

# Deficiencies associated with the use of inhaler devices for asthma

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(Key words: inhaler devices, asthma, children, indications, deficiencies)

## Abstract

**Objective:** To study the deficiencies associated with the use of inhaler devices among children with asthma.

**Design:** Observational descriptive study

**Method:** Study population comprised consecutive children seen at all medical clinics of Lady Ridgeway Hospital using inhaler devices for asthma. Study was carried out from February 2008 until 150 patients were enrolled. Data was collected using an interviewer administered questionnaire. Technique of using inhaler was checked. Knowledge about maintenance of the device was assessed.

**Results:** Of the 150 patients 63% were in the 5-13 year age group. Fifty six percent were using the inhaler for 1-4 years. Seventy one percent in the below 2 year age group used the Holding chamber (Babyhaler). Forty percent in the 2-4 year age group used a volume spacer and a face mask. Eighty four percent in the 5-13 year age group used a dry powder inhaler or volume spacer without the face mask. Steroids alone were used by 84% of children while 16% used combination drugs. Compliance was good in 85%. Technique was satisfactory in 67% cases.

**Conclusion:** There are major deficiencies in the usage of inhaler devices among patients with asthma.

## Introduction

Major deficiencies are observed in the usage of inhaler devices among patients with asthma during our daily practice. Therefore we felt that there is an important need for an evaluation of this aspect.

It was noted that many asthmatic children use inhaler

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devices poorly resulting in substandard drug delivery even after following inhalation instructions. Studies have shown that over 50% of patients do not use metered dose inhalers (MDIs) correctly<sup>1</sup>. Comprehensive inhalation instructions and repeated checkups are needed to assure reliable inhalation technique<sup>2</sup>.

## Objective

To study the deficiencies associated with the use of inhaler devices among children with asthma.

*Specific Objectives include:*

- Appropriateness of the use of long term medication
- Appropriateness of the inhaled device for the individual patient
- Whether guidelines are followed when prescribing medication
- Whether the technique and compliance are satisfactory
- Knowledge about maintenance of the device among patients and caregivers and the degree of control.

## Method

This was an observational descriptive study. The study population comprised consecutive children seen at all medical clinics of Lady Ridgeway Hospital using inhaler devices for asthma. Study was carried out from February 2008 over 3 months until a total of 150 patients (equally distributed among the six medical unit clinics) were enrolled. Only children who had been using the inhaler device for more than 1.5 months were included in the study. The patients and parents were interviewed using an interviewer administered questionnaire. The technique was checked in patients who presented with the devices and in others by asking them to come with the devices on a second occasion. The technique was checked by the second author and guidelines in the Handbook of Asthma Management by Jyotsna M Joshi<sup>3</sup> and the Paediatric Clinics of North America<sup>4</sup>

were used to assess the technique. The technique was checked using a check list which involved main points such as shaking the inhaler device prior to use, proper holding of the mouthpiece, depth of breathing and the movement of the valve in the spacer device for MDIs and the holding of the device at mouth, depth and rate of breathing and emptying of the capsule for the DPIs. For MDIs four out of four criteria was considered very good, 3 out of 4 satisfactory (last two essential) and 2 or less poor. For the DPIs 3 out of 3 was considered very good; if the last 2 criteria were met it was considered satisfactory while less than 2 or if last 2 criteria were not met was considered poor. The compliance was considered very good when it was almost 100%, satisfactory when mothers said that they forgot to give only occasionally and poor when doses were missed frequently. The current degree of control was assessed from the severity prior to use of inhaler devices and at present.

## Results

Data was collected from a total of 150 patients. The age groups of the children are shown in Table 1.

**Table 1**  
**Age group of the children**

Age group	No. of patients (%)
<2 yrs	17 (11)
2-4 yrs	39 (26)
5-13 yrs	94 (63)

The duration the children were on the inhaler is shown in Table 2. The maximum duration on the inhaler was 7 years.

**Table 2**  
**Duration on the inhaler**

Duration on inhaler	No. of patients (%)
< 1 year	51 (34)
1-4 years	83 (56)
>5 years	16 (10)

### *Appropriateness of use of long term medication*

Almost all the patients included in the study had asthma symptoms needing daily medication (4% severe persistent, 63% moderately persistent, 30% mild persistent). Only 04 (3%) patients had mild intermittent symptoms and 3 of them had completely improved after starting medication. This shows that long term medication in these children were appropriate.

