COMPARATIVE OUTCOMES BETWEEN INHALED BUDESONIDE AND ORAL MONTELUKAST IN MILD PERSISTENT CHILDHOOD ASTHMA

¹Dr Sushant Mane, ²Dr Pareekshit Prakash Rampur, ³Dr Sakina Shabbir Rajagara

¹MD Pediatrics, Associate Professor, Grant Government Medical College, Sir J.J. Group of Hospitals, Mumbai

²MD Pediatrics, Senior Resident, Grant Government Medical College, Sir J.J. Group of Hospitals, Mumbai

³Junior Resident II Pediatrics, Grant Government Medical College, Sir J.J. Group of Hospitals, Mumbai

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Corresponding author: Dr Sushant Mane

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Abstract

Background: Asthma is a heterogeneous disease, usually characterized by chronic airway inflammation. It is defined by the history of recurrent respiratory symptoms such as wheeze, shortness of breath, chest tightness and cough that vary over time and in intensity, together with variable expiratory airflow limitation.

Aim: To compare the clinical efficacy of oral montelukast with inhaled budesonide as controller medication in mild persistent childhood asthma.

Methods: 54 Children of both genders aged 3 to 12 years, diagnosed as mild persistent childhood asthma in OPD and in pediatric indoor admissions at the tertiary care Hospital in Mumbai were enrolled in this randomized prospective parallel-group comparative study. 28 (51.9%) patients of group A were started on Oral montelukast & 26 (48.1%) of group B were started on inhaled budesonide.

Results: Amongst patients of Group A, 9 were asymptomatic & 19 were symptomatic at 4 weeks of treatment. 10 were asymptomatic & 18 were symptomatic at 3 months of treatment. P-Value was 0.09 suggesting no significant change/improvement in control of asthma symptoms at 3 months than at 4 weeks in children treated with oral montelukast. Out of 26 patients of Group B, 6 were asymptomatic & 20 were symptomatic at 4 weeks of treatment. 17 were asymptomatic & 9 were symptomatic at 3 months of treatment. P-Value was 0.046 suggesting a statistically significant improvement in control of asthma symptoms at 3 months than at 4 weeks in children treated with inhaled budesonide.

Conclusion: More children on inhaled budesonide were controlled on their asthma symptoms, required significantly less reliever medications, had lesser episodes of night awakening due to asthma symptoms and had improvement in their day-time symptoms and activity than those on oral montelukast.

Introduction:

Asthma is a heterogeneous disease, usually characterized by chronic airway inflammation. It is defined by the history of recurrent respiratory symptoms such as wheeze, shortness of breath, chest tightness and cough that vary over time and in intensity, together with variable expiratory airflow limitation¹. IgE is the antibody responsible for activation of allergic reactions in the pathogenesis of allergic diseases leading to the development and persistence of inflammation. Mast cells have large number of IgE receptors that release a wide variety of mediators to initiate acute bronchospasm and proinflammatory cytokines to perpetuate underlying airway inflammation when activated².

Less inflammation typically leads to better asthma control, with fewer exacerbations and decreased

need for quick-reliever asthma medications. However, exacerbations can still occur². Out of India's 1.31 billion people, about 6% of children and 2% of adults have asthma³.

One study using data from the third National Family Health Survey (NFHS 3) found the prevalence of self-reported asthma symptoms to be 1.9%.⁴ The burden of asthma is immense, with more than 300 million individuals currently suffering from asthma worldwide, about 1/10th of which are living in India. The prevalence of asthma has been estimated to range 3-38% in children, being the commonest chronic disorder amongst them⁵. Asthma accounts for 1 in 250 deaths across the globe, however, most of these deaths are preventable with appropriate management^{3,6}.

The recommended dose of montelukast is 4 mg/day for children under 5 years, 5 mg/day between 6 to 14 years and 10 mg/day over 14 years, preferentially at night. Leukotriene Receptor Antagonists (LTRA), according to most studies, are well-tolerated. Side effects include headache, otitis, abdominal pain, pharyngitis, urticaria and nausea⁷.

