

Adrenaline and Dexamethasone, vs Adrenaline and Fluticasone, vs Adrenaline alone in Bronchiolitis: A Randomized Controlled Trial

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Authors' contributions

This work was carried out in collaboration among all authors. Author JRG designed the study. Author AMS performed the statistical analysis, wrote the protocol and managed the analyses of the study. Author NBA wrote the first draft of the manuscript and corresponded with the journal editors for final corrections. Author RDB managed the literature searches. All authors read and approved the final manuscript.

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ABSTRACT

Background and Objectives: There is no consensus over which drug best reduces symptoms in Bronchiolitis syndrome. The primary objective of our study is to establish comparative effect of adrenaline nebulisation alone and combination of adrenaline nebulisation plus injectable dexamethasone and adrenaline nebulisation plus fluticasone nebulisation in the treatment of clinical cases of bronchiolitis.

Methods: 100 patients diagnosed clinically as bronchiolitis were enrolled in study from 1 month to 24 months of age. Patients were enrolled by purposive sampling. Patients with respiratory distress assessment instrument score [RDAI] of 4 to 15 were chosen, randomized into three groups and treatment given till patient fulfilled discharge criteria. Group A (n=33) were given nebulised adrenaline alone, Group B (n=34) were given nebulised adrenaline plus injectable dexamethasone and Group C (n=33) were given nebulised adrenaline plus nebulised fluticasone.

Results: The mean reduction in clinical severity-RDAI score was 1.75 ± 0.86 in Group A, 2.30 ± 0.68 in Group B and 1.42 ± 0.9 in Group C when measured in terms of difference in clinical scores between day 1 and 2 ($p=0.0003$).

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Mean duration of hospital stay in the group A was (4.93±1.95 days), Group C (4.78±1.83) and Group B (3.91 ±1.37 days). The difference of stay between the Groups A and B was 1.02±0.58 days vs 0.87± 0.46 days in groups B and C ($p=0.0048$). Reduction in the length of hospital stay in group B was 22% compared to Group A & 19% compared to Group C ($p=0.0048$).

Side effects were tachycardia in six patients.

Conclusion: Combination of adrenaline nebulization and injectable dexamethasone was found significantly better as compared to nebulised adrenaline plus nebulised fluticasone and nebulised adrenaline alone in patients of clinical bronchiolitis in reducing severity of clinical symptoms and duration of hospitalization.

Keywords: Bronchiolitis; adrenaline; dexamethasone; fluticasone; nebulisation.

1. INTRODUCTION

Bronchiolitis is characterized by acute onset of respiratory symptoms in a child younger than 2 years of age. Typically, symptoms of upper respiratory tract viral infection, such as fever and coryza, progress within 4–6 days to include evidence of lower respiratory tract involvement with the onset of cough and wheezing. The incidence has been reported to be about 11% to 15%. Depending on the severity of the infection, there are at least 5 hospitalizations for every 1000 children younger than 2 years of age.

Affected infants become gradually dyspnoeic and gradually recover spontaneously [1]. During convalescent phase, respiratory and bronchial secretions becomes thick and abundant which leads to the blockage of airways and segmental atelectasis which has shown unresponsiveness to bronchodilator therapy.

The current treatment for bronchiolitis is not uniform. The mainstay of treatment is, supportive care with supplemental oxygen, adequate hydration and mechanical ventilation as needed [2,3]. Bronchodilators and corticosteroids are widely used but not routinely recommended [4]. While a meta analysis of the effects of nebulised selective beta 2 agonists failed to show any consistent benefit [5], a meta analysis of the effect of nebulised epinephrine suggested a decrease in clinical symptoms compared with either placebo or albuterol [6,7]. A published study on dexamethasone showed better outcomes in hospital admission rate or respiratory clinical score compared with placebo [8]. However, combination therapy using dexamethasone and epinephrine has been reported to produce an improvement in respiratory clinical score within the first hour and may significantly reduce hospital admissions [9]. Additionally, two small studies have reported beneficial outcomes by combining epinephrine

with dexamethasone [10,11] or albuterol with dexamethasone [10,11]. In a similar population, there has been no benefit reported with either dexamethasone alone, epinephrine alone or albuterol alone [9,11].

2. MATERIALS AND METHODS

2.1 Design of the Study

A randomized, Prospective, comparative open label controlled clinical trial. Study patients were recruited during mid December 2014 to end of August 2015 admitted at Pediatrics department of Sir T G hospital and Govt Medical College, Bhavnagar, Gujarat.

