advantages of receiving nebulization. Those children who presented with Lower Respiratory Infection signs and symptoms were selected and grouped. They were allotted odd numbers and even numbers accordingly. Odd number taken for salbutamol nebulisation and even number taken for Hypertonic saline nebulisation. The children were assessed before and at 1 hour after giving salbutamol and Hypertonic Saline Nebulisation using oxygen saturation level, heart rate and respiratory pattern consecutively for 3 days. The data obtained was planned to be analysis, based on the objectives of the study using descriptive and inferential statistics.

Results and Findings

80 children were enrolled in the study; 40 received salbutamol nebulisation and 40 received Hypertonic saline nebulisation.

On Day 1 the mean pretest oxygen saturation level, heart rate and respiratory pattern was 2.15 ± 0.89 , 4.70 ± 2.57 , 2.75 ± 0.43 whereas the mean posttest oxygen saturation level, heart rate and respiratory pattern is 1.58 ± 0.74 , 4.60 ± 2.65 , 2.15 ± 0.36 in the group I and In group II the mean pretest oxygen saturation level, heart rate and respiratory pattern was 1.70 ± 0.60 , 3.12 ± 1.39 , 2.05 ± 0.22 whereas the mean post-test oxygen saturation level, heart rate and respiratory pattern was 1.20 ± 0.56 , 3.08 ± 1.43 , 2.00 ± 0.00 (Table 1).

Day-1	Group-I (N = 40)					Group -II (N = 40)				
	Pre Test		Post Test		Level of Significance	Pre Test		Post Test		Level of Significance
	Mean	S.D	Mean	S.D	“t” Value and “p” Value	Mean	S.D	Mean	S.D	“t” Value and “p” Value
Oxygen saturation level	2.15	0.89	1.58	0.74	‘t’ = 7.264 ‘p’ = 0.000 ***H.S	1.70	0.60	1.20	0.56	‘t’ = 6.245 ‘p’ = 0.000 *** H.S
Heart Rate	4.70	2.57	4.60	2.65	‘t’ = 2.082 ‘p’ = 0.044 *S	3.12	1.39	3.08	1.43	‘t’ = 1.433 ‘p’ = 0.160 NS
Respiratory pattern	2.75	0.43	2.15	0.36	‘t’ = 7.649 ‘p’ = 0.000 ***H.S	2.05	0.22	2.00	0.00	‘t’ = 1.433 ‘p’ = 0.160 NS

Table 1: Comparison of pre and post-test level of Oxygen saturation, Heart level and Respiratory pattern in group I and II (Day 1).

HS: Highly Significant; NS: Not Significant

On day 2 the mean pretest oxygen saturation level, heart rate and respiratory pattern was 1.65 ± 0.77 , 4.60 ± 2.71 , 2.22 ± 0.42 whereas the mean post-test oxygen saturation level, heart rate and respiratory pattern is 1.28 ± 0.50 , 4.52 ± 2.71 , 2.02 ± 0.15 in group I and in group II the mean pretest oxygen saturation level, heart rate and respiratory pattern was 1.20 ± 0.56 , 2.98 ± 1.56 , 2.00 ± 0.00 whereas the mean posttest oxygen saturation level, heart rate and respiratory pattern is 1.10 ± 0.30 , 2.95 ± 1.58 , 1.85 ± 0.36 (Table 2).

Day-2	Group-I (N = 40)					Group-II (N = 40)				
	Pre Test		Post Test		Level of Significance	Pre Test		Post Test		Level of Significance
	Mean	S.D	Mean	S.D	“t” Value and “p” Value	Mean	S.D	Mean	S.D	“t” Value and “p” Value
Oxygen saturation level	1.65	0.77	1.28	0.50	‘t’ = 4.837 ‘p’ = 0.000***HS	1.20	0.56	1.10	0.30	‘t’ = 2.082 ‘p’ = 0.044 *S
Heart Rate	4.60	2.71	4.52	2.71	‘t’ = 1.778 ‘p’ = 0.083 NS	2.98	1.56	2.95	1.58	‘t’ = 1.000 ‘p’ = 0.323 N.S
Respiratory pattern	2.22	0.42	2.02	0.15	‘t’ = 3.122 ‘p’ = 0.003*S	2.00	0.00	1.85	0.36	‘t’ = 2.623 ‘p’ = 0.012* S

Table 2: Comparison of pre and posttest level of Oxygen saturation, Heart level and Respiratory pattern in group I and II (Day 2).