Montelukast is a safe drug with modest benefits in bronchial asthma. It is useful in mild persistent asthma where ICS administration may-be impractical due to compliance issues, and also in patients with comorbidities like allergic rhinitis. It is also found to decrease the episodes of viral-induced wheeze in young children⁸. Montelukast was demonstrated to be not inferior to fluticasone in increasing the percentage of Rescue Free Days (RFDs) among 6- to 14-year-old patients with mild asthma⁸. Inhaled budesonide also caused a dose-dependent reduction in lower leg growth, but this only reached significance at the 800 mg/day dose⁹. In this study, we tried to compare the clinical efficacy of oral montelukast with Inhaled budesonide considering symptom control as main outcome¹⁰.

Aim

To compare the clinical efficacy of oral montelukast with inhaled budesonide as controller medication in mild persistent childhood asthma.

Materials and Methods

This randomized prospective parallel-group comparative study was carried out from January 2017 to October 2018. Sixty children of both genders, between 3-12 years age recently diagnosed as mild persistent asthma that attended Asthma clinic or were admitted in the pediatric ward of a tertiary care hospital in Mumbai participated in the study. Institutional ethics committee approval was taken. Written informed consent was taken from the parents.

Out of the 60 enrolled study subjects; randomization in group A or group B was done by numbering the subjects serially & dividing into odd & even numbers with odd numbers being included in group A & even numbers in group B. Group A: 30 patients were given montelukast 4 mg (<5 years) or 5 mg (>5 years) tablet as once a day in the evening for 3 months. Group B: 30 patients were given inhaled budesonide 100 mcg 1 puff twice a day with MDI and spacer with a mask in children below 5 years & with/without a mask in children above 5 years of age for 3 months. Out of 60

patients enrolled for study, Group A (n=30) had 2 dropouts (2 lost to follow-up) and group B (n=30) had 4 dropouts (2 lost to follow-up, 2 Poor compliance to treatment) There were total 6 dropouts; hence 54 patients were included in the final study.

Inclusion criteria

- Children of both genders of age 3 to 12 years diagnosed as mild persistent childhood asthma in OPD and in paediatric indoor admissions.

Exclusion criteria

- Any child with associated acute or chronic respiratory illness
- Children lost to follow-up
- Children with poor/non-compliance with treatment including incorrect inhalational technique
- Children with other comorbid conditions like heart, kidney, liver, CNS disorders

Study technique

A detailed history of patients including chief complaints, comorbidities, symptom frequency, family history of asthma or other allergic disorders, perinatal history, family history and allergen history was recorded. Clinical examination and baseline investigations like complete blood count with the absolute eosinophilic count, pulmonary function test (in children more than 6 years of age) were done. Clinical categorization of asthma was done as per severity and children with mild persistent childhood asthma meeting inclusion criteria were included in the study.

Statistical analysis

- Pearson's chi-square test was applied to test the relationship between categorized independent and dependent variables.
- Mean and standard deviations were calculated
- Unpaired T-test was performed to test the relationship between independent variables.
- Microsoft Excel was used to enter & code the data, SPSS 21.0 was used to decode & analyze data.
- The p-value (significance) of < 0.05 is deemed statistically significant.

Definition:

Mild persistent asthma is defined as the asthmatic daytime attack occurs >2/week, but <1/day and night time attack >2/month, FEV1 or PEF >80% of predicted and PEF variability 20-30%.

Table 1: Classification of asthma Severity

CLASSIFICATION OF ASTHMA SEVERITY				
	INTERMITTENT	PERSISTENT		
		MILD	MODERATE	SEVERE
COMPONENTS OF SEVERITY				
Impairment				
Day time symptoms	<=2days/wk	>2days/wk but not daily	Daily	Throughout the day
Nighttime awakenings				
Age 0-4 years	0	1-2x/mo	3-4x/mo	>1x/wk
Age >=5 years	<=2x/mo	3-4x/mo	>1x/wk but not nightly	Often 7x/wk
Use of short-acting Beta agonist	<=2 days/wk	>2 days/wk but not daily and not more than 1x on any day	Daily	Several times per day
Interference with Normal activity	None	Minor limitation	Some limitation	Extreme limitation
Lung Function				
FEV1 % predicted	Normal FEV1 between exacerbations >80% predicted	>=80% predicted	60-80% predicted	<60% predicted
FEV1/FVC Ratio				
Age 5-11 years	>85%	>80 %	75-80%	<75 %
Age >=12 years	Normal	Normal	Reduced 5 %	Reduced >5 %
Risk				
Exacerbations requiring systemic steroids				
Age 0-4 years	0-1 /yr	>=2 exacerbations requiring systemic corticosteroids or >= 4 wheezing episodes per year lasting > 1 day		
Age >=5 years	0-1 /yr	>=2 /yr	>=2/yr	>=2/yr

