ORIGINAL RESEARCH PAPER

Paediatrics

NEBULIZER VERSUS METERED DOSE INHALERS IN THE MANAGEMENT OF ACUTE EXACERBATION OF ASTHMA IN PAEDIATRIC EMERGENCY ROOM.

KEY WORDS: pelvis, sexual dimorphism, sciatic tubercle.

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ABSTRACT

AIMS AND OBJECTIVES:
The aim of the study is to compare the efficacy of aerosolized beta 2 agonists delivered via a nebulizer versus a metered dose inhaler for the treatment of acute exacerbation in pediatric age groups.

STUDY DESIGN:

a) Inclusion criteria:
- Children aged between of 3 to 14 years, who had been diagnosed as having bronchial asthma and attending Paediatric Emergency room with acute exacerbation.

b) Exclusion criteria:
- Age below 3years
- Bronchiolitis.
- Clinical/Radiological Pneumonia
- Chronic pulmonary diseases (cystic fibrosis, pulmonary tuberculosis, emphysema, etc)
- Pulmonary and/or cardiac congenital malformations.
- Foreign body aspirations.
- Children of parents who are not willing to participate in the study.

METHODOLOGY:
Study group: Paediatric age group(age 3 to 14 years)
Sample size: 80 subjects
Study design: Randomized prospective study
Children aged between 3-14 years brought to Paediatric ER with acute exacerbation of asthma aged between 3 to 14 years, will be randomized into 2 equal groups to receive aerosolized beta 2 agonist via nebulizer (group 1) and via metered dose inhaler (group 2). Clinical assessment of severity will be assessed based on Sensorium, Heart rate, Respiratory rate, Retractions, oxygen saturation, wheeze severity and air entry. The response to therapy will be assessed after half an hour, 1 hour, 1 and half hour and 2 hours. Outcome of therapy in these two groups will be assessed based on improvement in the respiratory distress, sensorium, air entry, oxygen saturation and the need for admission after 2 hours of therapy and will be compared between them.

PLAN FOR STATISTICAL ANALYSIS:
Descriptive statistics using SPSS software

INTRODUCTION:

Bronchial asthma is an important cause of morbidity in childhood Asthma is a chronic inflammatory disorder of the airways which is characterized by obstruction of airflow. It can be completely or partially reversed with or without specific therapy. The clinical manifestations of asthma in childhood involve intermittent episodes of cough and wheezing,.Wheezing occurs as a result of turbulent air flow through narrowed large, central airways that causes oscillation of bronchial walls[4]. Administration of aerosolized medication is favored for the treatment of asthma. Oral medications along with nebulisers and or inhalers are suggestive for treatment depending on the intensity of the asthma.

DIFFERENTIAL DIAGNOSIS[30]:

Chronic obstructive pulmonary disease (COPD)
Congestive heart failure
Gastroesophageal reflux disease
Mechanical obstruction of the airways (e.g., tumors, foreign bodies)
Vocal cord dysfunction.

Asthma alternative diagnosis[31]:

Clinical Features	Diagnosis	Investigation
Feeding difficulties with cough and vomiting RRI Since Birth With Murmur	Aspiration Congential heart disease	Barium swallow ECHO
RRI with clubbing with persistent pulmonary infilterates Febrile illness with frequent respiratory infections FTT+ GI symptoms Sudden chocking cough +localized wheeze	Intestitial Pnemonia Immunodeficiency Cystic fibrosis Foreign body	Bronchoalveolar lavage Immunoglobulin assay Sweat chloride Bronchoscopy.

GRADING OF ASTHMA SEVERITY[29]:

Grade of severity	Symptoms of airflow obstruction	Night time symptoms	Peak Expiratory Flow
Mild intermittent (grade 1)	->once a week -asymptomatic and normal between attacks	< twice a month	->80% of personal best -<20% of diurnal variation
Mild persistent (grade 2)	->once a week but - < once a day Nocturnal symptoms more than twice a month	>twice a month	->80%of personal best -20-30% diurnal variation

