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EVALUATION OF ADHERENCE TO USE OF STEROID METERED DOSE INHALER IN PAEDIATRIC POPULATION

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ABSTRACT
Adherence to therapy is an important factor for better asthma outcome. Poor adherence to metered dose inhaler is a major problem in pediatrics which leads to increased rate of asthma instability and morbidity. The purpose of our study is to evaluate proper handling technique and hygiene while using canisters and to find out different variables that lead to the non-adherence associated with the use of Metered Dose Inhaler. Data was collected through well structured questionnaire on demographic data, proper handling and hygiene while using meter dose inhaler. Most of the patients scored only average compliance with treatment (48.5%). Majority of them were not practicing good hygiene (79.6%).Thus the results obtained clearly shows the ineffective use of inhaled corticosteroids. Education should be given on proper inhalational technique, hygiene and need of regular follow up. Clinical pharmacists should include in the counseling team inorder to improve the patient adherence.

KEYWORDS: Asthma, Metered Dose Inhaler, Adherence.

INTRODUCTION
Asthma is an irreversible, chronic, inflammatory, hyper-responsive disorder leading to the airway obstruction. It is one of the most common troubles in pediatrics.[1] About 8% of children miss their school once per month yearly.[2] Pharmacological treatment of asthma includes bronchodilators-beta 2 agonists and anticholinergics, leukotriene antagonists, mast cell stabilizers and most importantly steroids.[3] Even though oral route is simple, they are found to be less effective and more prone to produce Adverse Drug Reactions. Since inhalation allows rapid availability of drugs with sufficient concentration, it remains the mainstay treatment. Also lower dose is only required to produce therapeutic efficacy when compared to oral route.[4]

Metered Dose Inhaler is the most commonly used inhalational device since it have high cost effectiveness ratio. It sprays a fixed quantity of drugs into the lungs orally. In order to achieve the proper control of asthma, it is important to use the proper technique of the device for the correct delivery of the drug into the airways.[5] Metered Dose Inhaler is easier, faster, economic and simple to carry and is able to withstand the problems associated with oral intake.[5,6] Inhaled steroids are considered to be the most effective asthma relievers when taken regularly.[7] They reduce inflammation and narrowing of bronchus. Consistent use of inhaled steroids reduced hospital visits and mortality rate by 80% and 21% respectively.[8] But in converse its improper technique can leads to less delivery of drug and decreased efficacy.[9] Hygiene in using inhaler is also important. Poor hygiene practice can also generate new infections as well as over washing of spacer results in diminished effects.

Adherence can be defined as the extent to which patients take their medications as per the prescription. In developed countries, adherence rate is only 50% for the chronic illness and for asthma; it varies from 15 to 67%.[10-14] Poor adherence to inhaled steroids may influence the morbidity and mortality pattern of the disease.[11] Reasons for non adherence includes misconcepts such as regular inhaler use can develop habits, incidence of Adverse Drug Reactions, problems associated with poor hygiene, cost of medication, multiple usage of drugs and increase visits to hospitals.[15-17] Our study focused on the evaluation of proper handling technique and hygiene in using Metered Dose Inhalers for the treatment of asthma, to find out different variables that lead to the non-adherence and methods to solve issues related to use of Metered Dose Inhaler.

MATERIALS AND METHODS
An observational questionnaire based study was conducted in a tertiary care teaching hospital in a period of 2 months. Data was collected using a structured

questionnaire. Information regarding socio economic status, family history, Metered Dose Inhalation technique score chart, hygiene of transpacer and compliance was obtained. Both the caretaker and children were interviewed and asked to demonstrate the inhalational technique and assessed by the adopted scoring system. Each performed step scored one and non performed as zero (Checklist 1). All children from age of 2 to 18 years, diagnosed with Asthma and maintained on Metered Dose Inhaler were included in our study. Patients who are not willing to participate in the study and who are under 2 year's age are excluded from our study.

Checklist 1: Metered Dose Inhaler technique scoring chart

Steps	Inhaler Technique
1	Shake the inhaler vigorously
2	Remove cap
3	Hold upright
4	Breath out gently not fully
5	Start breathing in slowly
6	Actuate during inspiration
7	Continuous slow inhalation
8	Hold breath
9	Gargle mouth and face

RESULTS

A total of 54 patients were included in our study. The demographic details are showed in table 1. Out of the total participants, 28 were male (51.8 %) and rest were females. Children of age between 2 to 6 years were dominating, 28 (51.8%) followed by age group 6 to 12 years (31.4%). Most patients were underweight (50.0%). 72.2% patients don't have any relatives using inhalers. In our study, most of the patient's one canister of inhaler finished within 1 month (61.1%). The majority of the patients do not discontinued their inhaler in the middle of treatment (83.3%). About 87% of participants were under regular follow up and 57.4% of patients continued their treatment as per doctor's advice. Only 9.2 % of patients missed their dose. (Table 2).