Table 2: Level of asthma symptom control

A. Level of asthma symptom control				
In the past 4 weeks, has the patient had:		Well controlled	Partly controlled	Uncontrolled
Daytime symptoms more than twice/week?	Yes/No			
Any night waking due to asthma?	Yes/No	None of these	1–2 of these	3–4 of these
Reliever needed more than twice/week?	Yes/No			
Any activity limitation due to asthma?	Yes/No			

Results**Table 3: Results**

		Group A	Group B	P-value
Age Distribution (Age group)	<i>3 to <6 yrs</i>	17 (60.7%)	15 (57.7%)	
	<i>6yrs to 12 yrs</i>	11 (39.3%)	11 (42.3%)	
Association of Age and Treatment (Age in months)	<i>Mean(in months)</i>	72.46	72.31	0.985
	<i>SD</i>	34.413	26.767	
Association of Gender and Treatment (Gender)	<i>Male</i>	15 (53.6%)	14 (53.8%)	
	<i>Female</i>	13 (46.6%)	12 (46.2%)	
Age at first symptoms of Asthma	<i>Mean Age (in months)</i>	41.57	34.31	
	<i>SD (in months)</i>	30.31	26.81	
Symptoms frequency of patients as per treatment group	<i>Perennial</i>	25(89.3%)	23 (88.5%)	0.96
	<i>Seasonal</i>	3 (10.7%)	3 (11.5%)	
Diurnal variation of symptoms	<i>Night Predominant</i>	15 (53.6%)	20 (76.9%)	
	<i>Day Predominant</i>	3 (10.7%)	0 (0.0%)	
	<i>Non Specific</i>	10 (35.7%)	6 (23.1%)	
	<i>SD</i>	102.4	104	

- Out of 28 patients in group A, Mean age of patients in group A was 72.46 (SD 34.413) months & in group B it was 72.31 (SD 26.763) with a p-value of 0.985. There was no significant difference in age between two groups A & B.
- In Group A, 13 (46.4%) patients were females and 15 (53.6%) were males. In Group B, 12 (46.2%) were females & 14 (53.8%) were males. p value was 1.000.
- In group A, 92.9% of patients were residents of the urban area & 7.1% were residents of rural area as compared to 96.2% urban & 3.8% rural in group B.
- Mean age at first symptoms of asthma in group A was 41.57 (SD 30.31) months while in group B, it was 34.31 (SD 26.81) months.
- In group A, 25 (89.3%) patients had perennial symptoms and 3 (10.7%) had seasonal symptoms. In group B, 23 (88.5%) had perennial and 3 (11.5%) had seasonal symptoms.
- In group A, 15 (53.6%) patients had symptoms predominantly in the night, 3 (10.7%) had

predominant daytime symptoms whereas 10 (35.7%) had no specific diurnal variation. In group B, 20 (76.9%) patients had symptoms predominantly in the night, none had predominant daytime symptoms whereas 6 (23.1%) had no specific diurnal variation.

- Out of 54 patients studied, 16 patients were having family history of allergic disorders. 8 were having the history in 1st degree relatives, 4 in 2nd degree & 4 in 3rd degree relatives.
- Out of 54 patients, 5 (9.4%) had associated allergic diseases. 3 (5.6%) patients had allergic rhinitis, 1 (1.9%) had allergic conjunctivitis & 1 (1.9%) had atopic dermatitis.
- Symptoms of asthma were triggered by viral URTI in 25 (46.3%), exercise/crying/laughing in 13(24.1%), changes in weather in 37 (68.5%), refrigerated food/beverages in 44 (81.5%), Environmental allergens (e.g. Animal Dander, Dust, Molds, Pollens, Air Pollutants/Smoke, Strong odours-Perfumes/Cleaning agents etc.) in 23 (42.6%) & NSAIDs (Ibuprofen) in 1 (1.9%) patient.

