

## STUDY ON PRESCRIBING AND ADMINISTRATION OF THERAPEUTIC AEROSOLS IN PEDIATRIC PULMONARY DISEASE AT A PRIVATE TERTIARY CARE TEACHING HOSPITAL

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### ABSTRACT

**AIM:** Inhalation therapy is the mainstay of treatment for many paediatric pulmonary diseases. Delivering aerosols to infants and children is a challenging task. The aim of the study is to assess the utilization pattern of bronchodilator drugs as aerosol therapy in the Department of Pediatrics. **MATERIALS AND METHODS:** A Prospective observational study was conducted among 133 pediatric patients. All the inpatients prescribed with bronchodilators as aerosol therapy in Pediatric ward were included in the study. Questionnaire was designed for assessment of parents or caregivers perception about asthma, medications, inhalation or nebulization therapy. **RESULTS:** In the study population of 133 patients male children were found to be more (58.6 %) than the female children (41.4%) Wheezing associated with lower respiratory tract infection was the most predominant disorder found in 35.3% children. The majority of the clinical conditions were in moderate state which was about 39.8%. In 52.6% of the prescriptions bronchodilator therapy was given by nebulization. Almost 75% of the care givers were found not familiar to bronchodilators. Only 12% of the subjects have perceived the mechanism of action of their inhaled medication in true sense. The patient's perceptions about the use of inhalers were analyzed. As per the majority of the respondents (37.5 %) The inhalers are easy to use. 25% reported that using inhalers is very complicated. To a majority of the parents cost of inhaled medication were of major concern.

### KEY WORDS

Aerosol therapy, Inhalers, Nebulization, prospective, Pulmonary disease

### INTRODUCTION

Asthma affects an estimated 300 million individuals worldwide. Evidence shows that the prevalence of asthma is increasing, especially in children. Annually, the World Health Organization (WHO) has estimated that 15 million disability-adjusted life-years are lost and 250,000 asthma deaths are reported worldwide. Nebulizer devices are widely used to deliver aerosol therapy, especially in children. A wide variety of nebulizers are available for use in home and hospital, with varying capacities to deliver drugs to the lungs [1]. Inhalation therapy is the mainstay of treatment for many paediatric pulmonary diseases. The inhalation route offers a faster onset of action and

high in situ drug concentrations compared with systemic administration. Delivering aerosols to infants and children is a challenging task and cannot be thought of as a miniaturization of adult therapy, because children have anatomical, physiological, and behavioural differences to adults [2]. In recent years inhalation therapy has achieved ever increasing importance in maintaining respiratory function [3]. The delivery of aerosolized medication to infants and children is complicated by anatomic and physiologic differences in their respiratory systems compared with adults [4, 5, 6].

Delivery of medication in aerosol form to the pediatric population is an important therapeutic

module. Aerosol therapy allows rapid medication effects, reduces systemic side effects, and provides uniform results in comparable clinical presentations if preparation techniques and dosages are appropriate. Proper and successful administration of aerosol therapy to the infant or child requires a comprehensive amount of skill and knowledge on the part of the respiratory therapy practitioner [7].

Although healthcare providers advise and train their patients in the use of different aerosol delivery devices, real-life use differs from the training, and understanding the effects that this individual use has on drug delivery is important. Lack of child cooperation is a common scenario for aerosol delivery problems. Another factor is that information about the performance of delivery devices among different age groups is usually unavailable. Moreover, the approval process of inhalation devices by regulatory agencies varies from country to country. Some will include simulated adult breathing patterns, others will include both paediatric and adult breathing patterns, and others will require none. Any of these differences can have a tremendous impact on intrapulmonary drug deposition.

Inaccurate and incomplete prescribing of nebulized bronchodilators can result in uncertainty and suboptimal treatment. A prospective audit has demonstrated major deficiencies in the prescribing and administration of nebulized bronchodilators and it has highlighted the need for a local protocol and continuing staff education [8].

When asthma happens to children, they are unaware of the dangers, warning signs, or consequences. They trust their parents and other providers to take care of them. The recommendation that bronchodilators should be used as required for symptom relief rather than regularly has been reinforced. Parents may under use bronchodilators for several reasons. They may also have underreported symptoms but administered treatment appropriate to the symptoms that were present. The fact that parents seemed to administer bronchodilator rather erratically and tended to report symptoms

without treating them suggests that there is scope for improvements in educating parents. At the very least, the prescription of bronchodilators for relief of symptoms as required needs to be defined more clearly [9].