2.2 Participants

Patients from 1 to 24 months of age with mild to moderate bronchiolitis, presented to the emergency department with acute onset of symptoms with RDAI score between 5 and 15 were recruited for the study [12].

2.3 Sample Size

100 patients of clinically diagnosed bronchiolitis admitted in the ward were enrolled in study. Study was started from 16th December 2013 and after total 100 patients were enrolled by 30 august 2014, we stopped further enrolment.

2.4 Inclusion Criteria

All cases of bronchiolitis with a Respiratory Distress Assessment Instrument (RDAI) score of 4 to 15 on a scale of 0 (mild) to 17 (severe) [12].

2.5 Exclusion Criteria

Those who have received steroid within two weeks before admission, children with chronic lung disease, congenital malformation of heart

and lung, asthma, cystic fibrosis, previous history of Wheeze associated Lower respiratory tract infection (WALRI), children presented with severe disease [RDAI >15], saturation <85% on room air, cyanosis or having progressive respiratory failure.

Sampling in this study is convenient purposive sampling and patients are chosen as first come first enrolled in study. Patients were randomised into three groups using a lottery method. Our study was non-blinded.

Group-A patients received nebulised adrenaline; 5 ml in 1:1000 solutions [undiluted] per treatment every 6 hourly till discharge.

Group-B received single dose of intramuscular dexamethasone injection; 0.6 mg/kg (max 10 mg) and nebulised adrenaline.

Group-C received nebulised adrenaline and nebulised fluticasone; 500 mcg two times a day for 48 hrs (3 ml of 2 mg/2 ml respule diluted in 10 ml normal saline).

IV fluid and supportive treatment were administered to all on clinical basis. Antibiotics were not used.

All admitted patients were subjected to blood routine investigation and chest radiography. Viral aetiology is the most common in pathogenesis of bronchiolitis, so bacterial blood culture was not sent. Virological diagnosis specifically respiratory syncytial virus isolation was not available.

2.6 Add on Therapy

Additional inhalations administered as needed clinically were recorded as add-on therapy.

Adrenaline and fluticasone nebulisation were given by paediatric nebuliser kit. Piston driven electric nebuliser machine was used. The nebulisers were administered for 10 minute duration. All patients were enrolled within 24 hours of admission to the hospital.

2.7 Monitoring

Patients were examined at the enrolment and every day. Relevant demographic and clinical data were obtained from each patient that included the following parameters in particular: age, sex, duration of each symptom, and history of previous wheezing episode/cardiac

disease/foreign body aspiration, gestational age, and mode of delivery. Vital parameters [heart rate, respiratory rate, saturation] were measured and recorded. Patients were examined for presence of cyanosis, pallor, and chest retractions. In systemic examination, emphasis was laid on breath sounds and presence of rhonchi or rhonchi with crepitation. Intravenous fluids were administered at maintenance rate for children with feeding difficulty. A clinical score was assigned using a clinical severity score [12]. The scoring was done daily during the hospital stay and was tabulated.

The major outcome parameters studied to find out the efficacy of treatment were improvement in respiratory distress (clinical score) and the duration of hospital stay. Other minor outcomes were number of add-on treatments required and failure rates in each group. The duration of hospital stay was measured using a method previously validated by the Paediatric Investigators Collaborative Network on Infections in Canada studies of hospitalized children with RSV infection [PICNIC study] [13].

Only those days, for which bronchiolitis was the reason for hospitalization, were recorded as valid hospital days. Discharge timing was at the discretion of the attending physician.

2.8 Discharge Criteria

1. Absence of fever and respiratory distress,
2. Breathing room air comfortably with saturation > 96% and
3. Tolerating oral feeds.

3. RESULTS

Enrolment of case of bronchiolitis is shown in flow chart Fig. 1.

All three groups were comparable in terms of age and clinical characteristics as well as laboratory parameters (Table 2). The mean age of the participants was 11.20 ± 7.50 months, the youngest being 1 month and the oldest patient was 24 months of age. According to our study, Males were more commonly affected than Females (M: F ratio of 1.94:1). All children had cough and fast breathing and had wheezing, 85% had fever, and 94% had cold as the complaints at admission.