Moderate persistent (grade 3)	->once a day -Attack affects activity.Exacerbations may affect activity and sleep Nocturnal symptoms more than once a week	->once a week	-60-80%of personal best ->30% diurnal variation.
Severe persistent (grade 4)	-Continuous -Limited physical activity -Frequent exacerbations -Frequent nocturnal asthma symptoms	-Frequent	-<60% of personal best ->30% of diurnal variation

ASTHMA TREATMENT IN CHILDREN:

Inhaled therapy is the cornerstone of asthma treatment for children of all ages. Information about the lung dose for a particular drug formulation is seldom available for children, and marked differences exist between the various inhalers. In general, a metered-dose inhaler (MDI) with spacer is preferable to nebulized therapy due to its greater convenience, more effective lung deposition, lower risk of side effects, and lower cost[30].

CHOOSING INHALER FOR CHILDRFEN ACCORDING TO AGE[31,32,33]:

Age Group	Preferred Device	Alternate Device
Younger than 4 years	Pressurized metereddose inhaler with dedicated spacer with face mask	Nebulizer with face mask
4 – 6 years	Pressurized metereddose Inhaler with dedicated spacer with mouthpiece	Nebulizer with mouthpiece
Older than 6 years	Dry powder inhaler,or breath-actuated pressurized metereddose inhaler, or pressurized metereddose inhaler with spacer and mouthpiece	Nebulizer with mouthpiece

Controller Medications

Controller medications for children include inhaled and systemic glucocorticosteroids, leukotriene modifiers, longacting inhaled _2-agonists, theophylline, cromones, and long-acting oral 2-agonists.

1.Inhaled glucocorticosteroids:

Inhaled glucocorticosteroids are the most effective controller therapy, and are therefore the recommended treatment for asthma for children of all ages.

Drug	Low Daily Dose (_g)	Medium Daily Dose (_g)	High Daily Dose (_g)‡
Beclomethasone dipropionate	100 – 200	>200 - 400	>400
Budesonide*	100 – 200	>200 - 400	>400
Ciclesonide	80 – 160	>160 - 320	>320
Flunisolide	500 – 750	>750 - 1250	>1250
Fluticasone	100 – 200	>200 - 500	>500
Mometasone furoate	100 – 200	>200 - 400	>400
Triamcinolone acetonide	400 – 800	>800 - 1200	>1200 †

Children older than 5 years[34,35]. According to the study done by SHAPIRO .G. showed marked and rapid clinical improvements in symptoms and lung function at low doses of inhaled glucocorticosteroids (100-200 _g budesonide daily) while some patients required a higher dose of (400 _g/day) to achieve optimal asthma control and effective protection.

2.LEUKOTRIENE MODIFIERS. CHILDREN

Leukotriene modifiers provide partial protection against exercise-induced bronchoconstriction within hours after administration. It also reduce viral induced asthma exacerbations in children ages 2-5 years having a history of intermittent asthma. According to studies done by Bisgaard et al leukotrine modifiers reduces asthma excarbation.

3. RAPID-ACTING INHALED BETA 2-AGONISTS[39].

Role in therapy - Rapid-acting inhaled Beta 2-agonists are the medications of choice for relief of bronchospasm during acute exacerbations of asthma and for the pretreatment of exercise-induced bronchoconstriction. They include salbutamol, terbutaline, fenoterol, reproterol, and pirbuterol.

Children older than 5 years. Long-acting inhaled Beta 2- Agonists is given in children older than 5 years as add-on therapy for patients whose asthma is not controlled on low to high doses of inhaled glucocorticosteroids. Significant improvements in peak flow and other lung function measurements have been found in most studies. Combination products containing an inhaled glucocorticosteroid and a long-acting inhaled Beta 2-agonist are preferred.

4.THEOPHYLLINE.

Theophylline is an effective as monotherapy and as add-on treatment to inhaled or oral glucocorticosteroids in children older than 5 years. It is significantly more effective than placebo at controlling day and night symptoms and improving lung function. Side effects: Mild central nervous stimulation, palpitations, tachycardia, arrhythmias, abdominal pain, diarrhea,gastric bleeding may also occur if the dose is more than 10 mg/lkg.

5.CROMONES:

Sodium cromoglycate and nedocromil sodium have a limited role in the long-term treatment of asthma in children .Nedocromil sodium reduces exacerbations, but its effect on other asthma outcomes is not superior to placebo. Side effects - Cough, throat irritation, and bronchoconstriction occur with sodium cromoglycate.

