

To Compare the Efficacy of Single Dose Oral Dexamethasone versus Multi-Dose Prednisolone in the Treatment of Acute Asthma Exacerbation

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ABSTRACT

Objective: To compare the efficacy of single dose oral dexamethasone versus multi-dose prednisolone in the treatment of acute asthma exacerbation.

Study Design: Randomized controlled trial Study.

Place and Duration of Study: This study was conducted at the Department of pediatrics, Gomal Medical College D.I Khan from Sep 2015 to March 2016.

Materials and Methods: A total of 160 children under 12 years of age were divided in 2 groups at random, dexamethasone was given to children in A group and in group B prednisolone was given. All children were followed until 10th day after discharge to determine the efficacy of treatment in terms of relapse.

Results: Group A contained children having mean age 7.53 + 2.23 years & group B had children with mean age 8.1 + 2.3 years (p value 0.107). Of the whole sample, we had 65% males in group A and 55% in group B, female gender was found in 25% in group A while 45% in group B. (p 0.197). Efficacy in terms of relapse for group A was 85% while that of group B was 70%, (p value of 0.023).

Conclusion: The oral dexamethasone is more effective than oral prednisolone in the treatment of acute exacerbation of bronchial asthma in children below 12 years, however, we recommend more randomized controlled trials specially in various combinations with bronchodilators for the generation of solid evidence in the treatment of acute asthma.

Key Words: Acute Asthma, dexamethasone, prednisolone, glucocorticoid, steroid, relapse

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INTRODUCTION

Asthma is a chronic & recurrent ailment, having significant morbidity. In 2007, 96 lac(13.1%) patients were identified as asthmatic. In which, 70% had at least one asthmatic attack in the previous 12 months.¹

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The goal of treatment is to achieve control of clinical manifestation of the disease and maintain this control for prolonged period, with appropriate regard to safety and cost of treatment.² Broncho constriction is best targeted with beta-2 agonists, the airway edema and secretion that accompany an acute exacerbation respond to systemic corticosteroid therapy.³

The British thoracic society guidelines on management of asthma, recommend commencing oral prednisolone early for children presenting with exacerbations of asthma and if discharged, continuing treatment for up to three to five days.⁴

Oral prednisolone and dexamethasone are the currently recommended systemic steroids for acute asthma exacerbations. Dexamethasone is a long acting glucocorticoid with half-life of 36 to 72 hours and is 6 times more potent than prednisolone. Prednisolone is a short acting glucocorticoid with half-life of 18 to 36 hours.⁵

Studies regarding comparison of oral dexamethasone and prednisolone show that short course dexamethasone has a parental preference with better compliance,⁶ and also more cost effective and cost saving.⁷ In one study, 4.1% of prednisolone patients were admitted before the 2-week follow-up⁸ and another study shows 16% in

Dexagroup needed un-planned visits on follow up ($P = .27$).⁹

Aim of this study is to compare the efficacy of dexamethasone and prednisolone in acute asthma in terms of relapse within 10 days. This study will also help to improve drug administration, compliance, leading to decrease hospital visits, with better asthma control and parental preference for single dose steroid.

MATERIALS AND METHODS

Inclusion Criteria:

- Age: 2-12 years and both gender
- Diagnosed patients of asthma presenting with acute asthma exacerbation.

Exclusion Criteria:

- Subjects with severe or life-threatening asthma (Severe respiratory distress (RR > 40/min and use of accessory muscles, agitated or drowsy, unable to speak in sentences, having loud wheeze or silent chest, not responding to usual treatment of asthma i.e. Bronchodilators and Steroids).
- Fever > 39.5°C
- Other medical illness (Congenital heart disease, cystic fibrosis, T.B)
- Corticosteroids use Orally in the last month

Data Collection Procedure: The study has been approved from hospital ethical committee of Gomal Medical College, D.I Khan. Eligible patients were enrolled in trial after taking informed consent from parents. Patients presenting to the emergency department fulfilling the inclusion criteria was randomized to either Prednisolone tablet (2 mg/kg/day not exceeding 60 mg / day in 2 divided doses) for five days or single-dose Dexamet has one tablet (0.6 mg/kg not exceeding eighteen mg). All patients with an acute asthma exacerbation were treated according to the institution's asthma clinical care guideline. Patients were discharged after stabilization. After discharge, subjects were followed after ten days. The major conclusion is the relation between both groups for relapse. All the information was collected on a specially designed proforma (attached).