As per Table 3 three patients had a positive family history of asthma, 13 children were born

by caesarean section, and four children were born preterm. Among the confounding factors for severe disease, we found that children with *preterm birth had severe disease* ($p=0.0013$). Other risk factors for severe disease studied in our study did not show the same correlation.

The clinical score at admission was 8.53 ± 1.59 . The score in the adrenaline group was (9.0 ± 1.63) compared to adrenaline plus dexamethasone (8.58 ± 1.8) and adrenaline plus fluticasone group (8.3 ± 1.23) however, the difference was *not significant* ($p=0.1967$).

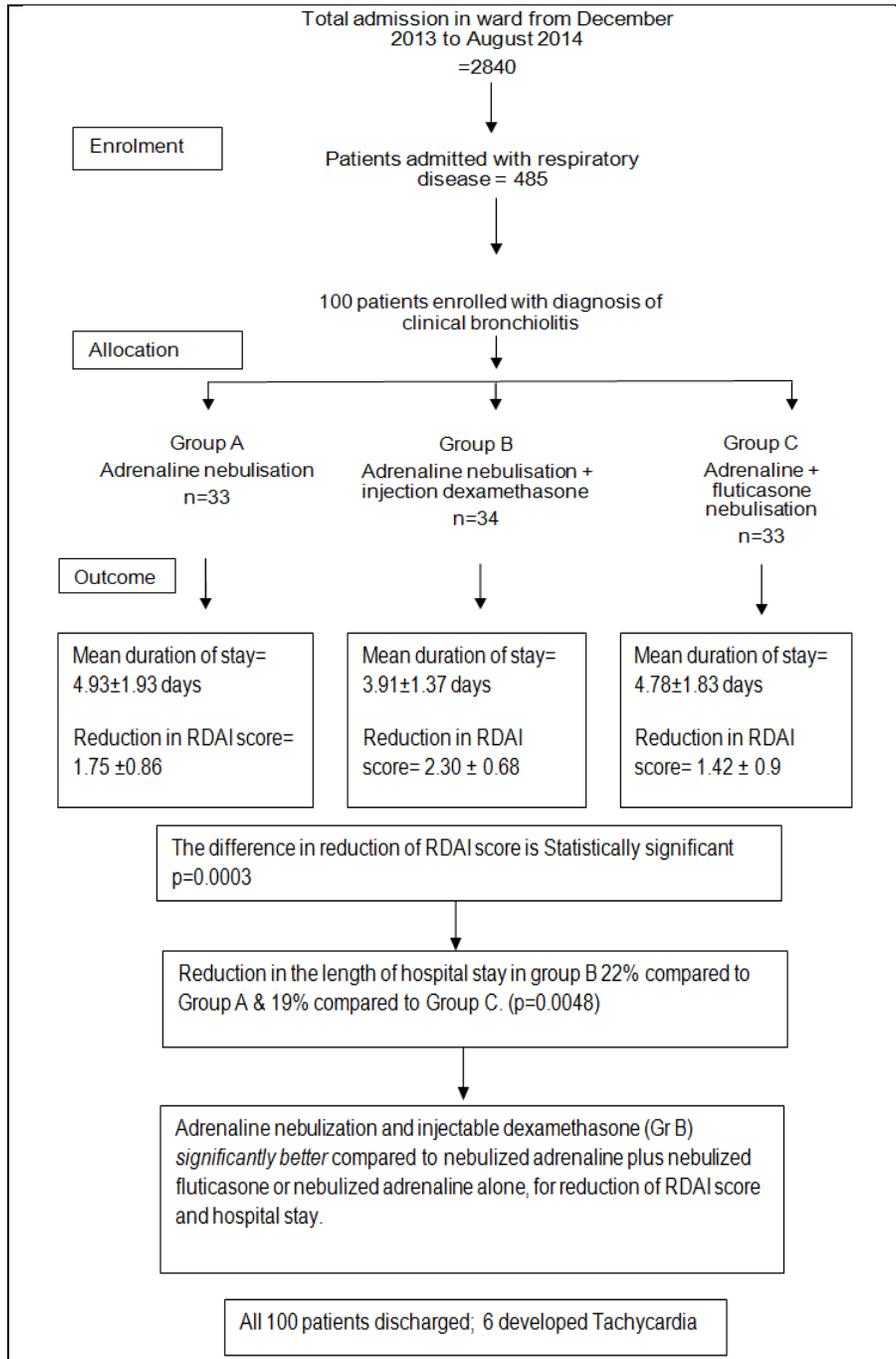


Fig. 1. Flow chart

Table 1. Respiratory distress assessment instrument [12]