6.LONG-ACTING ORAL BETA 2-AGONISTS.

Treatment with long-acting oral beta 2-agonist with formulations of salbutamol, terbutaline, and bambuterol reduces nocturnal symptoms of asthma. Due to their potential side effects of cardiovascular stimulation, anxiety, and skeletal muscle tremor, their use is not encouraged.

AEROSAL DELIVERY SYSTEMS[29]

There are a number of aerosol delivet systems:

1. MDI(Metered dose inhaler) +Spacer
2. MDI+spacer+ Mask< 3years
3. Dry Powder Inhaler(DPI)
4. Nebulisers

1. Metered Dose Inhalers:

They are pressurized canisters which are designed to deliver unit dose of aerosolized drug into the lung.

- It is a small portable handy instrument consisting of outer plastic casing with mouth cover and inner pressurized canister.
- The canister contains an1) active drug preparation mixed with b)propellent and a surfactant. The drug used is salbutamol or steroid mixed with propellants like chloroflurocarbon(CFC) or hydrofluroalkane.
- Cfc is replaced with hydrofluroalkane as CFC has a chemical action on the stratospheric ozone.
- The propellant acts as a mode of transport to carry the drug.
- The propellant remains in a liquid state whereas on release under high pressure it evaporates and carrys the drug.
- Surfactant like sorbiton trioleate or lecithin mixes with propellants and acts as a anticlumping agent to reduce intrapulmonary deposition.
- Very slow inhalations followed by a breath-holding pause of 10 s after the inhalation have been found to enhance pulmonary deposition as compared with fast inhalations (about 90 1 min – I with and without a breath-holding .

ADVANTAGES:

- Handy and portable
- Less nosocomial infections seen.

- Good aerosol delivery in short time.

DISADVANTAGES:
- Hand and lung coordination is required
- Children below 7 years cannot use
- Difficult to use in severe episode of asthma

2.SPACERS:
- Spacer ia an extensible compartment or accessory attached to MDI to eliminate hand lung coordination.
- Spacers with mdi are found to be an effective nebulizer in the treatment of mild to moderate asthma
- It reduces oropharyngeal deposition and prevent canidiasis.
- Small volume spacers are preferred in children less than 2 years.
- For children less than 3 years a face mask must be attached to the mouth piece for beeter intrapulmonary deposition of aerosol.

3.DRY POWDER INHALERS:
Dry power inhalers are breath activated devices which produce fine particles of medication by scraping or milling of the aerosol powder.

The most widely used dry powder inhalers are Spinhaler, the Rotahaler, the Diskhaler and the Turbuhaler.
- The rotahaler also uses gelatin capsule . After the capsule is broken it causes a turbulence during inhalation.
- In the diskhaler active drug and lactose are kept in an air-tight aluminium blister that is pierced before inhalation.

ADVANTAGES OF (DPI)
- No need for hand lung coordination.
- Easy to assemble and clean.
- CFC free and ozone free.

DISADVANTAGES:
- Requires good inspiratory effort
- Not useful in acute asthma
- May produce cough
- Less dispersible in humid conditions.

5. NEBULISERS:
- It produces a polydisperse where most of the drug is released of 1 to 5 microns in diameter. They use compressed air or oxygen for atomization . They work on Beurnalli's principle.

ADVANTAGES:
- Hand lung coordination not required.
- High dose of drug can be administered.
- Drug like antibiotics can be administered..

Can be used in ventilated patients and sick children.

DISADVANTAGES:
- Expensive
- Portable pressurized gas and power source is required.
- Contamination is possible.