The use of bronchodilators has been increasing for the past few decades. The literatures have reported a high rate of nasal rebound and other adverse events. Selection of an appropriate aerosol delivery device must be based on a thorough evaluation of the patient's ability to perform device-specific maneuvers. Thus Special considerations for aerosol delivery in pediatric patients need to be outlined.

## MATERIALS AND METHODS

The study was carried out in department of pediatrics for a period of 8 months, which is attached to a 500 bedded multi-specialty, tertiary care teaching hospital at Raichur. For obtaining the clearance certificate, an application along with study protocol was submitted to the Chairman of the Ethics Committee, The study was approved by Committee by issuing ethical clearance certificate. It was a prospective Observational study with sample size of 133 patients. Data were collected from Pediatric ward using structured data entry format. Only inpatients were included in the study. Patients in the pediatric ward prescribed with bronchodilators are included and patients who were prescribed with bronchodilators for surgical prophylaxis were excluded.

The questionnaire was designed for assessment of parents or caregivers perception about asthma, medications, inhalation or nebulization therapy. This included both open and close ended questions [10]. Data's were expressed as percentages and kept as 95% confidence interval.

## RESULTS AND DISCUSSION

In the study population of 133 patients male children were found to be more (58.6 %) than the female children (41.4%). Most of the pediatric patients treated with bronchodilators were infants (48.1%) followed by children 47.4% and

adolescents 3.8%. Parental social history revealed that 50.4% were found to be occasional smokers. (Table:1) From the analysis of various clinical conditions occurring in the ward, Wheezing associated with lower respiratory tract

infection was the most predominant disorder found in 35.3% children followed by acute bronchiolitis in 20.3% patients, acute asthma in 12 % patients. (Table:2)

**TABLE:1 Parental social history smoker (n=133)**

Serial No.	Parental social history smoker	No. of patients	Percentage
1	Daily smoker	18	13.5
2	Occasional smoker	67	50.4
3	Had never smoked	40	30
4	Had quit	8	6
<b>Parent education</b>			
1	< High school	29	21.8
2	High school graduate or general Education diploma	65	48.9
3	Some college or technical training	36	27
4	Not available	3	2.2

**TABLE: 2 various clinical conditions under therapy (n=133)**

SL No	Disorders	No.of Patients	% of patients
1	Wheezing associated with lower respiratory tract infections	47	35.3
2	Acute bronchiolitis	27	20.3
3	Acute bronchitis	9	5.2
4	Upper respiratory tract infections	4	3
5	Short pyrexia	11	8.2
6	Acute asthma, Hyper reactive airway disease	16	12
7	Pneumonia	6	4.5
8	Acute otitis media	6	4.5
9	Pyrexia of unknown origin	7	5.2

In 52.6% of the prescriptions bronchodilator therapy was given by nebulization and oral route. 31.6% were given by nebulization and 9% were given by oral, only 2.2 % accounted for inhalation and 1.5% were given by IV + Neb, Neb + Inh, Neb + Oral+ Inh each. (Fig.1) Only 12% of the subjects have perceived the mechanism of action of their inhaled medication in true sense. As inhaled medications are to be properly used as per the procedure, the

importance of how it acts need to be understood in the true sense. (Fig.2) When enquired about the advice they received regarding the proper use of their children's inhaler device or nebulizers 37.5% opined that they got advice from their health providers very rarely. As per 12.5% of the respondent they received instruction on a regular basis. The health care providers sometimes gave them instructions and 50% not at all received any instruction. (Fig. 3)

The parents perception about the use of inhalers were analyzed. As per the majority of the respondents (37.5%), the inhalers are easy to use. 25% reported that using inhalers is very complicated. (Fig. 4)

Majority of the parents cost of inhaled medication was of major concern. They were also worried about addiction, availability and side effect of the inhaled medication. (Fig.5)

FIG.1: Route of administration of bronchodilators (n=133)