Respiratory distress assessment instrument						
Symptoms	Score					Maximum score
	0	1	2	3	4	
Wheeze/crackles						
During expiration	None	End only	½ phase	¾ phase	Throughout	4
During inspiration	None	Partial	Throughout	-	-	2
Lung field involved	None	<2 of 4	>3 of 4	-	-	2
Retractions						
Supraclavicular	None	Mild	Moderate	Marked	-	3
Intercostal	None	Mild	Moderate	Marked	-	3
Substernal	None	Mild	Moderate	Marked	-	3
Total						17

Table 2. Characteristics of patients on admission Mean ± SD

	Group A n=33	Group B n=34	Group C n=33	Total n=100	p-value
0-6 months	13	15	6	34	0.1899
7-12 months	12	5	17	34	0.1082
>12 months	8	14	10	29	0.2292
Mean age (months)	9.48± 4.19	12.26± 9.16	11.90± 6.45	11.20± 7.50	0.2392
Fever	3.96±3.43	2.96±2.43	4.10±3.72	3.32±3.2	0.3148
Cough	5.93±4.13	5.36±3.99	4.51±4.23	5.23±4.1	0.3729
Cold	5.21±4.21	4.90±3.41	3.81±3.15	4.61±3.01	0.2641
Fast Breathing	3.22±3.12	2.79±2.77	2.61±2.72	2.76±2.80	0.6902
RR /min	58.18±7.67	55.88±10.22	55.33±8.58	56.46±8.89	0.3891
Oxygen Saturation (%)	95.18±2.55	95.79±2.07	95.36±2.54	95.45±2.56	0.6088
Haemoglobin (g/dl)	10.75±1.69	10.56±1.63	10.20±1.83	10.50±1.72	0.4187
TLC (cells/ul)	10745±3176	11510±3697	11153±3744	11,140±3735	0.6790
Neutrophils	44.33±16.42	50.38±17.92	52.69±17.35	49.15±17.40	0.1317
Lymphocytes	48.59±15.88	42.79±18.01	42.12±17.01	44.47±17.0	0.2448
Eosinophil	2.78±1.63	2.32±1.19	2.24±1.76	2.29±1.37	0.3076

*n= Total number RR= Respiratory rate g=Gram dl= Decilitre min=Minute SD=Standard deviation
ul=Micro litre*

Table 3. Confounding factors for severe disease

Variables		Clinical score on day1		p-value
		Min-max	Mean± SD	
Age in months	0-6 month	6-12	8.59± 1.53	0.1253
	7-12 month	6-13	8.76±1.47	
	Above 12 month	6-12	7.96±1.66	
Gender	Male	6-13	8.53±1.61	0.9979
	Female	6-12	8.52±1.56	
F/H of asthma	Present	6-12	9.33±2.50	0.3550
	Absent	6-13	8.50±1.50	
Mode of delivery	Normal	6-13	8.50±1.60	0.8457
	LSCS	7-12	8.60±1.44	
Gestational week	Preterm	10-12	11±1.55	0.0013
	Term	6-13	8.43±1.50	

F/H =family history Min= Minimum max=Maximum SD=Standard deviation

The major outcome parameters studied in the study were reduction in clinical severity and the length of hospital stay. As per Table 4 the mean reduction in clinical severity score was 2.08±1.14. The mean reduction in clinical severity score in adrenaline group was 1.75

±0.86; 2.30±0.68 in the adrenaline plus dexamethasone group and 1.42 ± 0.9 in adrenaline plus fluticasone group when measured in terms of difference in clinical scores between day 1 and 2. The difference was statistically significant. (p=0.0003).

As per Table 5 the mean duration of hospital stay was 4.54±1.63 days. In group A (4.93±1.93), and group C (4.78±1.83), it was marginally longer compared to the group B (3.91±1.37) (Fig. 2). The mean difference in length of stay between groups A & B was 1.02±0.58 days, between group C & B was 0.87±0.46 days and between Group A & C 0.15±0.12 days. Adrenaline plus dexamethasone group shows 22% reduction in the length of hospital stay when compared to the adrenaline group; whereas 19% reduction when

compared to adrenaline plus fluticasone group which was significant (p=0.0048). The mean difference between group A and group C is 0.15±0.12 days which was not significant (p=0.7483).