Table 4: Family History of Allergic Disorders, Co-morbid, Triggers for Asthma

Family history of Allergic Disorders	Frequency	
1st Degree	8	
2nd Degree	4	
3rd Degree	4	
4th Degree	16	
Co-morbid Allergic Disorders	Frequency	Percentage
Allergic Rhinitis	3	5.6%
Allergic Conjunctivitis	1	1.9%
Atopic Dermatitis	1	1.9%
Total	5	9.3%
Triggers Associated with Asthma Symptoms	Frequency	Percentage
Viral URTI	25	46.3%
Exercise/ Crying/ Laughing	13	24.1%
Changes in weather	37	68.5%
Refrigerated food/ beverages	44	81.5%
Environmental Allergen	23	42.6%
NSAIDs (Ibuprofen)	1	1.9%

Table 5: Readings of Pulmonary Function Tests- FEV1/FVC before starting treatment

Treatment Group	FEV1/FVC								
	Pre bronchodilator (% Predicted)			Post bronchodilator (% Predicted)			Percentage change		
	Mean	SD	p value	Mean	SD	p value	Mean	SD	p value
Group A	83.64	3.264	0.434	95.09	3.807	0.296	13.73	2.573	0.50
Group B	82.55	3.142		96.73	3.319		17.18	4.750	

- Before starting treatment, mean pre bronchodilator FEV1/FVC (Percentage of predicted) of group A was 83.64(SD 3.264) and that of group B was 82.55(SD 3.142) with p value of 0.434.
- Mean post bronchodilator FEV1/FVC (Percentage of predicted) of group A was 95.09(SD 3.807) and that of group B was 96.73(SD 3.319) with p value of 0.296.
- Mean percentage change in FEV1/FVC of group A was 13.73(SD 2.573) and that of group B was 17.18(SD 4.750) with p value of 0.50.
- There was no statistically significant difference in pre-bronchodilator, post-bronchodilator & percentage change in FEV1/FVC between two treatment groups A & B (Table 5).

Table 6: Readings of FEV1

Readings for FEV1		Group A	Group B	P-value
FEV1 before starting treatment	Mean	83.45	82.91	0.638
Pre bronchodilator	SD	2.77	2.587	
FEV1 before starting treatment	Mean	96.09	98.45	0.102
Post bronchodilator	SD	3.506	2.945	
FEV1 before starting treatment	Mean	15.27	18.82	0.064
FEV1 Percentage change	SD	2.867	5.269	
FEV1/FVC before starting treatment	Mean	83.64	82.55	0.434
Pre bronchodilator	SD	3.264	3.142	
FEV1/FVC before starting treatment	Mean	95.09	96.73	0.296
Post bronchodilator	SD	3.807	3.319	
FEV1/FVC before starting treatment	Mean	13.73	2.573	0.5
FEV1 Percentage change	SD	2.573	4.75	

- Before starting treatment, mean pre-bronchodilator, FEV1 (Percentage of predicted) of group A was 83.45(SD 2.77) and that of group B was 82.91(SD 2.587) with a p-value of 0.638. Mean post-bronchodilator FEV1 (Percentage of predicted) of group A was 96.09(SD 3.506) and that of group B was 98.45(SD 2.945) with a p-value of 0.102. Mean percentage change in FEV1 of group A was 15.27(SD 2.867) and that of group B was 18.82(SD 5.269) with a p-value of 0.064. There was no statistically

significant difference in pre-bronchodilator, post-bronchodilator & percentage change in FEV1 between two treatment groups A & B.