Table 1: Demographic details of patients

Variables	Number	Percentage
Gender		
Male	28	51.8 %
Female	26	48.1 %
Age		
2 to 6	28	51.8 %
7 to 12	17	31.4 %
13 to 18	9	16.6 %
Weight		
Underweight	27	50 %
Normal	21	38.8 %
Overweight	6	11.1 %
Level of education of parents		
Illiterate	39	72.2%
Literate	12	22.2%
Higher education	3	5.5%
Family History		
Yes	15	27.7 %
No	39	72.2 %

Table 2: Patient's characteristics related to use of inhalers

Variables	Percentage
Duration of one canister of inhaler	
Less than 1 month	61.1
2 months	22.2
3months	9.2
< 3 months	7.4
Discontinued inhaler	
Yes	16.6
No	83.3
Regular follow up	
Yes	87
No	12.9

Follow doctors follow up	
Yes	57.4
No	42.5
Missed dose	
Yes	9.2
No	90.8

Figure 1 depicts that 61.1% of children were using inhaler for more than 1 year. Most of the patients were not practicing good hygiene technique (79.6%). 48.5% of patients scored only average compliance with treatment (figure 2). 33.2 % showed improvement after treatment while 37% doesn't produce any change in their disease and 29.6% worsened their condition after treatment (figure 3).