On day 3 the mean pretest oxygen saturation level, heart rate and respiratory pattern was 1.48 ± 0.55 , 4.52 ± 2.71 , 2.02 ± 0.15 whereas the mean post-test oxygen saturation level, heart rate and respiratory pattern is 1.15 ± 0.36 , 4.45 ± 2.77 , 1.95 ± 0.22 in group I and in group II the mean pretest oxygen saturation level, heart rate and respiratory pattern was 1.00 ± 0.00 , 2.92 ± 1.59 , 1.88 ± 0.33 whereas the mean posttest oxygen saturation level, heart rate and respiratory pattern is 1.00 ± 0.00 , 2.82 ± 1.61 , 1.28 ± 0.45 (Table 3).

Day-3 Variables	Group-I (N = 40)					Group-II (N = 40)				
	Pre Test		Post Test		Level of Significance	Pre Test		Post Test		Level of Significance
	Mean	S.D	Mean	S.D	“t” Value and “p” Value	Mean	S.D	Mean	S.D	“t” Value and “p” Value
Oxygen saturation level	1.48	0.55	1.15	0.36	‘t’ = 4.333 ‘p’ = 0.000 ***H.S	1.00	0.00	1.00	0.00	‘t’ = 0.000 ‘p’ = 0.000*** H.S
Heart Rate	4.52	2.71	4.45	2.77	‘t’ = 1.778 ‘p’ = 0.083 *S	2.92	1.59	2.82	1.61	‘t’ = 1.669 ‘p’ = 0.103 N.S
Respiratory pattern	2.02	0.15	1.95	0.22	‘t’ = 1.778 ‘p’ = 0.083* S	1.88	0.33	1.28	0.45	‘t’ = 7.649 ‘p’ = 0.000***H.S

Table 3: Comparison of pre and posttest level of Oxygen saturation, Heart level and Respiratory pattern in group I and II (Day 3).

The above table highlights that the mean oxygen saturation level, heart rate and respiratory pattern between Group I and Group II shows Group I has Statistical difference with the mean of 1.15, 4.45 and 1.95 with t value 2,623, 3.034 and 9.000 shows there is significant difference in the salbutamol nebulization compare to hypertonic saline.

Further in the table 1, 2, 3 with the pre and post test result on the day 1, 2, 3 it showed that each nebulization has significant difference in the breathing pattern, heart rate and oxygen saturation of the baby in the post test but when compare between two method salbutamol has more effect than saline nebulization (Table 4).

Variables	Group-I (N = 40) (Salbutamol)		Group-II (N = 40) (Hypertonic saline)		Significance “t” value and “p” value
	Mean	S.D	Mean	S.D	
Oxygen Saturation	1.15	0.36	1.00	0.00	t =2.623 p =0.012* S
Heart Rate	4.45	2.77	2.82	1.61	t = 3.034 p =0.004* S
Respiratory Pattern	1.95	0.22	1.28	0.45	t =9.000 p =0.000 ***HS

Table 4: Comparison of the effectiveness between Salbutamol and Hypertonic saline group on posttest level of oxygen saturation, heart rate and respiratory pattern among children.

Discussion

In this study the author compared the effect of Salbutamol Vs Hypertonic saline nebulisation for children with LRTI. The study results were supported by the following authors. Walsh P, *et al.* [7] conducted study on “Comparison of nebulized epinephrine to albuterol in bronchiolitis”. Patients received either three doses of racemic albuterol or one dose of racemic epinephrine plus two saline nebulizers. The study concluded that in children up to the 18th month of life, treatment of bronchiolitis with nebulized racemic albuterol led to more successful discharges than nebulized epinephrine. Kuzik BA, *et al.* [8] conducted a prospective, randomized, double-blinded, controlled, multicenter trial study on “Nebulized hypertonic saline in the treatment of viral bronchiolitis”. Patients were randomized to receive, in a double-blind fashion, repeated doses of nebulized 3% HS (treatment group) or 0.9% normal saline (NS; control group), in addition to rou-