- Before starting treatment, mean pre-bronchodilator, FVC (Percentage of predicted) of group A was 97.82(SD 3.331) and that of group B was 98.45(SD 3.078) with a p-value of 0.646. Mean post-bronchodilator FVC (Percentage of predicted) of group A was 98.64(SD 2.501) and that of group B was 99.27(SD 2.240) with p-value of 0.537. Mean percentage change in FVC of group A was 0.82(SD 1.168) and that of group B was 0.82(SD 1.250) with a p-value of 1.000. There was no statistically significant difference in pre-bronchodilator, post-bronchodilator & percentage change in FVC between two treatment groups A & B.
- Out of 54 study subjects, 28 (51.9%) patients of group A were started on Oral montelukast & 26 (48.1%) of group B were started on inhaled budesonide.
- At 4 weeks of treatment, 14(50.0%) patients in group A had daytime asthma symptoms more than twice/week against 11 (42.3%) in group B. With a p-value of 0.597, there was no statistically significant difference in daytime asthma symptoms between the two treatment groups at 4 weeks of treatment.
- At 4 weeks of treatment, 15(53.6%) patients in group A had night awakening due to asthma

symptoms against 13 (50.0%) in group B. With a p-value of 0.597, there was no statistically significant difference in night awakening due to asthma symptoms between the two treatment groups at 4 weeks of treatment.

- At 4 weeks of treatment, 17(60.7%) patients in group A needed reliever medication (inhaled salbutamol) more than twice/week against 9 (34.6%) in group B. With p-value of 0.064, there was no statistically significant difference in need of reliever medication between the two treatment groups at 4 weeks of treatment.
- At 4 weeks of treatment, 5(17.9%) patients in group A had a limitation of activity as against 1 (3.8%) in group B. With a p-value of 0.194, there was no statistically significant difference in activity limitation between the two treatment groups at 4 weeks of treatment.
- At 4 weeks following regular treatment 9 (32.1%) patients were controlled in group A as against 6 (23.1%) in group B. 8 (28.6%) patients were partially controlled in group A against 16 (61.5%) in group B. 11 (39.3%) patients were uncontrolled in group A against 4 (15.4%) in group B. Thus, at 4 weeks of regular treatment, symptoms of children in Group A were better controlled than those in Group B (p=0.039- Significant).

Table 7: Group A & B (P Value) Treatment, Symptoms

		Group A	Group B	P-Value
Treatment group for enrolled patients		28 (51.9%)	26 (48.1%)	
Clinical Symptoms at 4 weeks Follow-up	<i>Daytime Symptoms > twice/ week</i>	14 (50.0%)	11 (42.3%)	
	<i>Night Awakening</i>	15 (53.6%)	13 (50.0%)	
	<i>Reliever Needed > twice/week</i>	17 (60.7%)	9 (34.6%)	
	<i>Activity Limitation</i>	5 (17.9%)	1 (3.8%)	
Correlation of Daytime Symptoms at 4 weeks of Treatment	<i>No</i>	14 (50.0%)	15 (57.7%)	0.597 (non significant)
	<i>Yes</i>	14 (50.0%)	11(42.3%)	
Correlation of Night Awakening due to Asthma at 4 weeks of Treatment	<i>No</i>	13 (14.6%)	13 (50.0%)	0.597 (non significant)
	<i>Yes</i>	15 (53.6%)	13 (50.0%)	