By using software SPSS the data was recorded & evaluated in the computer. For variables like age the mean and \pm SD was computed. Frequency &% was computed for the variable like relapse. The proportion of patients with relapse was compared among two study groups using chi square test. A P-value of <0.05 was considered statistically significant. The results were entered in table form.

RESULTS

Patients of age 2-12 yrs were enrolled in the study. The sample was selected according to operational definition of acute exacerbation of Asthma and was divided in 2 groups at random. In A group 80 children was given a Dexamet has one single-dose orally (0.6 mg/kg not exceeding 18 mg) while 80 children in group B were subjected to Oral Prednisolone (1 mg/kg per dose to a maximum of 30 mg) twice daily for 5 days.

The mean age of the whole study sample was 7.82 + 2.27 years. Mean age of children in group A was 7.53 + 2.23 years while in group B it was 8.1 + 2.3 yrs. By applying T-test (p value of 0.107) the difference was insignificant statistically. (Table 1)

Children were divided in various age groups categorically. The groups made included children up to 6.00 yrs of age, from 6.01 to 9.00 yrs and from 9.01 to 12.00 yrs. The percentages of various categories are elaborated in Table 2.

After gender wise distribution of the sample, we observed that we had 65% males in group A and 55% in group B, female gender was found in 25% in group A while 45% in B group. While applying chi square test (p value of 0.197) the difference was not significant statistically. (Table 3)

Table No. 1: Comparison of mean age of both groups (n = 80 each)

Treatment Groups	N	Mean Age	Std. Deviation	Std. Error Mean	p-value
Oral Dexamethasone	80	7.5300	2.23598	.24999	0.107
Oral Prednisolone	80	8.1100	2.29516	.25661	

Table No. 2: Age categories of both groups (n = 80 each)

Age Groups in Years		Treatment Groups	
		Oral Dexamethasone Group	Oral Prednisolone Group
Up to 6.00	Count	36	20
	% within Treatment Groups	45.0%	25.0%
6.01 to 9.00	Count	24	32
	% within Treatment Groups	30.0%	40.0%
9.01 to 12.00	Count	20	28
	% within Treatment Groups	25.0%	35.0%
Total	Count	80	80
	% within Treatment Groups	100.0%	100.0%

All the children were given standard doses of the dexamethasone and prednisolone according to their treatment arms. Patients once stabilized were discharged and a follow up visit was done till the 10th day of discharge to determine the relapse. On follow up, we observed that in group A 15% of patients represented with relapse (Table 4) while in group B 30% of patients presented with relapse within 10 days after the discharge (Table 5). In this connection, efficacy of group A was 85% while that of group B was 70%. The difference was significant statistically (p value of 0.023) after using chi square test, (Table 6)

Table No. 3: Comparison of gender between both groups (n = 80 each)

Gender of Child		Treatment Groups		Total	p-value
		Oral Dexamethasone Group	Oral Prednisolone Group		
Male	Count	52	44	96	
	% within Treatment Groups	65.0%	55.0%	60.0%	
Female	Count	28	36	64	0.197
	% within Treatment Groups	35.0%	45.0%	40.0%	
Total	Count	80	80	160	
	% within Treatment Groups	100.0%	100.0%	100.0%	

Table No. 4: Frequency of relapse in group A (n = 80)

	Frequency	Percent
Yes	12	15.0
No	68	85.0
Total	80	100.0

Table No. 5: Frequency of relapse in group B (n = 80)

	Frequency	Percent
Yes	24	30.0
No	56	70.0
Total	80	100.0

Table No. 6: Comparison of efficacy between both groups (n = 80 each)

Efficacy of Treatment		Treatment Groups		Total	p-value
		Oral Dexamethasone Group	Oral Prednisolone Group		
Yes	Count	68	56	124	
	% within Treatment Groups	85.0%	70.0%	77.5%	
No	Count	12	24	36	0.023
	% within Treatment Groups	15.0%	30.0%	22.5%	
Total	Count	80	80	160	
	% within Treatment Groups	100.0%	100.0%	100.0%	