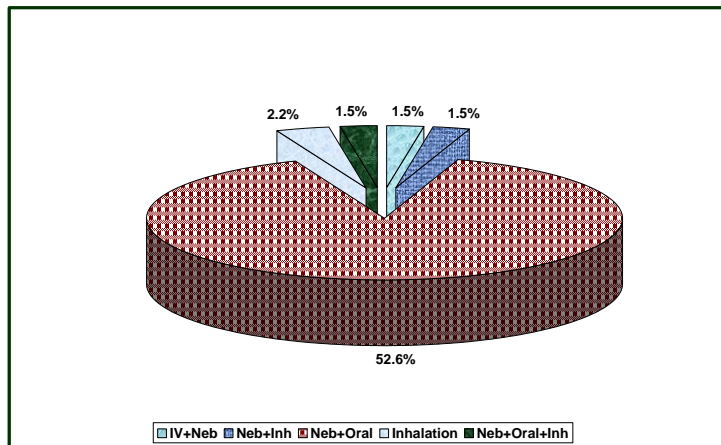


FIG.2. Perceived role of inhaled medication (n=133)

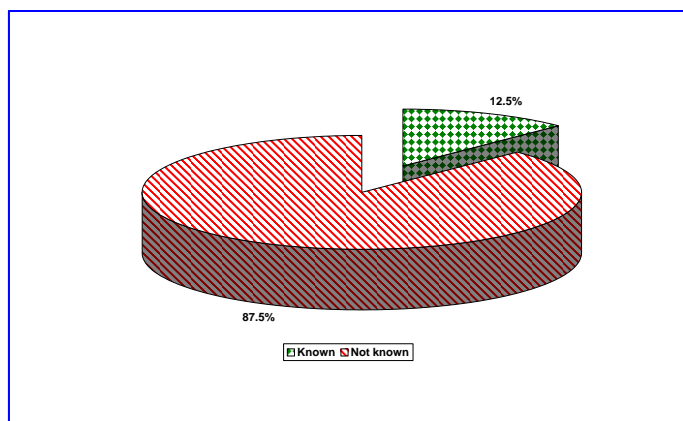


FIG.3 Advice regarding the use of inhalers or nebulizers (n=133)

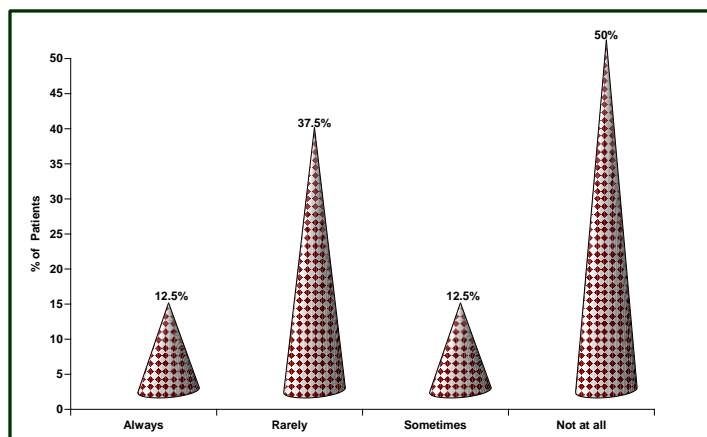


FIG. 4 Feeling about the use of inhalers (n=133)