MANAGEMENT OF
1.ACUTE ASTHMA- MODERATE[29]

SIGNS AND SYMPTOMS	TREATMENT
APPEARANCE: ALERT, TONE/POSTURE: NORMAL INCREASE IN RESPIRATORY RATE, INCREASE IN WORK OF BREATHING+INCREASE IN TIDAL VOLUME + INCREASE IN BREATH SOUND AND WHEEZE	1. MDI+Spacer: salbutamol 2 puffs every 2 min upto 10 puffs depending on response 2. Oral prednisolone stat dose 3. < 2year- 10mg, 2-5 year- 20 mg,<5 year 30mg

2.Acute severe asthma:
SIGNS AND SYMPTOMS:
Alter in tone with normal posture. Increase in respiratory rate, work of breathing and tidal volume Tachycardia+ $Sa0_2$92% or less with normal liver span

TREATMENT:
1. oxygen through non rebreathing mask 10-15 l/min
2. -Nebulised salbutamol through oxygen
   <1 yr: 0.25 ml
   1-5 yrs- 0.5 ml
   >5yrs:1 ml in 3ml NS
   3. Tablet. Prednisolone stat dose
   < 2 years- 10gm
   2-5 years-20 mg
   >5 yrs- 30-40 mg
   -If oral prednisolone cannot be given hydrocortisone is given
   -If improved nebulization with salbutamol 4th hrly and continue prednisolone for three days.
   If not improved treat as life threatening asthma.

3.LIFE THREATENING ASTHMA
SIGNS AND SYMPTOMS:
Alter in tone with normal posture. Decrease in respiratory rate, work of breathing and tidal volume . Decrease in breath sound and wheeze Increase in heart rate , abnormal colour, SAO_2<92%

Treatment:
1. Oxygen – non breathing mask 10-15 l/min to keep Sao_2>92%
2. IV access and treat shock
3. Nebulise salbutanol+ipratropium . Reassess every 20 minutes
4. Inj hydrocortisone and nebulisation salbutamol 1-3 hrly.

4.NEAR FATAL ASTHMA
SIGNS AND SYMPTOMS:
No response to pain, Altered tone and posture ,Bradypnea, grunting, Decreased in respiratory rate, work of breathing and tidal volume .

Heart rate:
Relative or absolute bradycardia, SAO_2<92%

Treatment:
1. Position airway ans ventilate
2. BMV with 100% o_2.
3. IV access and treat shock
4. Inj adrenaline 0.1 ml/kg s.c(1 in 10,000) reassess and repeat 3 doses at 20 minutes
5. Inj hydrocortisone sta if not improved
6. Inj Aminophylline loading dose 5mg/kd followed by 1 mg/kg/hr in 5%D If not improved Consider magnesium sulfate 25-40mg/kg iv in NS once in 30 minutes
7. Plan to shift to ICU inj terbutaline 3 to 6 mcg/kg IV over 60 min.

Infusion 0.1-0.4 mcg/kg/hr with montoring. Intubation and ventilation if not improved.

Table 1: Age Distribution

Age group	No. of cases	Percentage
3-7	15	16.6
7-11	43	48.0
11-14	32	3.4
Total	90	100.0

In the present study a total of 90 children were taken of which the most common age group to develop asthma was between 7-11 years with43 cases (48%) followed by 3-7 years with 15 cases (16.6%) followed by 11-14 years 32 cases(3.4%).

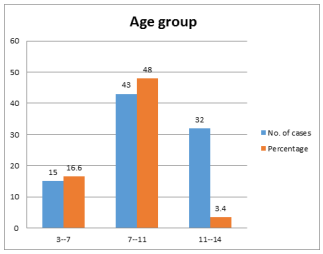


Table 2: Gender

Gender	No. of cases	Percentage
Male	58	64.0
Female	32	36.0
Total	90	100.0

Out of 90 cases, Male cases were more commonly seen with 58 cases (64%) followed by 32 female cases (36%).

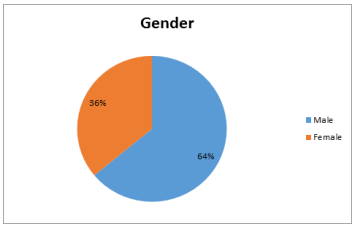


Table 3: Seasonal Variation

Season	No. of cases	Percentage
Yes	67	74.0
No	23	26.0
Total	90	100.0

Out of 90 cases of asthma 67 cases(74%) had seasonal variation and 23 cases (26%) without Seasonal Variation.