Correlation of need of Reliever > Twice/week at 4 weeks of Treatment	<i>No</i>	11(39.3%)	17(65.4%)	0.064 (Non Significant)
	<i>Yes</i>	17 (60.7%)	9(34.6%)	
Correlation of Activity Limitation at 4 weeks of Treatment	<i>No</i>	23 (82.1%)	25(96.2%)	0.194 (Non Significant)
	<i>Yes</i>	5 (17.9%)	1 (3.8%)	
Correlation of Treatment Group with Level of Control at 4 weeks	<i>Controlled</i>	9 (32.1%)	6 (23.1%)	0.039 (Significant)
		8 (28.6%)	16(61.5%)	
	<i>Partially Controlled</i>			
	<i>Uncontrolled</i>	11(39.3%)	4(15.4%)	
Clinical Symptoms at 3months follow up	<i>Daytime Symptoms > twice/ week</i>	15 (53.6%)	7 (26.9%)	
	<i>Night Awakening</i>	15 (53.6%)	6 (23.1%)	
	<i>Reliever Needed > twice/week</i>	17 (60.7%)	7 (26.9%)	
	<i>Activity Limitation</i>	6 (21.4%)	1(3.8%)	
	<i>Acute severe Exacerbation</i>	2 (7.1%)	1 (3.8%)	
Correlation of Daytime Symptoms at 3 months of Treatment	<i>Yes</i>	15 (53.6%)	7(26.9%)	0.057 (Non Significant)
	<i>No</i>	13(46.4%)	19(73.1%)	
Correlation of Night Awakening due to Asthma at 3 months of Treatment	<i>Yes</i>	15 (53.6%)	6(23.1%)	0.028 (Significant)
	<i>No</i>	13(46.4%)	20(76.9%)	
Correlation of need of Reliever > Twice/week at 3 months of Treatment	<i>Yes</i>	17 (60.7%)	11(39.3%)	0.016 (Significant)
	<i>No</i>	7(26.9%)	19(73.1%)	
Correlation of Activity Limitation at 3 months of Treatment	<i>Yes</i>	6 (21.4%)	1(3.8%)	0.102 (Non Significant)
	<i>No</i>	22(76.6%)	25(96.2%)	
Correlation of Acute Severe Exacerbations during 3 months with Treatment Groups	<i>Yes</i>	2(7.1%)	26 (92.9%)	1.000 (Non-significant)
	<i>No</i>	1(3.8%)	25(96.2%)	
Correlation of Treatment Group with Level of control at 3 months	<i>Controlled</i>	10(35.7)	17(65.4%)	0.069 (Non-Significant)
		7(25.0%)	5(19.2%)	
	<i>Partially Controlled</i>			
	<i>Uncontrolled</i>	11(39.3%)	4(15.4%)	

Association Viral URTI Trigger and Control by Treatment Groups at 4 weeks	<i>Controlled</i>	8 (57.1%)	1 (9.1%)	0.045 (significant)
	<i>Partially Controlled</i>	5(35.7%)	8(72.7%)	
	<i>Uncontrolled</i>	1(7.1%)	2(18.2%)	
Association Viral URTI Trigger and Control by Treatment Groups at 3 months	<i>Controlled</i>	9(64.3%)	5(45.5%)	0.376 (Non Significant)
	<i>Partially Controlled</i>	4(28.6%)	3(27.3%)	
	<i>Uncontrolled</i>	1(7.1%)	3(27.3%)	
Association Allergic Rhinitis and Control by Treatment at 4 weeks	<i>Controlled</i>	2(100.0%)	0(0.0%)	0.333 (Non significant)
	<i>Uncontrolled</i>	0(0.0%)	1(100.0%)	
Association Allergic Rhinitis and Control by Treatment at 3 months	<i>Controlled</i>	2(100%)	0(0.0%)	0.333 (Non Significant)
	<i>Partially controlled</i>	0(0.0%)	1(100.0%)	
Comparison of Oral Montelukast control at 4 weeks & at 3months	<i>Asymptomatic (%) 4 weeks</i>	9(32.1%)	6(23.1%)	0.09 (Non Significant) for Group A
	<i>Asymptomatic (%) 3 Months</i>	10(35.7%)	17(65.4%)	and
	<i>Symptomatic (%)</i>	19(67.9%)	20(76.9%)	0.046 (Significant) for Group B
	<i>4 weeks</i>			
	<i>Symptomatic (%)</i>	18(64.3%)	9(34.6%)	
	<i>3 months</i>			

- At 3 months of treatment, 15(53.6%) patients in group A had daytime symptoms more than twice/week against 7 (26.9%) in group B. With a p-value of 0.057, there was no statistically significant difference in daytime symptoms between the two treatment groups at 3 months of treatment.
- At 3 months of treatment, 15(53.6%) patients in group A had night awakening due to asthma symptoms as against 6 (23.1%) in group B. Thus, children in Group B had lesser episodes of night awakening due to asthma symptoms at 3 months follow up as compared to that in Group A (p=0.028-Significant).
- At 3 months of treatment, 17 (60.7%) patients in group A needed reliever more than twice/week against 7 (26.9%) in group B. This shows that children

in Group B required fewer reliever medications at 3 months follow up as compared to those in Group A (p=0.016- Significant).

