J MEDICINE 2012; 13 : 16-21

Incorrect Inhaler Technique Compromising Quality of Life of Asthmatic Patients

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Abstract:

Objective: *The inhalation route is widely used for the treatment of asthma. It is considered that inadequate inhaler technique is the leading cause of therapy failure. To determine the proportion of incorrect inhaler use and associated factors in asthmatic patients compromising quality of life.*

Methodology: *It is a cross sectional study conducted at Specialist Chest Clinic Fatima Bhai Hospital Karachi from September 2010 to March 2011. A sample size of 215 was selected by Non-probability purposive sampling technique. Trained health care workers in presence Chest specialist requested patients to demonstrate their inhaler technique and assessed it according to the checklist. If any of the steps was missing or done incorrectly, it was marked as incorrect technique. Information was also collected through a structured questionnaire on socio-demographic variables such as age, gender, education, duration of asthma, duration of inhaler use, and patient education of inhaler technique. Data was entered and analyzed on SPSS-14.*

Results: *There was an inverse relationship between education level and incorrect inhaler technique ($p<0.05$). Education of inhaler usage provided by doctors was more effective as compared to education provided by nurses ($p<0.038$). There was no significant relationship between age, sex, duration of asthma, duration of inhaler use, frequency of inhaler use and incorrect inhaler technique.*

Conclusion*: Quality of life of a large percentage of patients is compromised by incorrect inhaler use and education level of patients had significant relationship with incorrect inhaler technique.*

Keyword: *Asthma; Inhaler technique; Factors; Metered dose inhaler; Pakistan.*

Introduction:

Asthma imposes a growing burden on society in terms of morbidity, quality of life, and healthcare costs. Asthma affects 300 million people, and is estimated to increase to 400 million by 2025. This expected incline is most likely because of increased urbanization and atopic disorders.[1] In Europe a higher prevalence is seen in lower socioeconomic groups and most of the deaths caused by asthma occur in underdeveloped countries.[1-2]

The inhalation route is widely used for the treatment of asthma. It is considered that inadequate inhaler technique is the leading cause of therapy failure. Incorrect Inhaler Technique has become a public health issue of chest diseases. Due to the incorrect positioning of inhalers technique can result in a suboptimal or even zero lung deposition. Even with correct technique less than one fourth of dose is deposited in lung. Most of the dose is deposited in the oropharynx.[3] Asthma was less stable in patients who had incorrect inhaler technique compared to correct users ($p<0.001$).[4] Inhaled medication is the second most common medication form used in the world after tablets.[5] Because of its beneficial effects such as rapid onset and minimal side effects, it is considered an important therapy in respiratory diseases and is the first line of treatment for asthma.[6] In a Swiss study, it was noticed that 56% of patients suffering from Chronic Obstructive Pulmonary Disease (COPD) were on regular inhaled corticosteroids.[7]

Due to advanced technology, various forms of sophisticated inhalers and spacer devices are available for convenience of patients. The inhaler is not a simple tool, it needs technical skills which include inhalation of a suitable volume of drug, rhythm of inhalation, the length of inspiratory apnea following administration of medicine and the coordination between breathing cycle and the activation of device. Incorrect use of inhalers may lead to unnecessary and repeated hospitalizations as well as becoming an

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economic burden. As a consequence, patients are the main sufferers, who face the distress of dyspnea and increased morbidity and mortality also. Although several guidelines have been established by experts of respiratory illnesses for correct use of inhalers, despite these, inhalers are not used properly. In USA, 28% to 68% of patients do not use inhalers correctly; furthermore, 39-67% of health care providers are unable to perform correct technique themselves.[5]