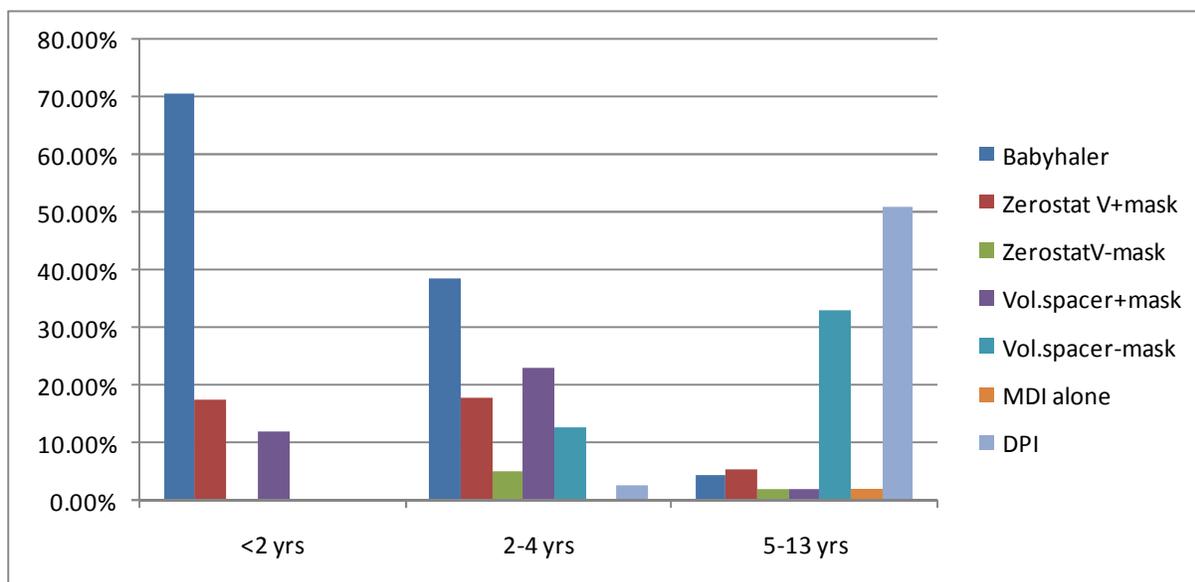
### *Appropriateness of the inhaler device*

According to the Ministry of Healthcare and Nutrition National Best Practice Paediatric Guidelines<sup>5</sup> the most appropriate inhaler devices at different ages are as follows:

- <2 years: metered dose inhaler (MDI) + holding chamber (Babyhaler)
- 2-5 years: MDI + spacer device (with a face mask up to 3 years)
- >5 years: MDI + spacer device / dry powder inhaler (DPI)
- >8 years: MDI alone may be possible

However, it is also advised that children should be changed to a device that is more acceptable to them when they are not doing well with the one prescribed.

Percentage distribution of inhaler types in different age groups is shown in Figure 1.



**Figure 1: Percentage distribution of inhaler types in different age groups**

In the under 2 years age group 71% were using the appropriate device (Babyhaler) whilst 29% were using inappropriate devices. In the 2-4 year age group, 40% used appropriate instruments (22% volumatic spacer + face mask and 18% Zerostat V + face mask), and 60% were using inappropriate devices. In the 5-13 year age group, 84% were using appropriate devices (51% DPI, 32% volumatic space without face mask and 1% Zerostat V without mask) whilst 16% were using inappropriate devices.

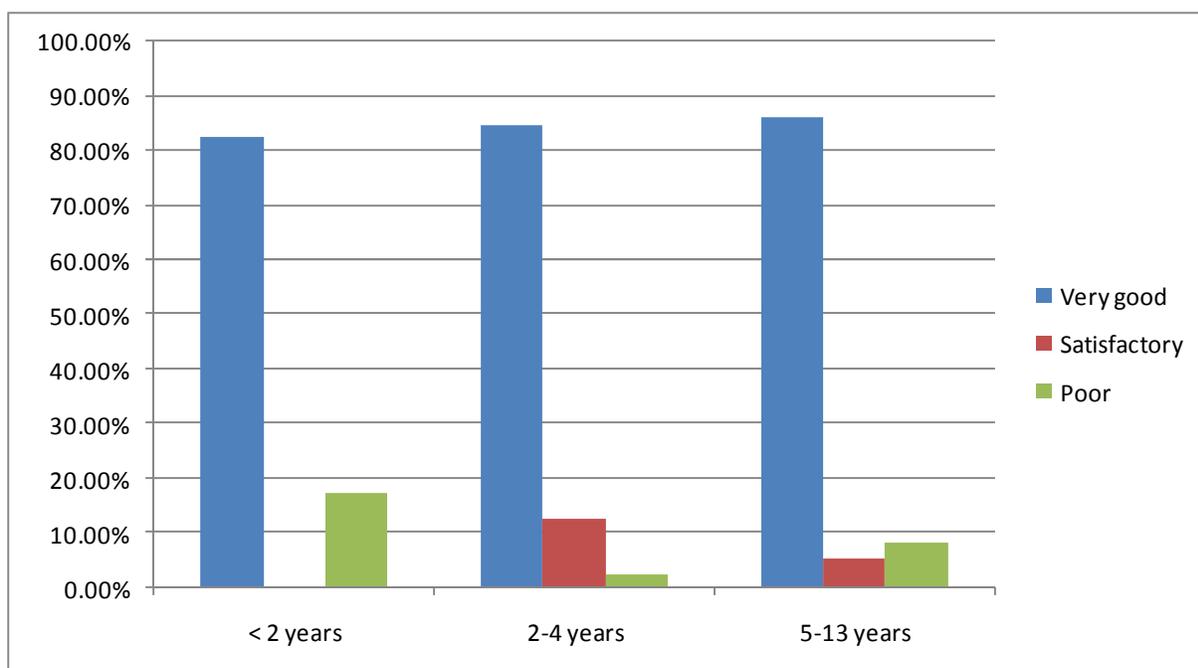
#### ***Whether guidelines are followed***