- At 3 months of treatment, 6 (21.4%) patients in group A had a limitation of activity as against 1 (3.8%) in group B, with a p-value of 0.102, there was no statistically significant difference in activity limitation between the two treatment groups at 3 months of treatment.
- During 3 months of treatment, 2 (7.1%) patients in group A had acute severe exacerbation requiring step-up of treatment as against 1 (3.8%) in group B. With a p-value of 0.100, there was no statistically significant difference in the incidence of acute severe exacerbations between two treatment groups.

- At 3 months following regular treatment: 10 (35.7%) patients were controlled in group A as against 17 (65.4%) in group B. 7 (25.0%) patients were partially controlled in group A as against 5 (19.2%) in group B. 11 (39.3%) patients were uncontrolled in group A as against 4 (15.4%) in group B. A p-value of 0.069, suggested statistically non-significant difference in the control status between two groups at 3 months of treatment. However, in terms of percentage, more number of children in Group B were controlled on their asthma symptoms.
- In 14 patients out of 28 in group A, symptoms were triggered by viral URTI whereas 11 out of 26 patients in group B had this triggering factor. At 4 weeks out of these cases, 8 (57.1%) patients were controlled in group A against 1 (9.1%) in group B. 5 (35.7%) patients were partially controlled in group A against 8 (72.2%) in group B. 1 (7.1%) patient was uncontrolled in group A against 2 (18.2%) in group B. Thus, children in Group A who had an exacerbation following viral URTI as a trigger were better controlled at 4 weeks as compared to those in Group B (p=0.045- Significant).
- At 3 months out of these cases, 9 (64.3%) patients were controlled in group A against 5 (45.5%) in group B. 4 (28.6%) patients were partially controlled in group A against 3 (27.3%) in group B. 1 (7.1%) patient was uncontrolled in group A against 3 (27.3%) in group B. Thus, at 3 months, there was no statistically significant difference in the control status of patients with viral URTI as a trigger in between the two treatment groups.
- 2 patients out of 28 in group A had allergic rhinitis whereas 1 out of 26 patients in group B had it. At 4 weeks, out of these cases. 2 (100.0%) patients were controlled in group A against none (0.0%) in group B. 1 (100%) Patient in Group B was uncontrolled. P-Value was 0.333, suggesting a statistically non-significant difference in control of asthma symptoms in patients having allergic rhinitis as a co-morbid allergic disorder between two groups at 4 weeks of treatment.
- At 3 months, out of these cases. 2 (100.0%) patients were controlled in group A against none (0.0%) in group B. 1 (100%) Patient in Group B was partially controlled. P-Value was 0.333, suggesting a statistically non-significant difference in control of asthma symptoms in patients having allergic rhinitis as co-morbid allergic disorder between two groups at 3 months of treatment.

- The goal of asthma treatment is to keep symptoms well-controlled and future risk reduction of exacerbations, fixed airflow limitation & side effects of treatment. Out of 28 patients of Group A, 9 were asymptomatic & 19 were symptomatic at 4 weeks of treatment. 10 were asymptomatic & 18 were symptomatic at 3 months of treatment. P-Value was 0.09 suggesting no significant change/improvement in control of asthma symptoms at 3 months than at 4 weeks in children treated with oral montelukast.

Out of 26 patients of Group B, 6 were asymptomatic & 20 were symptomatic at 4 weeks of treatment. 17 were asymptomatic & 9 were symptomatic at 3 months of treatment. P-Value was 0.046 suggesting a statistically significant improvement in control of asthma symptoms at 3 months than at 4 weeks in children treated with inhaled budesonide.

Discussion

Inhaled steroids & oral montelukast are both established therapies for control of mild persistent childhood asthma, but montelukast has the ease of administering once-daily tablet orally and does not require skills or special instructions to be followed as for inhaled budesonide.

There was statistically insignificant difference in clinical symptoms of asthma between two treatment groups at 4 weeks of treatment. In patients on inhaled budesonide, although the day and night-time symptoms were relieved to a similar extent as in patients on montelukast, but the need for relievers was much less and improvement in activity was much more in patients on inhaled budesonide at 4 weeks of follow-up.

At 4 weeks of regular treatment, asthma symptoms of children on oral montelukast were better controlled than those on inhaled budesonide (statistically significant: p-value was 0.039). These findings were similar to those in the study by Lucie Blais et al.¹¹ which suggested that the risk of exacerbations was significantly higher in the Inhaled corticosteroids than the leukotriene receptor antagonist group at 4 weeks of treatment¹¹.