DISCUSSION

Comparatively Prednisolone has short half-life (12 - 36 hours), so it needs daily intake.¹⁰ After compliance steroid treatment is valuable on outpatient basis. One research has cleared that at least 7% of patients examined in a pediatric emergency department (ED) showed non-compliance in prescriptions filling.¹¹ From other study it is clear that, patients had taken the corticosteroids orally up to 64 % of the the prescribed time length of treatment.¹² Factors for Prednisolone non-compliance includes bitter taste, Nausea /vomiting & Lengthy course of treatment .¹³

Dexamethasone has prolonged half-life (36 - 72 hours).¹⁰ It has good oral and parenteral absorption.¹⁰ In a comparative research, 2-day treatment with hydrocortisone, a dexamethasone single dose of 0.6 mg/kg caused a decreased stay at hospital in patients with asthma exacerbations.¹⁴ Taste wise dexamethasone is more acceptable as compared to prednisolone inpatients with asthma exacerbations.¹⁵

The present study evaluated the efficacy of oral dexamethasone vs oral prednisolone in the treatment of pediatric acute asthma in terms of relapse rate.

Several studies relating prednisolone with dexamethasone in the management of acute exacerbations of asthma in pediatric patients are available.¹⁶⁻²²

Three studies relating prednisolone with dexamethasone (oral) have been noted.^{18,19,21} It is clear from these research trials that prednisolone & dexamethasone were alike in managing acute asthma exacerbations.¹⁶⁻²¹

In another study, 96 prednisone and 104 dexamethasone subjects completed the study regimen and follow-up. More patients in the dexamethasone group reported a return to normal activities within 3 days compared with the prednisolone group.²³

The pharmacological properties of dexamethasone give it preference over other steroids due a shorter course of treatment, which increases compliance. Research shows that compliance to therapy causes effective asthma management outcomes.^{24,25}

In comparison to preceding two trials, in our study greater relapse rate for dexamethasone (16%) was noted.^{18,19} 30% relapse rate for prednisone was noted which is greater than the preceding trials. However, major difference in efficacy between the prednisone & dexamethasone was noted in our research. However, due to less number of children, we cannot ignore that there may be a slight difference in anti-inflammatory roles of prednisone & dexamethasone for the treatment of acute pediatric asthma exacerbations.

In another review by Redman et al, there are six other studies relating to dexamethasone with prednisolone, none of which provides any major difference in effectiveness for clinical feature rates, relapse rates, or Hospital admission rates.²⁶

CONCLUSION

In conclusion, for the management of acute asthma, the relapse rates were better between children who received Single dose oral Dexamethasone compared to multiple doses of oral Prednisolone. Advantages of Dexamethasone as reported in literature include fewer doses, reduced emesis, and a decrease in the number of school/work days missed. Further studies locally on patient compliance may be required for developing practical recommendations for the treatment of acute asthma among children.

Author's Contribution:

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Conflict of Interest: The study has no conflict of interest to declare by any author.