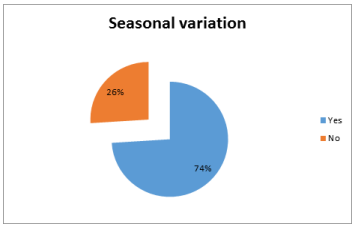


Table 4: Diurnal Variation

Diurnal	No. of cases	Percentage
Yes	73	81.1
No	17	18.9
Total	90	100.0

Out of 90 cases of asthma 73 cases had Diurnal Variation with the percentage of 81.1%, followed by 17 cases (18.9%) without Diurnal Variation.

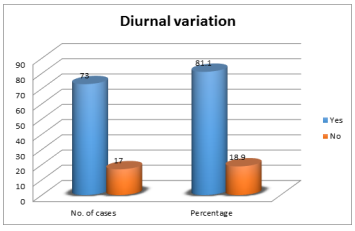


Table 5: History of Allergy

Allergy	No. of cases	Percentage
Yes	76	84.0
No	14	16.0
Total	90	100.0

Out of 90 cases of asthma 76 cases (84%) had History of Allergy followed by 14 cases (16%) without History of Allergy.

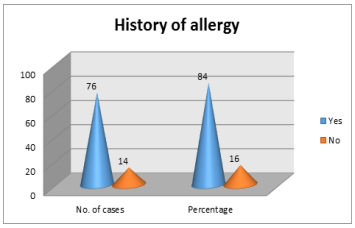


Table 6: Family History

Family history	No. of cases	Percentage
Yes	55	61.1
No	35	38.9
Total	90	100.0

Out of 90 cases of asthma 55 cases (61.1%) had Family History of athma followed by 35 cases (38.9%) without Family History of asthma.

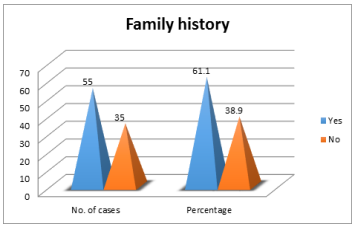


Table7 : Passive Smoking History

Smoking	No. of cases	Percentage
Yes	27	30.0
No	63	70.0
Total	90	100.0

Out of 90 cases, 63 cases (70%)had no Passive Smoking history followed by 27 cases (30%) with Passive Smoking History.

Table 8: Frequency of Illness

Frequency	No. of cases	Percentage
Daily	35	39.0
<2 weeks	18	20.0
>2weeks	37	41.0
Total	90	100.0

Out of 90 cases, 37 cases(41%) had frequency of asthma less than 2 weeks of Illness, followed by 35 cases (39%) daily and followed by 18 cases (20%) had more than 2 weeks Illness.

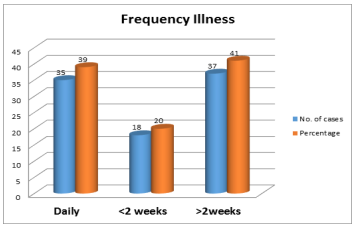


Table 9: Salbutamol Mode of Delivery MDI-S Vs Nebulizer

Salbutamol MOD	No. of cases	Percentage
MDI-S	45	50.0
Nebulizer	45	50.0
Total	90	100.0

Out of 90 cases, 45 cases (50%) were treated with metered dose of salbutamol (MDI-S)and 45 cases (50%) treated with Nebulizer.

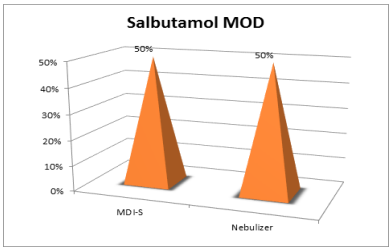


Table10: Change in PEFR-MDI -Spacer Vs Nebuliser(30 mts)

PEFR(30 min)	Mean	S.D
MDI – Spacer (45)	232.31	8.95
Nebulizer (45)	196.21	10.16
'p' value	**<0.001**	Significant

Out of 90 cases, PEFR (30 mins) MDI-Spacer 45 cases had mean value 232.31 with standard deviation of 8.95 and using Nebuliser in 45 cases had mean value of 196.21 with standard deviation of 10.16.