At 3 months of treatment, patients on inhaled budesonide required significantly fewer reliever medications and there were statistically significant lesser episodes of night awakening due to asthma symptoms. The day-time symptoms were significantly relieved and improvement in activity was much more in patients on inhaled budesonide at 3 months of follow-up. Though it was not statistically

significant, it was clinically significant if the percentage of patients having the symptoms was considered. These findings were in concordance with the study done by Neha Raghava et al.¹² in which significant improvement in the frequency of asthma attacks, percentage improvement in the AEC, FEV₁, percentage improvement in the PEF_R in both, groups were seen. More significant improvement in asthma attacks/symptoms were seen in patients on inhaled budesonide than those on oral montelukast.

During 3 months of treatment, 2 (7.1%) patients in group A had acute severe exacerbation requiring step-up of treatment as against 1 (3.8%) in group B. With a p-value of 0.100, there was no statistically significant difference in incidence of acute severe exacerbations between two treatment groups. These findings were in contrast to those in the study by Lucie Blais et al.²⁴ which suggests that the risk of exacerbations was significantly higher in the Inhaled corticosteroids than the leukotriene receptor antagonist group. However, the findings were similar to the findings in the study conducted by Shah M B et al.¹³ and Neha Raghava et al.¹²

At a p-value of 0.069, statistically non-significant difference was observed in the control status between the two groups at 3 months of treatment. However, in terms of percentage, more number of children in Group B were controlled on their asthma symptoms. Similar results were found in the study by Shah M B et al.¹³ which suggested that oral Montelukast is not inferior to Budesonide in treatment of mild persistent asthma in 2 to 18-year-old children in terms of control of symptoms and improvement in pulmonary function tests over a 12 week period.

Both the patients having allergic rhinitis as a co-morbid disorder were controlled on oral montelukast at 4 weeks & 3 months whereas one patient on inhaled budesonide was uncontrolled at 4 weeks & partially controlled at 3 months. Montelukast is a drug for the treatment of allergic rhinitis also, thereby controlling asthma symptoms & allergic rhinitis both. Inhaled budesonide has a lesser role in the control of allergic rhinitis. In support of the present study conducted by us similar outcome was found in a study conducted by Sreejyothi G et al.¹⁴ which suggested that Children with comorbidities like allergic rhinitis had good control with montelukast. Patients in the category of controlled were considered as 'Asymptomatic'. Patients in categories of partially controlled & uncontrolled were

considered as 'Symptomatic'. On statistical analysis, comparing clinical efficacy of oral montelukast at 4 weeks and 3 months, the p-value for symptom control was 0.09, suggesting no significant change/improvement in control. On statistical analysis, comparing clinical efficacy of inhaled budesonide at 4 weeks and 3 months, the p-value was 0.046 suggesting a statistically significant improvement in control at 3 months than at 4 weeks in patients on inhaled budesonide. This suggests that montelukast has a relatively rapid onset of symptom control in children with asthma but has lesser clinical efficacy as compared to inhaled budesonide. Inhaled budesonide takes relatively more time to achieve symptom control, but has more clinical efficacy than montelukast. This is because montelukast has anti-inflammatory effect only against inflammation-mediated through leukotrienes whereas Inhaled corticosteroids have a versatile anti-inflammatory activity which down-regulates most pathways involved in the synthesis of cytokines and other inflammatory mediators, resulting in better control and higher clinical efficacy.¹⁵

Conclusion

At 4 weeks of regular treatment, symptoms of children with mild persistent childhood asthma on oral montelukast were better controlled than those on inhaled budesonide. In patients on inhaled budesonide, the need of reliever medications was much less and improvement in activity was much more at 4 weeks of follow-up.

At 3 months of regular treatment, there was statistically non-significant difference in the control status between two groups. However in terms of absolute numbers, more children on inhaled budesonide were controlled on their asthma symptoms than those on oral montelukast. Patients on inhaled budesonide required significantly less reliever medications and had lesser episodes of night awakening due to asthma symptoms. Also, more number of children on inhaled budesonide had improvement in their day-time symptoms and activity than those on oral montelukast.

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