Mean number of nebulisation required as add-on therapy: In our study, 11 from the adrenaline group, 10 from the adrenaline and dexamethasone group and 13 from adrenaline fluticasone group required additional nebulisations; the difference was not significant (p=0.1955).

A total of six patients had shown tachycardia after giving nebulisation. Tachycardia was probably due to systemic effect of adrenaline after absorption in pulmonary capillaries.

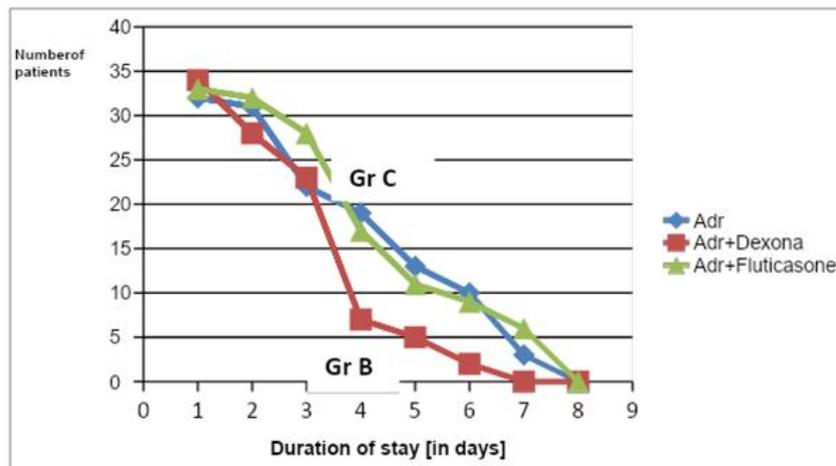


Fig. 2. Number of patients in each group remaining in the hospital every day
Gr B – Adrenaline + inj Dexamethasone; Gr C – Adrenaline + Fluticasone

Table 4. Reduction in clinical severity score

Reduction in clinical severity score	Adrenaline	Adrenaline + dexamethasone	Adrenaline + Fluticasone
Mean ± SD (Reduction)	1.75 ±0.86	2.29 ±0.68	1.42 ±0.90

p < 0.0003; SD= Standard deviation

Table 5. Length of hospital stay in days

Length of hospital stay	Adrenaline (n=33)	Adrenaline plus Dexamethasone (n=34)	Adrenaline plus fluticasone (n=33)	Total (n=100)
1-2 days	2	6	1	9
3-4 days	12	21	15	48
>4 days	19	7	17	43
Mean ± SD (days)	4.93±1.95	3.91±1.37	4.78±1.83	4.54±1.63
p value	0.0048			

n= Total number SD= Standard deviation

Table 6. Daily clinical score (RDAI) Mean \pm SD

Day of admission	Adrenaline		Adrenaline + Dexamethasone		Adrenaline + Fluticasone	
	No of patients	Mean \pm SD	No of patients	Mean \pm SD	No of patients	Mean \pm SD
Day 0	33	9 \pm 1.63	34	8.58 \pm 1.8	33	8.3 \pm 1.23
Day 1	32	9 \pm 1.63	34	8.58 \pm 1.8	33	8.3 \pm 1.23
Day 2	31	7 \pm 1.65	28	6.17 \pm 1.73	32	7.03 \pm 1.15
Day 3	22	6.06 \pm 1.48	23	5.6 \pm 1.34	28	5.9 \pm 1.22
Day 4	19	5.71 \pm 1.102	7	6 \pm 6.23	17	5 \pm 1.21
Day 5	13	5 \pm 0.93	5	5.28 \pm 1.25	9	4.6 \pm 1.09
Day 6	10	4.7 \pm 0.48	2	4.2 \pm 0.44	6	4.75 \pm 0.46
Day 7	3	4 \pm 0.37	0	4	0	4
Day 8	0	4 \pm 0	0	0	0	0

4. DISCUSSION

In our study patients who were given nebulised adrenaline with injectable dexamethasone showed decreased duration of hospital stay and decrease in clinical severity score in the 2nd day of admission. The pathophysiological mechanism behind the synergistic effect of the combination of a bronchodilator and steroids is unclear, although the synergy has been documented in the treatment of asthma. It has been suggested that bronchodilators stimulate steroid receptor expression and that steroids stimulate (post) adrenergic receptors. The anti-inflammatory effects of adrenergic agonists and steroids are mediated by common pathways [9]. We have utilised adrenaline nebulisation which has lesser systemic effect. Therefore, it would be interesting to determine if other bronchodilators in combination with steroids have effects similar to those of epinephrine.