In Asia, the situation is more worrisome. A study conducted in India reported that 64% of adults suffering from respiratory diseases and prescribed metered dose inhalers (MDIs) used them incorrectly while 25.9% of adults with respiratory diseases who were prescribed rotahalers used them incorrectly.[8] It has been observed in Pakistan that only 25% of doctors knew the correct use of inhalers[9]. Multiple factors have been associated with incorrect inhaler technique. Inhalers are more misused by elderly patients (77.2% 60-75 years). In the same study it was noticed that inhaler technique was worse in those subjects who did not have patient education regarding inhaler technique (66.5% versus 86.4%, $p<0.0001$).[7] For patients' ease various spacer devices have been designed. However, their use is limited because of high cost.[10] To overcome hurdles in correct use of inhalers guidelines are designed based on western experiences, where literacy rates are high. In Pakistan, approximately 17% of the population is living below the poverty line while the literacy rate is only about 50% in adults.[11] With the increasing number of people above 60 years of age in developing countries, the high illiteracy rate and dearth of patient education practices, there is a need to determine the extent of incorrect usage of inhalers among asthmatics and identify whether the same factors are operative here as have been implicated in western or other studies, leading to incorrect inhaler usage. This will help in developing baseline data for devising appropriate strategies that may lead to a reduction in the morbidity related to incorrect usage.

In Pakistan the prevalence of asthma is 4.3%, in Bangladesh 3.8% and in India 3%. This prevalence is estimated by a self reported wheeze in the past 12 months.[12] Asthma results from complex interactions between multiple associated factors including genetics, gender, airway hyper-reactivity, atopy, allergens, infections, tobacco smoke, and obesity. Medications like aspirin, cold air, emotions such as anger or fear, and physical exercise act as a trigger for asthma [13]. Urbanization is a proven factor, but rural communities are not exempt.[13-14]

Multiple studies have been done to determine the factors associated with correct or incorrect inhaler technique. These predictors are teaching proper technique, education level, gender and age. Male patients and younger patients used inhaler more correctly than females (43% vs. 4%) or older patients, respectively.[15] Elderly patients with COPD, even when in a stable clinical condition, may be unable to gain optimum benefit from their inhaler.[16]

Objective:

To determine the proportion of incorrect inhaler use and associated factors in asthmatic patients compromising quality of life.

Methodology:

It is a cross sectional study conducted at Specialist Chest Clinic Fatima Bhai Hospital Karachi from September 2010 to March 2011. A sample size of 215 was selected by Non-probability purposive sampling technique. Trained health care workers in presence Chest specialist requested patients to demonstrate their inhaler technique and assessed it according to the checklist. If any of the steps was missing or done incorrectly, it was marked as incorrect inhaler technique. Information was also collected through a structured questionnaire on socio-demographic variables such as age, gender, education, duration of asthma, duration of inhaler use, and patient education of inhaler technique. Data was entered and analyzed on SPSS-14. Descriptive statistics (frequencies) age, gender, education, duration of asthma and duration of inhaler use were used to describe sample characteristics. Taking correct and incorrect use of inhaler as outcome variables, the study participants were divided in to two groups. Variables such as age, duration of asthma, duration of inhaler use, were categorized. Then impact of the afore-mentioned variables upon the two groups was determined by using chi square test. Other categorical variables, such as educational status, instruction received on inhaler technique by health care worker were also analyzed by chi square test.

Results:

Correct inhaler technique was found to be 16.3% (n=35) and incorrect inhaler technique was 83.7% (n=181)

Factors Associated with Incorrect Inhaler Technique:

Age: There was statistically no significant relationship between the increasing age of the patients and correct or

incorrect inhaler technique (p<0.263) (Table-II). *Gender:* Incorrect inhaler technique in women was 58.3% as compared to incorrect technique of 41.7% of men (p<0.092). Educational Status: A statistically significant effect was found of education on inhaler technique (p<0.00). No-one had a correct inhaler technique in the "no education" and "matriculate" groups. The rate of incorrect inhaler technique among higher secondary group was 95.8%, among graduates was 94% and was 36.4% in postgraduates. Patient Education Regarding Inhaler Technique: All patients who attend the consultant chest clinics patient education regarding inhaler use. This includes a practical demonstration of correct inhaler technique by a trained healthcare worker followed by patient demonstration back to him or her. The number of patients taught by doctors were more 153/215 and their teaching was more effective as compared to nurses (p<0.038). Duration of asthma: No significant association was found between incorrect inhaler technique and duration of asthma (p<0.674) (Table-III). Duration of Inhaler Use: Duration of inhaler use had no statistical significant effect upon inhaler technique (p<0.360) (Table-IV). Frequency of inhaler use: Frequency of inhaler use had no statistically significant relationship with inhaler technique (0.347) (Table-V).