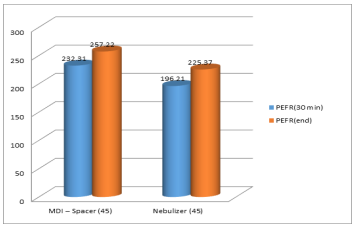
Table11: Change in PEFR-MDI -Spacer Vs Nebuliser(end 2 hour)

PEFR(end)	Mean	S.D
MDI – Spacer (45)	257.22	11.01
Nebulizer (45)	225.37	9.16
'p' value	**<0.001**	Significant

There is statistically significant improvement in PEFR at 30 mts and at the end 2 hour of treatment with the MDI-Spacer group than with the nebulised group.

Table12: Change in PEFR-MDI -Spacer Vs Nebuliser (30 mts vs end 2 hour)

Mean	PEFR(30 min)	PEFR(end 2 hour)
MDI – Spacer (45)	232.31	257.22
Nebulizer (45)	196.21	225.37



DISCUSSION:

The main aim of the study is to see is to compare the efficacy of aerosolized beta 2 agonists delivered via a nebulizer versus a metered dose inhaler for the treatment of acute exacerbation in pediatric age groups.

There are several mode of treatment for asthma and excarbation which differs in terms, efficacy and cost. Beta 2 agonist are the most commonly administered as they relieve bronchospasm. In India Environmental factors, including increasing exposure to pollution, allergies, tobacco smoke, and sedentary lifestyle were identified as risk factors for asthma. The proportion of Indian school children suffering from Bronchial Asthma had increased to more than double in the last 10 years and reached the highest-level ever.

AGE AND GENDER:

In the present study a total of 90 children were taken of which the most common age group to develop asthma was between 7-11 years with43 cases (48%) followed by 3-7 years with 15 cases (16.6%) followed by 11-14 years 32 cases(3.4%). In our study asthma is more commonly seen in males than in females with 58 cases(64%.) According to the study done by ALBERT et al[44] the most common age group to develop asthma was 5- 10 years with 98 cases out of 255 cases which is almost similar to present study. Study done by Erika von Mutius[45] stated that the most common age group to develop ashma was between 6- 10 years of age. The study also stated that The prevalence of asthma, atopy, and bronchial hyperresponsiveness were lower in Turkish children than in native German children. Studies done by Paula Lozano et al [46]in U.S.A. stated that the most common age group to develope asthma was between 10- 17 years of age with males and white race being more affected . Studies done by De macro [47]Sex affects the development of asthma in a time-dependent manner.until age 13–14 years, the incidence and prevalence of asthma are greater among boys than among girls.

SEASONAL VARIATION:

In the present study done in 90 cases of asthma 67 cases(74%) had seasonal variation. According to the study done in korea [48]the average numbers of children who presented at the emergency department for asthma were from from September to November. the numbers of patients who presented at the emergency department each year were at their highest during September or October, when there were 2-fold increases in the numbers compared to the annual averages which is similar to the present study. Studies done by Julia et al [49] for children among the age of 6-10 years of age in the university of virgenia showed the asthma attack on children between july to December.

FAMILY HISTORY AND PASSIVE SMOKING HISTORY:

n the present study out of 90 cases of asthma 55 cases (61.1%) had Family History of asthma and 27 cases (30%) had a history of Passive Smoking where mostly father's were smoker's**.** Studies done by Rengyi Xu [54] stated that mother's asthma history was strongly associated with the children's onset of asthma. Using the binary indicator to quantify parental history, it was concluded that the lifetime relative risk of asthma for people whose mother had asthma relative to people whose mother did not have asthma is 3.714. Studies done by **Melissa A. Valerio**[55]showed that children with a parent with asthma were about twice as likely to have asthma, and those with a parent and grandparent with asthma were four times more likely to have asthma, regardless of gender, ethnic background and birth order. The prevalence of smoking and increase in smoke-free legislation, tobacco smoke exposure remains a significant public health burden, particularly in young children who have no control over their environment. The data is conclusive that smoking, environmental tobacco smoke, and thirdhand smoke all negatively impact childhood respiratory health. In a recent Indian study, the researchers found a consistent association between being exposed to, and having experienced.

domestic violence, and childhood asthma prevalence in India[56]. Studies done by Christina et al[57] stated that despite efforts to reduce Second hand smoking in india exposure with indoor smoking bans in public spaces, a large percentage of low-income children in the Kansas City area continue to suffer the adverse effects of SHS. It is seen that 40% of children live with a smoker and 15% are regularly exposed to SHS in their home environment.