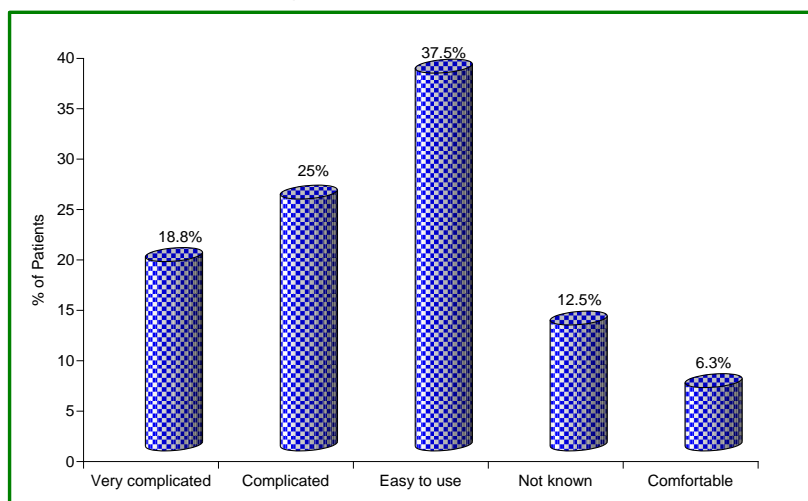
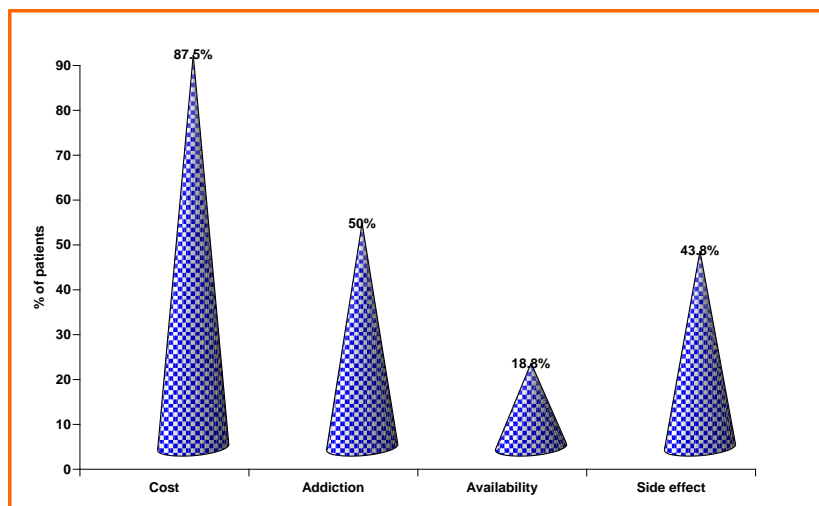


FIG.5: Concerns in using inhaled medication (n=133)



Inhalation therapy is the mainstay of treatment for many paediatric pulmonary diseases. The inhalation route offers a faster onset of action and high in situ drug concentrations compared with systemic administration. There were, in total, 133 prescriptions for bronchodilator drugs recorded in pediatric ward. Salbutamol (63.2%) (CI95 55% to 71.4%) alone was the major prescription for most of the patients. Studies say that children receiving nebulised salbutamol may be at risk of developing cardiac complications, and cardiac monitoring should be considered in these cases. 50.3%(CI 95 41.8% to 58.8%) of the patients were prescribed with Ipratropium and salbutamol combination

.This combination were most commonly used in asthma (81.3%)(CI 95 74.67% to 87.93%) , WALRI(40.4%)(CI 95 32.06% to 48.74%) ,and bronchiolitis (70.3%)(CI 95 62.53% to 78.07%). In 52.6 % ( CI 95 44.11% to 61.09%) of the prescriptions bronchodilator therapy was given by nebulization and oral route. 31.6% (CI 95 23.7% to 39.5%) were given by nebulization. Guidelines also say that nebulizer may be suitable for all age groups and recommended mode for patients with severe episodes or on ventilator [11]. In a review of use of Fixed Combination Preparations of Inhaled Short Acting  $\beta_2$  Agonists and Inhaled Corticosteroids, by Gupta (2000)

Regular use of short-acting beta-2 agonists or their combinations with inhaled steroids in asthma patients becomes a matter of serious concern. Such a use could be potentially harmful to the patient as it may be associated with increased morbidity and mortality due to asthma because of poor asthma control and because of the delay in seeking medical advice during acute episodes [12]. It was found that 77.4% of pediatric patients not received any oxygen supplementation. Oxygen saturation must be maintained > 91%. Oxygen and intravenous feeding must be maintained [13]. While carrying out a questionnaire survey for parents or caregivers about their perception about asthma, medication habit and inhaler therapy, the results of this survey underscore the need for continuous education [14]. Similar studies carried out by **Kofman (2004)** revealed that inhalation technique should be reassessed at each encounter and that cleaning techniques to be taught to parents or patients [15].

#### CONCLUSION

Delivery of aerosolized medication to infants and children is complicated by anatomic and physiologic differences in their respiratory systems compared with adults. Proper and successful administration of aerosol therapy to the infant or child requires a comprehensive amount of skill and knowledge on the part of the health care provider. The study highlighted the need for a local protocol and continuing staff and parent education.

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#### CONFLICT OF INTEREST

We declare no conflicts of interest

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