Table-I

Base line characteristics of patients participating in the study

Characteristics	Percentage
Gender	
Male	44.2%
Female	55.8%
Mean age SD	39.2 + 14.2 years
Educational Level	
Illiterate	2.8%
Up to Matric	15.3%
Higher Secondary	22.3%
Graduates	39.1%
Postgraduates	20.5%
Duration of Asthma	
< 5 years	54.4%
6 to 10 years	39.5%
> 10 years	6%
Duration of Inhaler Used	
< 5 years	55.3%
6 to 10 years	40.5%
> 10 years	4.2%
Frequency of Inhaler used	
BID + PRN	50.7%
QID+ PRN	1.9%
PRN	47.4%
Who Taught you Inhaler Technique	
Doctors	71.2%
Nurses	28.8%

Table-II

Association of Age and Inhaler Technique

Age Group	Correct Inhaler Technique n= (%)	Incorrect Inhaler Technique n = (%)	Total of number of Patients n= 215	Confidence Interval	P value
<30 years	9 (12.9)	61 (87.1)	70	0.29-1.53	0.345
30 to 39 years	13 (24)	41 (76)	54	0.23-107	0.73
40 to 49 years	7 (19.4)	29 (80.5)	36	0.37-1.9	0.57
50 to 59 years	5 (2.9)	30 (85.7)	35	0.43-3.34	0.75
>60 years	1 (5%)	19 (95)	20	0.51-31	0.15

Table-III

Duration of Asthma and Inhaler Technique

Duration of Asthma	Correct Technique n= (%)	Incorrect Technique n = (%)	Total of number of Patients n= 215	Confidence Interval	P value
< = 5years	20 (17.09)	97 (82.9)	117	0.59-2.3	0.72
6 to 10 years	12 (14.2)	73 (85.8)	85	0.61-2.7	0.45
>10 years	3 (23.1)	10 (76.9)	13	0.16-2.4	0.49

Table-IV

Duration of Inhaler use and inhaler Technique

Duration of inhaler use	Correct Inhaler Technique n (%)	Incorrect Inhaler Technique n (%)	Total numbers of Patients n (100%)	Confidence Interval	P value
<=5 Years	19 (15.9)	100 (84.1)	119	0.45-1.96	0.89
6 to 10 years	13 (14.9)	74 (85.1)	87	0.56-2.94	0.66
>10 years	3 (33.3)	6 (66.66)	9	0.87-1.54	0.15

Table-V

Frequency of Inhaler Use and Inhaler Technique

Frequency of Inhaler Use	Correct Inhaler Technique n (%)	Incorrect Inhaler Technique n (%)	Total number of Patients n (100%)	Confidence Interval	P value
BID + PRN	15 (13.76)	94 (86.24)	109	0.33-1.42	0.31
QID+ PRN	0 (0)	4 (100)	4	0.78-0.88	0.37
PRN	20 (19.6)	82 (80.4)	102	0.30-1.30	0.21

Discussion:

Pressurized metered dose inhaler is usually regarded as a first choice. The metered dose inhaler is the commonest drug delivery device, in use by 67.9% of the patients in Lagos.[17] But their use is to a large degree dependent upon an individual's ability to co-ordinate their breathing to the actuation of the device. Pressurized metered dose inhalers seem simple to use but "press and breathe" pMDI are not easy to use. Difficulty in use faced by patients was highlighted for the first time in a report in 1965, which found that 14 out of 25 patients used pMDI incorrectly. In 1976, it was reported that 32–96% of patients used inhaler incorrectly.[15] A review of 21 studies reported that the frequency of incorrect inhaler technique ranged from 14% to 90%, with an estimated average of 50%. Incorrect inhaler technique among pressurized metered dose inhaler user was 71%.[4] In a Nigerian study incorrect inhaler technique was reported as 66% in asthmatic patients.[17]

Our study was designed to estimate incorrect inhaler technique and associated factors among our patients. To our knowledge previous studies in Pakistan have assessed steps of correct inhaler use among healthcare workers and have reported errors in inhalation techniques by patients.[18] This study found 83.7% (181 of 215 subjects) used the inhaler incorrectly, which means that our findings showed a much higher incorrect usage in Karachi than anywhere in the world, including Nigeria.