REFERENCES

- Andrew HL, Ronina AC, Joseph DS, Donald YM. Childhood asthma. In: Kliegman RM, Stanton BF, St. Geme III JW, Schor NF, Behrman RE, editors. Nelson textbook of paediatrics. 19th ed. Elsevier Saunders; 2011.p.780-801.
- Pedersen SE, Hurd SS, et al. Global Initiative for Asthma. Global strategy for the diagnosis and management of asthma in children 5 years and younger. *Pediatr Pulmonol* 2011; 46:1-17.
- Robinson, PD, Van Asperen P Asthma in childhood. *Pediatr Clin North Am* 2009;56:191-226.
- British Guideline on the Management of Asthma. British Thoracic Society Scottish Intercollegiate Guidelines Network. *Thorax* 2008; 63:iv1-121.
- Shefrin AE, Goldman RD. Use of dexamethasone and prednisone in acute asthma exacerbations in pediatric patients. *Can Fam Physician* 2009; 55:704-6.
- Williams KW, Andrews AL, Heine D, Russell WS, Titus MO. Parental preference for short-versus long-course corticosteroid therapy in children with asthma presenting to the pediatric emergency department. *Clin Pediatr (Phila)* 2013;52:30-4.
- Andrews AL, Wong KA, Heine D, Scott Russell W. A cost-effectiveness analysis of dexamethasone versus prednisone in pediatric acute asthma exacerbations. *Acad Emerg* 2012;19:943-8.
- Gordon S, Tompkins T, Dayan PS. Randomized trial of single-dose intramuscular dexamethasone compared with prednisolone for children with acute asthma. *Pediatr Emerg Care* 2007;23:521-7.
- Greenberg RA, Kerby G, Roosevelt GE. A comparison of oral dexamethasone with oral prednisone in pediatric asthma exacerbations treated in the emergency department. *Clin Pediatr (Phila)* 2008;47:817-23.
- Schimmer BP, Parker K. Goodman and Gilman's The Pharmacological Basis of Therapeutics. In: Brunton L, Lazo J, Parker K, editors. Adrenocorticotrophic hormone; adrenocortical steroids and their synthetic analogues; inhibitors of the syntheses and actions of adrenocortical hormones. 11th edition. Columbus, Ohio: The McGraw-Hill Companies, Inc; 2006.p.2314-42.
- Matsui D, Joubert GI, Dykxhoorn S, Rieder MJ. Compliance with prescription filling in the pediatric emergency department. *Arch Pediatr Adolesc Med* 2000;154(2):195-8.
- Butler K, Cooper WO. Adherence of pediatric asthma patients with oral corticosteroid prescriptions following pediatric emergency department visit or hospitalization. *Pediatr Emerg Care* 2004;20:730-5.
- Lucas-Bouwman ME, Roorda RJ, Jansman FG, Brand PL. Crushed prednisolone tablets or oral solution for acute asthma? *Arch Dis Child* 2001; 84(4):347-8.
- Ebrahimi S, Sarkari B. Comparative efficacy of dexamethasone versus hydrocortisone in severe acute pediatric asthma. *Iran J Allergy Asthma-Immunol* 2007;6:159-160.
- Hames H, Seabrook JA, Matsui D, Rieder MJ, Joubert GI. A palatability study of a flavored dexamethasone preparation versus prednisolone liquid in children. *Can J Clin Pharmacol* 2008; 15:e95-e98.
- Klig JE, Hodge D, Rutherford MW. Symptomatic improvement following emergency department management of asthma: a pilot study of intramuscular dexamethasone versus oral prednisone. *J Asthma* 1997;34:419-25.
- Gries DM, Moffitt DR, Pulos E, Carter ER. A single dose of intramuscularly administered dexamethasone acetate is as effective as oral prednisone to treat asthma exacerbations in young children. *J Pediatr* 2000;136:298-303.
- Qureshi F, Zaritsky A, et al. Comparative efficacy of oral dexamethasone versus oral prednisone in acute pediatric asthma. *J Pediatr* 2001;139:20-6.
- Altamimi S, Robertson R, et al. Single-dose oral dexamethasone in the emergency management of children with exacerbations of mild to moderate asthma. *Pediatr Emerg Care* 2006;22: 786-93.
- Gordon S, Tompkins T, Dayan PS. Randomized trial of single-dose intramuscular dexamethasone compared with prednisolone for children with acute asthma. *Pediatr Emerg Care* 2007;23:521-7.
- Greenberg RA, Kerby G, Roosevelt GE. A comparison of oral dexamethasone with oral prednisone in pediatric asthma exacerbations treated in the emergency department. *Clin Pediatr (Phila)* 2008;47:817-23.
- Scarfone RJ, Loiselle JM, Wiley JF, Decker JM, Henretig FM, Joffe MD. Nebulized dexamethasone versus oral prednisone in the emergency treatment of asthmatic children. *Ann Emerg Med* 1995; 26:480-6.
- Kravitz J, Dominici P, Ufberg J, et al. Two days of dexamethasone versus 5 days of prednisone in the treatment of acute asthma: a randomized controlled trial. *Ann Emerg Med* 2011; 58(2):200-4.
- Burkhart PV, Rayens MK, Revelette WR, Ohlmann A. Improved health outcomes with peak flow monitoring for children with asthma. *J Asthma*. 2007;44:137-42.
- Jan RL, Wang JY, Huang MC, et al. An internet-based interactive telemonitoring system for improving childhood asthma outcomes in Taiwan. *Telemed J E Health* 2007;13:257-68.
- Redman E, Powell C. Prednisolone or Dexamethasone for Acute Exacerbations of Asthma: Do They Have Similar Efficacy in the Management of Exacerbations of Childhood Asthma? *Arch Dis Child* 2013;98(11):6-919.