FREQUENCY OF ILLNESS AND TREATMENT:

In the present study Out of 90 cases, 37 cases(41%) had frequency of asthma less than 2 weeks of Illness, followed by 35 cases (39%) daily and followed by 18 cases (20%) had more than 2 weeks Illness.In acute moderate asthma there was increase in respiratory rate, increase in work of breathing and, increase in breath sounds, increase in tidal volume and wheeze. There was always decrease in SPO_2 with <90% in almost all the cases . There was a decrease in the peak expiratory volume, and decrease in the forced expiratory volume(FEV_1) <0.80 suggested airway obstruction. According to the study done by Uruj Altaf Qureshi et al[58] showed that FEV_1 in mild asthma is 12±0.45 mild persistent asthma is 2.45±0.54 and moderate persistent asthma is 2.1 5±0.55 which is similar study.

According to the study done in swede assessment of airflow limitation was less than 80% of predicted in FEV1 or PEF was greater in the Severe asthma study compared with other children.

In the present study Metered dose inhalers and neublizers were used and significant improvement was noted half hour and two hours after the treatment. It was seen that there was improvement in PEFR after administration of MDS in half an hour with mean 232.31 compared to nebulizer with mean of 196.21 with significant P Value of < 0.001. and improvement after 2 hours with mean 257.22 for MDS- spacer compared to nebulized with mean of 225.37 after 2 hours. There was also Improvement in FEV_1 using MDI – Spacer 1.603and Nebulizer with mean of 1.541in half after 30 minutes. There was better improvement after 2 hours with usingMDI – Spacer 1.732and Nebulizer with mean of 1.692. There was a increase in SPO_2 of >90% after using MDS spacer with mean of 2.45 compared to nebuliser with mean of 2.23. The heart rate and respiratory rate became normal after using MDS spacer compared to nebuliser after 2 hours of administration.

Short acting beta 2 agonist is the treatment option which quickly

relievesbronchospasm .Reversibility with bronchodilators predicts a good outcome in acute bronchial asthma.It can be delivered by Nebuliser and MDI with spacer.

Spacers are known to improve the compliance of the patient,increase the efficacy of drug delivery and reduce oral absorption compared to MDI without spacers or holding chamber.

According to the studies done by Bel et al [59] by The pharmacy ICS was collected at ± 1.5 years before and after the children's 12-year follow-up, this could be considered a limitation for estimating the prevalence of severe asthma.

Metered dose inhaler (MDI) or nebulizer not only reducing the adverse effects from oral or parenteral administration, but also avoiding patient discomfort when treating a paediatric population. The MDI is a convenient device to use for quick relief of acute airway obstruction, but there can be problems of coordination between actuation and inhalation, particularly in small children who may not comprehend the instructions or whose hand-inspiration coordination may not yet be adequately developed. Studies done by Yung-Zen Lin[60] showed that MDI group, and the mean per cent increase of FEV1, PEF, and Sao2 were significantly higher than those for the nebulizer group. MDI administration gave no problem with osmotic change during nebuliser treatment. patients by nebuliser. In addition to having less adverse effects, MDI treatment with a valved holding chamber can be very easily performed by patients themselves, or with help from physicians or parents if the patients are too young.

This is therefore a portable, convenient method to provide quick symptom relief during an acute asthmatic attack and thus prevents it progressing. Frequent visits to an emergency room may be avoided. Another advantage is that the substitution of MDI treatment for nebuliser treatment is the time and finance savings.

CONCLUSION:

- The burden of symptoms was high among schoolchildren with asthma, about one in five children reported impaired asthma control at both age 7-11 years. The most common factors of impaired asthma control were family history of allergic disease
- Children with problematic severe asthma suffer from more impaired health-related quality of life than patients with controlled asthma, including essential effects on daily activities and emotional well-being .
- In the present study it is seen that metered dose inhaler-spacers have a better effect than nebulisers as they have a quick relieve on asthma attack and prevent its progression.

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