Plint found in randomised placebo trial that dexamethasone combined with nebulised epinephrine led to a reduction in hospitalization due to bronchiolitis within seven days of enrolment compared to nebulised adrenaline alone, dexamethasone alone or placebo [7].

In our study dexamethasone was used as single intramuscular injection as compared to the study by Roosevelt in which Dexamethasone was used for once a day for three days and in the study of Klassen it was used alone in oral form for three days [14,15].

In our study by using adrenaline dexamethasone combination we found that there was a reduction in hospital stay. This observation was similar to the findings from Bentur, et al. who found that

dexamethasone and nebulised adrenaline combination has a mean reduction of 2.6 \pm 0.2 days (26%) compared to only adrenaline nebulisation group [9].

In our study, patients who were given Adrenaline and injectable dexamethasone showed reduction in clinical score between day 1 and day 2 ($p < 0.0003$). This was similar to Kyuncu study who showed that a single dose of dexamethasone added to nebulised L-epinephrine for acute bronchiolitis in infants as compared to nebulised adrenaline alone ($p < 0.01$) resulted in a better clinical outcome, on the fifth day, in mild to moderate bronchiolitis [8].

But as per the recommendations given by 2006 American Academy of Paediatrics (AAP) subcommittee on diagnosis and management of bronchiolitis, corticosteroids should *not* be used in management of bronchiolitis [2]. A Cochrane Systematic Review of Glucocorticoids for acute viral bronchiolitis in infants and young children, including both oral and parenteral administration, identified no clinically relevant effect of systemic or inhaled glucocorticoids on admissions or length of hospitalization [16]. Schuch identified a significant reduction of hospitalization and clinical score within four hours of therapy with dexamethasone when compared to placebo in children up to two years of age [17] however, there was a high rate of family history of atopy favouring dexamethasone group with no positive effect on administration rate or need for bronchodilators. So the author concluded that there is no benefit of corticosteroid after the first dose. Another study showed that a single-dose, dexamethasone injection versus placebo produced a significant: (1) decrease in the time

needed for the resolution of respiratory distress (hazard ratio 1.56; 95% CI, 1.14-2.13; $p= 0.005$), (2) decrease in the mean duration of symptoms of 11.8 hr (95% CI, 3.9-19.7; $p= 0.004$), (3) decrease in the mean duration of oxygen therapy of 14.9 hr (95% CI, 5.3-24.4; $p= 0.003$), and (4) decrease in the mean length of hospital stay of 13.4 hr (95%CI, 2.6-24.2; $p= 0.02$) [18]. Our study showed minimal number of patients developing Tachycardia as a side effect which is mostly attributable to Adrenaline. No other known side effects related to steroids were observed which is similar to the study by Fernandes which showed no increase in adverse effects with short term high dose inhaled or systemic corticosteroids [19].

5. CONCLUSION

Combination of adrenaline and single dose injection dexamethasone, is superior in terms of reduction of severity and reducing duration of hospitalization in comparison to adrenaline alone and adrenaline plus fluticasone nebulisation.

What is already known?

Treatment of bronchiolitis consists of supportive measures like maintenance of hydration, humidified oxygenation.

No meta-analysis supports the role of any pharmacological intervention.

Four prospective studies had shown positive effect of adrenaline and/ or steroid combination in treatment of bronchiolitis [7-9,19].

What this study adds?

There is a significant role of combining adrenaline nebulisation with *single dose injection dexamethasone*; when compared to, nebulised adrenaline plus fluticasone; or nebulised adrenaline alone; in the treatment of bronchiolitis; in the form of decreased severity of symptoms and duration of hospitalisation.

6. LIMITATION OF STUDY

Small number of sample, study conducted during non-winter season, blinding was not done, 'no pharmacological intervention' group not created as control.

We did not study RSV status as PCR facility was not available for viral study.

CONSENT

Written informed consent was obtained from all the parents before enrolling them into the study.

ETHICAL APPROVAL

Ethical committee approval was obtained from the *Institutional Review Board and Human Ethics committee* (ECR/557/Inst/GJ/2014/RR-17, 409/2014, Government Medical College, Bhavnagar [Regd. with: Government of India, MOHFW, DGHS, DCGI].

COMPETING INTERESTS

Authors have declared that no competing interests exist.