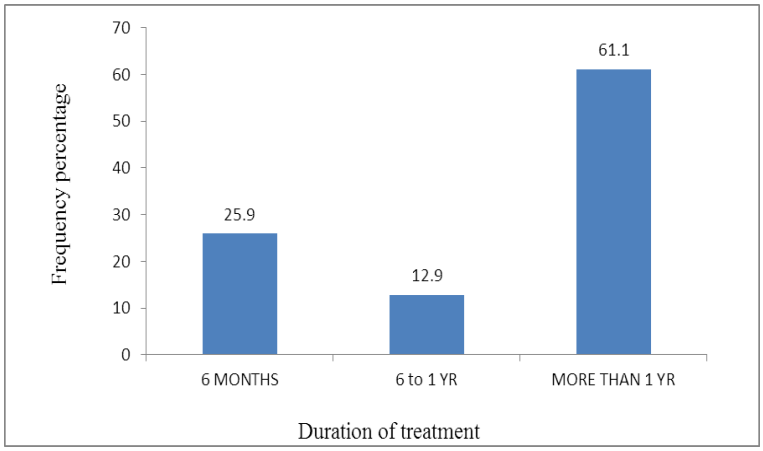

Figure 1: Duration of usage of Metered Dose Inhaler

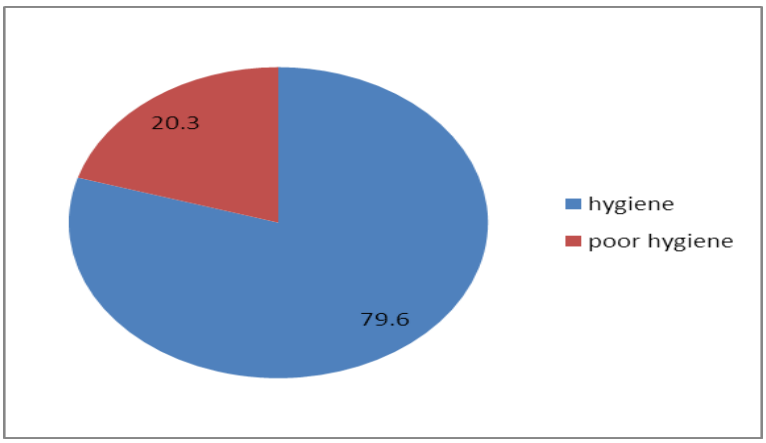

Figure 2: Tran spacer hygiene in subjects

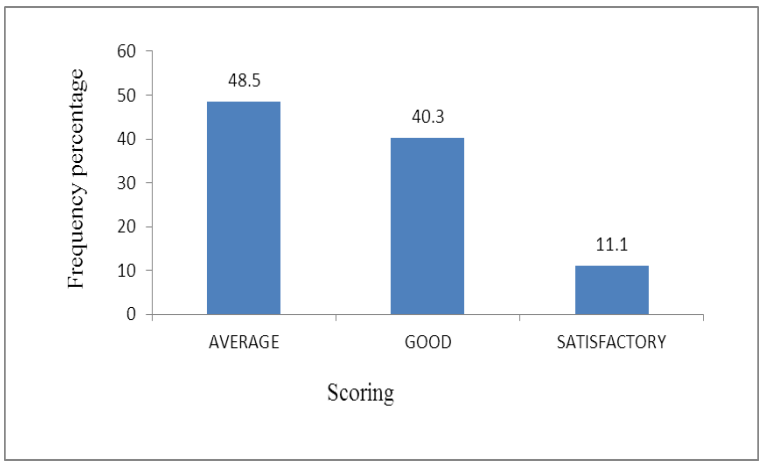

Figure 3: Metered Dose Inhaler technique score chart

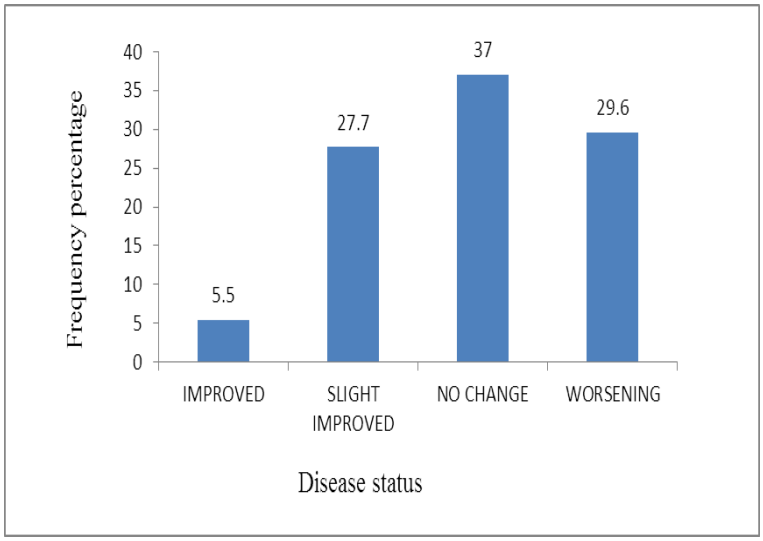

Figure 4: Disease status of the patients

DISCUSSION

Poor adherence to inhaled corticosteroids may contribute to increase asthma instability and morbidity. Reasons for poor compliance are dose, frequency of drugs, medication effects and inappropriate technique of inhalation devices.[18,19] Suboptimal use of inhalational devices causes misuse or overdose of drugs which results in diminished clinical efficacy and repeated hospitalization. This further leads to increased cost as well as safety problems in children. In our study, it clearly shows that about 48 % were having 1 to 2 attacks of asthma whereas 24 % in 3 to 5 attacks of asthma in the last 2 months after taking Metered Dose Inhaler.

Factors like gender, age and family history showed no significance in our study. Rifat et al supported that gender do not have any impact in maintaining adherence.[20] Educational status of the parents was the major predictor in non adherence. Illiterate parents showed poor response (table 1). Several studies suggest that higher educated parents possess high compliance. Rubin et al suggested that educating parents about treatment and disease condition will increase their active participation in the treatment and thereby increase in adherence.[21] Adherence rate increased only when the patient becomes more severely affected by disease.[22] Many children stopped their medication when they become asymptomatic.

As year progresses, the adherence rate to inhaler technique have been dramatically increasing. Similar studies published in 2005 and 2015 showed 17% and 38.5% respectively which continues in our study, 48.5%.[23,24] The key steps for proper delivery of drug are exhaling, pressing the canister and inhaling.[25] All steps in the proper inhalation technique were followed by only 11.1 % and most patients missed steps 3 and 8 (checklist 1). Thus the most patients lack complete benefits from inhaler which results in impairment in asthma control.[26,27]

Regular follow up should be performed for the proper use of inhalers. Advices given by the practitioners have to follow for better care. Studies reported that patients who were on inhaler for more than 1 year were less adherent compared to newer users.[28] This emphasizes the need of continuous re-evaluation of inhaler technique.[23] But sometimes physicians correlates the disease status with only the pharmacological characteristics of drug beneath the proper inhalational method, which leads to unwanted increase in dosage resulting in toxicity and adverse drug effects.[29] So the physicians should be well educated as well as updated and will be keen to look on all the aspects of medications including the inhaler technique.

Proper hygiene is another important phase. Excessive washing may leads to decreased delivery of drug. Frequent washing generates electrostatic charge in the spacer, which needs 30 doses of pressurized meter dose to deactivate it.[24] Simple remedies like washing spacer with mild soapy solution and allows it to drip-dry coats the spacer using an insulating layer improves drug delivery up to 60%.[24,30] In order to avoid the side effects of steroids, mouth should be rinsed with water but not drink since it may cause the drug to enter into the bloodstream.[31]

Various misbelieves on the usage of inhaled corticosteroid therapy has been there. Studies showed that the efficacy of inhaled corticosteroid therapy will be reduce as the treatment continues and increase in dose is needed to maintain the clinical efficacy. Concern on Adverse drug reactions and addiction are also high in many patients.[32] So counseling should alleviate all these misconceptions of both children and parents.

Press et al recommended 2 teaching methods- the brief intervention and the teach- to-goal for the counseling. Teach to goal method includes the repetitive demonstration and let the patient to demonstrate it back which boost his memory and considered to be most

successful method.[33] The inhalational technique counseling was usually given by the physicians. But their busy schedule affects the quality of communication, which is linked to the poor adherence.[34-36] More time should be given for counseling especially in patients with low educational status.[11] Various studies state that instructions given by the pharmacists were better when compared to other health care professionals.[28] Thus we suggest that the clinical pharmacists should get a prominent role in providing counseling on proper inhalational technique and better patient control.

CONCLUSION

Steroid Metered Dose Inhaler is a very effective method in the treatment of asthma. But improper use of spacer may leads to diminished efficacy and safety concerns. Education should be given on proper inhalational technique, hygiene and need of regular follow up. Clinical pharmacists should include in the counseling team inorder to improve the patient adherence. Thereby reduces the morbidity and instability of asthma.

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