tine therapy ordered by the attending physician. The author concluded that the use of nebulized 3% HS is a safe, inexpensive, and effective treatment for infants hospitalized with moderately severe viral bronchiolitis. Mull CC [9] conducted a randomized trial on "Nebulized epinephrine vs albuterol in the emergency department treatment of bronchiolitis". Sixty-six patients between 0 and 12 months of age with new-onset wheezing, were randomized in a double-blind fashion. The study concluded that although the patients treated with epinephrine were judged well enough for ED discharge significantly earlier than the patients treated with albuterol, epinephrine was not found to be more efficacious than albuterol in treating moderately ill infants with bronchiolitis. Park JY, *et al.* [10] conducted a study in Qatar "To determine the efficacy and safety of frequently nebulised hypertonic saline (HS) in moderately to severely ill infants with bronchiolitis". 126 infants were randomized to receive either nebulized 3% HS or 0.9% normal saline (NS) and 112 patients completed the study. The author concluded that frequent inhalation of HS shortened Length of Stay significantly and relieved symptoms and signs faster than NS for moderately to severely ill infants with bronchiolitis without apparent adverse effects. Donaldson SH [11] conducted study on "Mucus clearance and lung function in cystic fibrosis with hypertonic saline". A total of 24 patients with cystic fibrosis were randomly assigned to receive treatment. Mucus clearance and lung function were measured during 14-day baseline and treatment periods. The study showed that in patients with cystic fibrosis, inhalation of hypertonic saline produced a sustained acceleration of mucus clearance and improved lung function. Khashabi J, *et al.* [12] conducted study on "Comparison of the Efficacy of Nebulized L-Epinephrine, Salbutamol and Normal Saline in Acute Bronchiolitis". In a randomized clinical trial, 72 infants with moderately severe bronchiolitis were enrolled in three equal groups. The study result showed that both nebulized epinephrine and salbutamol improved oxygenation and decreased respiratory distress better than normal saline. L-epinephrine was more effective in relieving respiratory distress and improving oxygen saturation as well as the need for hospitalization than nebulized salbutamol.

Conclusion

With the above study result it is concluded that though Hypertonic saline is effective to clear the LRTI but in acute cases salbutamol is the choicest method for children to get relief and cure.

Bibliography

1. Margaret Young National President. Early childhood Australia. A voice for children (2009).
2. Dutta P. "Pediatric Nursing, 2nd edition". Jaypee. Delhi (2009): 280.
3. Robert Beaglehole, *et al.* "The World Health Report 2004 - Changing History". *World Health Organization Bulletin* (2004): 120-124.
4. Mulholland EK, *et al.* "Standardized Diagnosis of Pneumonia in Developing Countries". *Pediatric Infectious Disease Journal* 11.2 (1992): 77-81.
5. Shann F, *et al.* "Acute Lower Respiratory Tract Infections in Children: Possible Criteria for Selection of Patients for Antibiotic Therapy and Hospital Admission". *Bulletin of the World Health Organization* 62.5 (1984): 749-751.
6. Pavić I, *et al.* "Risk factors for acute respiratory tract infections in children". *American Journal of Pediatrics* 36.2 (2012): 539-542.
7. Walsh P. "Comparison of nebulized epinephrine to albuterol in bronchiolitis". *Academic Emergency Medicine* 15.4 (2008): 305-313.
8. Kuzik BA, *et al.* "Nebulized hypertonic saline in the treatment of viral bronchiolitis in infants". *Indian Journal of Pediatrics* 151 (2007): 266-270.
9. Mull CC, *et al.* "A randomized trial of nebulized epinephrine vs albuterol in the emergency department treatment of bronchiolitis". *Archives of Pediatric Adolescent Medicine* 158.2 (2004): 113-118.

10. Park JY, *et al.* "The efficacy of three percent hypertonic saline solution and fenoterol in infants with bronchiolitis". *Indian Journal of Pediatrics* 48.5 (2005): 518-522.
11. Donaldson SH, *et al.* "Mucus clearance and lung function in cystic fibrosis with hypertonic saline". *National England Journal of Medicine* 354.3 (2006): 241-250.
12. J Khashabi, *et al.* "Comparision of the Efficacy of Nebulized L-Epinephrine, Salbutamol and Normal Saline in Acute Bronchiolitis : A Randomized Clinical Trial". *Medical Journal of the Islamic Republic of Iran* 19.2 (2005): 119-125.

Volume 7 Issue 2 February 2018

©All rights reserved by Catherine R and Manju Bala Dash.