Comparison of revolizer with metered dose inhaler regarding ease-of-use in patients of asthma

Anum Ashfaq[1*], Rabiya Ashfaq[1], Muhammad Atif Beg[1]

European Journal of Medical Case Reports
Volume 10(4):94–100
DOI: 10.24911/ejmcr.9-2283

ABSTRACT

Background: Asthma is one of the most common pulmonary disease worldwide. Asthmatic patients are prone to frequent exacerbation of symptoms that range from cough to severe, disabling shortness of breath, leading to significant impairment of quality of life. Airway obstruction causes increased resistance to airflow and decreased expiratory flow rates. Revolizer is useful for inhaling dry medication powder orally for treating lung-related diseases.

Objective: To determine the frequency and comparison of ease-of-use of Revolizer among asthmatic patients who were on metered-dose inhalers (MDI's).

Methods: Study Design: Quasi-experimental pre-post design. Setting: Medicine Department, PAEC General hospital Islamabad. Duration: Six months, i.e., 15-10-2024 to 15-4-2025. Data Collection: After meeting the inclusion criteria, 100 patients were enrolled. Then those patients who were using MDIs previously were assorted revolizers and taught about the proper method of using them by investigator. After that, patients were asked to repeat the performance of inhalation technique in front of the investigator to make sure that the correct method of inhalation is learnt, and patient called after 2 weeks for follow-up. Data was entered and analyzed using statistical package for the Social Sciences (v 16.0), which is acceptable for analysis.

Results: The mean age of patients was 46.33 ± 9.31 years. There were 48 (48%) males and 52 (52%) females. The ease of use of Revolizer was found in 94 (94%) cases.

Conclusion: More than 90% of the patients were in ease of use of Revolizer among asthmatic patients. As compared to MDI, the ease of use was significantly found higher in Revolizer ($p < 0.001$).

Keywords: Revolizer, metered-dose inhalers, asthma, ease-of-use, dry-powder inhalers.

Type of Article: ORIGINAL ARTICLE **Specialty:** Pulmonary Medicine

Correspondence to: Anum Ashfaq
*Specialist in General Medicine, Pakistan Atomic Energy Commission General Hospital, Islamabad, Pakistan.
Email: dr.anumashfaq@hotmail.com
Full list of author information is available at the end of the article.

Received: 12 July 2025
Revised (1): 23 October 2025
Accepted: 31 December 2025

Background

Asthma is one of the most common chronic pulmonary diseases worldwide. It is characterized by variable and recurring symptoms, reversible airflow obstruction, and easily triggered bronchospasms. Symptoms include episodes of wheezing, coughing, chest tightness, and shortness of breath. These may occur a few times a day or a few times per week. Depending on the person, asthma symptoms may become worse at night or with exercise [1]. In addition, asthma imposes a large financial burden on health services and is among the most costly diseases in the UK. The long-term goals of asthma treatment are good symptom control, improved quality of life and reduce the frequency of exacerbations [2].

There is no cure for asthma. Symptoms can be prevented by avoiding triggers, such as allergens and irritants, and by the use of inhaled corticosteroids. The inherent advantages of aerosol drug delivery are a faster onset of action since the drug is being delivered to the site needing therapeutic effect and a lower systemic bioavailability, which reduces adverse effects [2]. Treatment options include bronchodilators like beta-sympathomimetics, methylxanthines, anticholinergics, and corticosteroids [3].

Critical errors have been identified while using various inhalation devices, which significantly reduces drug delivery and hence efficacy. Previous studies showed that most patients with asthma made no errors while using Dry powder inhalers (DPIs) [4]. DPI's need less coordination of actuation and inspiration as compared to metered-dose inhalers (MDIs) [5]. Important factors that should be considered when prescribing an inhalation device are ease-of-use, preference, and confidence as these may positively increase the possibility of patient's adherence, hence effectively increases the treatment outcomes and

potentially reduces the healthcare costs associated with uncontrolled disease [6].