REFERENCES

1. Price JF. Acute and long-term effects of viral bronchiolitis in infancy. *Lung*. 1990;168(Suppl):414–21.
2. American academy of pediatrics subcommittee on diagnosis and management of bronchiolitis. *Pediatrics*. 2006;118:1774-93.
3. King VJ, Viswanathan M, Bordley WC, Jackman AM, Sutton SF, Lohr KN, et al. Pharmacologic treatment of bronchiolitis in infants and children: A systematic review. *Arch Pediatr Adolesc Med*. 2004;158:127-37.
4. Kellner JD, Ohlsson A, Gadomski AM, Wang EE. Efficacy of bronchodilator therapy in bronchiolitis. A meta-analysis. *Arch Pediatr Adolesc Med*. 1996;150:1166-72.
5. Flores G, Horwitz RI. Efficacy of beta2-agonists in bronchiolitis: A reappraisal and meta-analysis. *Pediatrics* 1997;100:233-9.
6. Hartling L, Wiebe N, Russell K, Patel H, Klassen TP. A meta-analysis of RCT evaluating the efficacy of epinephrine for treatment of acute viral bronchiolitis. *Arch Pediatr Adolesc Med*. 2003;157:957-64.
7. Plint AC, Johnson DW, Patel H, et al. Epinephrine and dexamethasone in children with bronchiolitis. *N Engl J Med*. 2009;360:2079–89.
8. Kuyucu S, Unal S, Kuyucu N, et al. Additive effects of dexamethasone in nebulised salbutamol or L-epinephrine treated infants with acute bronchiolitis. *Pediatr Int*. 2004;46:539–44.

9. Bentur L, Shoseyov D, Feigenbaum D, et al. Dexamethasone inhalations in RSV bronchiolitis: A double-blind, placebo-controlled study. *Acta Paediatr.* 2005;94: 866–71.
10. Lowell DI, Lister G, Von Kloss H, McCarthy P. Wheezing in infants: The response to epinephrine. *Pediatrics.* 1987;79(6):939–45. PMID: 3295741
11. Liza Bialy, Foisy M, Smith M, Fernandes RM. Evidence-based child health: A cochrane review. *Journal Evid. Based Child Health.* 2011;6:258–275. DOI: 10.1002/ebch.673
12. Carvalho WBD, Johnston C, Fonseca MCM. Bronchiolitis and Roger's Textbook of Intensive Care. 4th Ed. Philadelphia: Wolters Kluwer Lippincott Williams & Wilkins. 2008;716-721.
13. Law BJ, Langley JM, Allen U, Paes B, Lee D, Mitchell I, et al. Pediatric investigators collaborative network on infections in Canada study of predictors of hospitalization for RSV infection for infants born at 33 through 35 completed weeks of gestation. *Pediatr Infect Dis J.* 2004;23: 806–814.
14. Roosevelt G, Sheehan K, Grupp Phelan J, Tanz RR, Listernick R. Dexamethasone in bronchiolitis: A randomised controlled trial. *Lancet.* 1996;348:292-5.
15. Klassen TP, Sutcliffe T, Watters LK, Wells GA, Allen UD, Li MM. Dexamethasone in salbutamol treated in patients with acute bronchiolitis: A randomized, controlled trial. *J Pediatr.* 1997;130:191-6.
16. Fernandes RM, Bialy LM, Vandermeer B, Tjosvold L, Plint AC, Patel H, et al. Glucocorticoids for acute viral bronchiolitis in infants and young children. *Cochrane Database Syst Rev.* 2010;CD004878.
17. Schuh S, Coates AL, Binnie R, Allin T, Goia C, Corey M, et al. Efficacy of oral dexamethasone in outpatients with acute bronchiolitis. *J Pediatr.* 2002;140:27-32.
18. Teeratakulpisarn J, Limwattananon C, Tanupattarachai S, et al. Efficacy of dexamethasone injection for acute bronchiolitis in hospitalized children: A RCT. *Pediatric Pulmonology.* 2007;42(5): 433-439. DOI: 10.1002/ppul.20585
19. Fernandes RM, Wingert A, Vandermeer B, Featherstone R, Ali S, Plint AC, Stang AS, Rowe BH, Johnson DW, Allain D, Klassen TP. Safety of corticosteroids in young children with acute respiratory conditions: A systematic review and meta-analysis. *BMJ Open.* 2019;9(8):e028511.

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