In our study only statistically significant association of incorrect inhaler use was found with low educational levels. There was no significant association with increasing age, female gender, duration of asthma, patient education about inhaler technique, or duration of inhaler use.

Inhaler technique is sub-optimal in many patient groups; and elderly is considered to be one of them. Several factors often seen in the elderly have been identified as predictive of incorrect inhaler use of pMDI, for example, arthritis, weakness, low mental-state scores and poor vision.[15-19]

Reports about the association of age with inhaler technique vary, as incorrect inhaler technique may be associated with cognitive impairment rather than actual age[20]. Some studies support a positive relationship between increasing age and incorrect inhaler technique (P<0.007) while other studies did not find any association of incorrect inhaler use with increasing age.[15-21] Our study also did not find a statistically significant association between incorrect inhaler use and increasing age (p<0.263) either, and findings support the last two studies. However, one of the reasons that no association was found may be the small number of patients above 60 years of age (n=20).

In literature we found that inhaler technique was reported to be worse in females than in males but we did not find a statistically significant correlation of female gender with incorrect inhaler technique (p<0.092).[21]

Patient education is considered an important factor regarding inhaler technique in literature, and verbal instruction is considered to be more effective than written instruction. Inclusion of a physical demonstration leads to improved inhaler technique. As all the patients in the study had received inhaler teaching including practical demonstration and re-check of inhaler technique, we could not differentiate between the effects of verbal and written instruction. However, even after such education, one cannot predict inhaler technique of patients.[22] It has been established that inhaler technique education must be repeated regularly in order to maintain correct technique. Hospitalized patients after three inhaler teaching sessions exhibited correct pMDI technique ($p < 0.26$).[23] Lack of repeated patient education may have been the reason that majority of the patients in our study revealed incorrect inhaler technique despite initial intensive patient education.

Unfortunately, literature shows that health care professionals who should provide correct inhaler technique education as part of routine asthma management perform little better than patients in their ability to use asthma inhaler devices themselves. One of the reasons maybe insufficient knowledge about inhaler technique in medical textbooks. Only two out of forty books included a simple list of steps about technique of pMDI.[5]

In Pakistan, only 25% doctors answered adequately regarding inhaler technique.[9] No study was found about inhaler technique among nurses. Although the primary objective of this study was not focused on differentiating between the efficacy of teaching techniques by doctors and nurses, but it was found that more patients used the inhaler incorrectly when educated by nurses as compared to those educated by doctors ($p<0.038$). This is supported by a study of incorrect pMDI inhaler technique among nurses (96%), house staff (47%) and respiratory therapists (15%, respectively.[15]

In our study education level was the most significant factor associated with incorrect inhaler technique ($p<0.00$). This has been reported by another study too, that the patients with low education level demonstrated incorrect pMDI technique as compared to highly educated patients ($P<0.007$).[21]

Conclusion:

Quality of life of a large percentage of patients is compromised by incorrect inhaler use and education level of patients had significant relationship with incorrect inhaler technique. Number of patients who taught inhaler technique by nurses used it incorrectly as compared to those taught by doctors.

Recommendation:

Improving the education level of the society will improve inhaler techniques. The short-term solution to this problem is effective patient and provider education. Health education efforts to teach patients how to use inhaler correctly should be stepped up. There should be complete descriptions of inhaler use in text-books of both nurses and doctors.

Acknowledgement:

Our heartiest acknowledgements to the Medical Director and staff of Fatima Bhai Hospital Karachi for providing every possible administrative help.

Conflict of interest : None

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