Of the total number of patients interviewed, only 42% used the reliever medication in addition to controller medication. According to the guidelines short acting bronchodilators should be prescribed for all patients who need prophylactic treatment. Out of the number of patients who were using the reliever medication only 33% knew about the management of an acute exacerbation with it. It was difficult to assess whether guidelines were followed when prescribing the corticosteroids at the start of treatment, as it had to depend on recall. Guidelines

recommend use of low dose inhaled steroids for mild persistent, either medium dose inhaled steroids or inhaled low medium dose and a long acting bronchodilator (especially for night time symptoms) for moderately persistent and inhaled high dose steroids and long acting bronchodilator for severe persistent. But steroids alone were used as long term medication by 84% of children while 16% used combination drugs which included long acting bronchodilators. Only one child with severe persistent symptoms was using combination drugs and all the others were using low to medium doses (200-400µg/day) of corticosteroids alone. Of the children with moderately persistent symptoms only 15.7% used combination drugs and 15.5% of children with mild persistent symptoms also used combination drugs.

#### ***Compliance and Technique***

Compliance in the different age groups is shown in Figure 2. In all age groups it was very good in over 80%.



**Figure 2: Assessment of compliance in different age groups**

Technique was very good in 25 (17%) children, satisfactory in 75 (50%) and poor in 50 (33%). The technique was checked at each clinic visit in 14%, three or more times in 16%, once or twice in 38% and never in 32%.

#### **Knowledge about the maintenance of the device**

A few questions were asked to assess the basic knowledge about maintenance of the inhaler device and the spacer. The percentage who knew the correct answer was calculated.

1. Twenty two percent knew when to change the steroid MDI.
2. Eighteen percent knew when to change the salbutamol MDI.
3. Seventy four percent knew how to clean the face and/or mouth.
4. Sixty eight percent knew how to clean the spacer/DPI.
5. Five percent cleaned the spacer daily, 8% twice weekly, 40% weekly, 18% fortnightly, 20% monthly and 9% less frequently.
6. Ten percent cleaned the DPI daily, 35% twice weekly, 33% weekly, 10% fortnightly and 12% monthly.
7. Ninety six percent never changed the spacer while 4% changed it yearly.

8. Whilst 61% never changed the DPI, 18% changed it yearly, 4% changed it six monthly and 17% changed it less frequently.

In our study 29% had complete improvement of symptoms, 60% some improvement and 11% no improvement at all.

#### **Discussion**

The most common cause for lack of improvement was frequent night symptoms not improved with steroid alone. Poor technique, poor knowledge about the device (MDI) and care of the spacer were among the other causes.

Technique was very good in 17%, satisfactory in 50% and poor in 33%. On the other hand, the technique was checked at each clinic visit in 14%, one or more times in 54% and never in 32%. Thus there appears to be good correlation between technique and degree of monitoring.

Another reason for poor technique noticed during the study was inappropriateness of the device (Figure 1). Several children in the 2-4 year age group were using either volumatic spacers or Zerostat V without facemasks. As the coordination is poor in this age group, they would probably have benefitted from the addition of face masks. In children less than 2 years

of age using Holding chambers (Babyhalers), the technique may have been poor because they were crying during the procedure. In a crying infant the drug delivery can be diminished by two thirds<sup>6</sup>.

A patient's use of their inhaler device should be checked at every consultation as inappropriate device selection or inadequate training can result in inefficient drug delivery and treatment failure<sup>7</sup>. At each contact, healthcare professionals should work with patients and their families on inhaler technique (level I)<sup>6</sup>.

When prescribing a pressurized MDI for maintenance or acute asthma, physicians should recommend use of a valved spacer with mouthpiece when possible for all children (level II)<sup>6</sup>. The size of the holding chamber may lead to different efficiency for different ages<sup>8</sup>. The younger children who had poor technique with the larger volumatic spacer (820 ml) might improve with the use of a smaller spacer with more pliable valve such as a Zerostat V (250 ml) spacer.

The knowledge about when to discard the MDI was poor among patients. Most of the parents who knew the average time to change the steroid canister did not actually know how to calculate the number of doses correctly and discard the canister. They did as advised by the medical officer or the pharmacist. This knowledge was important as inappropriate use can lead to poor control of the disease as well as a waste of expensive drugs. The knowledge about how to clean the mouth and face (if a face mask is used) and the spacer was better though some had inappropriate opinions.

## Conclusion

There are major deficiencies in the usage of inhaler devices among patients with asthma.

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