DPI's are one of the most preferred inhalation drug delivery system because these are being easy to use and breath-actuated that makes them well accepted by patients and prescribers [6]. Revolizers were designed to make inhaled medication more convenient and effective. Revolizer is a novel unit dose DPI device having adequate drug deposition and a simple inhalation technique, allowing patients to confirm dose delivery as they can see, hear, and taste drug. Researches have showed that more than 85% patients found Revolizer easy to use, as compared to 15% patients who found MDIs the easy one [6].

To our knowledge, limited data is available locally. The purpose of this study is to determine that Revolizers may be easy to use and preferred by patients in our population. The beneficial effects will be the better adherence to treatment, less hospital admissions due to exacerbation of symptoms, and better treatment outcomes.

Study Objectives

In 2015, 358 million people globally had asthma, up from 183 million in 1990. It caused about 397,100 deaths in 2015, most of which occurred in the developing world. Asthma often begins in childhood, and the rates have increased significantly since the 1960s. Asthma was recognized as early as Ancient Egypt. The word "asthma" is from the Greek ἅσθμα, ásthma, which means "panting" (7-10).

To determine the frequency and comparison of ease-of-use of Revolizer among asthmatic patients who were on MDI's.

Operational definitions

1. Exacerbation

An acute event in the natural course of disease characterized by a change in patient's baseline condition that is beyond normal day-to-day variation that included productive cough, shortness of breath, and/or fever.

2. Ease-of-use

To perform all steps of using Revolizer correctly after 2 weeks of prescription, all the steps are mentioned on the proforma.

Materials and Methods

Study design

Quasi-experimental pre-post design.

Settings

In-patient wards and out-patient department (OPD) of the medicine department of PAEC General hospital Islamabad, Pakistan.

Duration of study

Six months after approval of synopsis, i.e., 15-10-2024 to 15-4-2025.

Sample size

With help of WHO sample size calculator, expected population, and margin of error.

Level of significance = 5%

Population proportion who prefer Revolizer = 0.85

Absolute precision required = 10%

Sample size $n = 100$

Sampling technique

Consecutive non-probability sampling.

Inclusion criteria

1. This study included all males and females of ages 30-60 years who are known case of asthma.
2. Patients who were previously on MDI's.

Exclusion criteria

1. Patients having severe lung disease or poor lung functions (patients having peak flow rate less than 30% of predicted).

Data collection procedure

Approval from the ethical committee (reference code 1(1)/17) was taken for this study prior to commencing the study. A detailed procedure was explained and informed consent taken from patients. Patients had their peak flow rate done during admission when their acute phase of disease has settled down. Then those patients who were using MDIs previously were assorted Revolizers and were taught about the proper method of using them by the investigator. After that, patients were asked to perform the inhalation technique in front of the investigator to make sure that the correct method of inhalation is learnt. We assessed the results by questionnaire, made locally, to be given to these patients when they come to OPD after 2 weeks for follow-up. Patient assessment and feedback were done by double blinding method.

Data analysis procedure

Data was entered and analyzed using Statistical Package for the Social Sciences (v 16.0), which is applicable for analysis. Descriptive statistics was used to analyze qualitative and quantitative variables. Frequencies and percentages were presented for categorical variables like gender, ease-of-use of the revolizer. Mean $\pm$ SD was calculated for age duration of MDI's use. Effect modifier on age, gender, and duration of MDI use was controlled by stratification, and post stratification paired t-test was applied. p-value <0.05 was significant.

Results

The average age of the patients was 46.33 ± 9.31 years Table 1. There were 48 (48%) male and 52 (52%) females

Table 1. *Summary statistics of age (years) and time duration of disease (months).*

	N	100
Age(years)	Mean	46.33
	SD	9.31
	Minimum	30
	Maximum	60
	N	100
Time duration of disease (months)	Mean	19.40
	SD	13.87
	Minimum	1.00
	Maximum	112.00

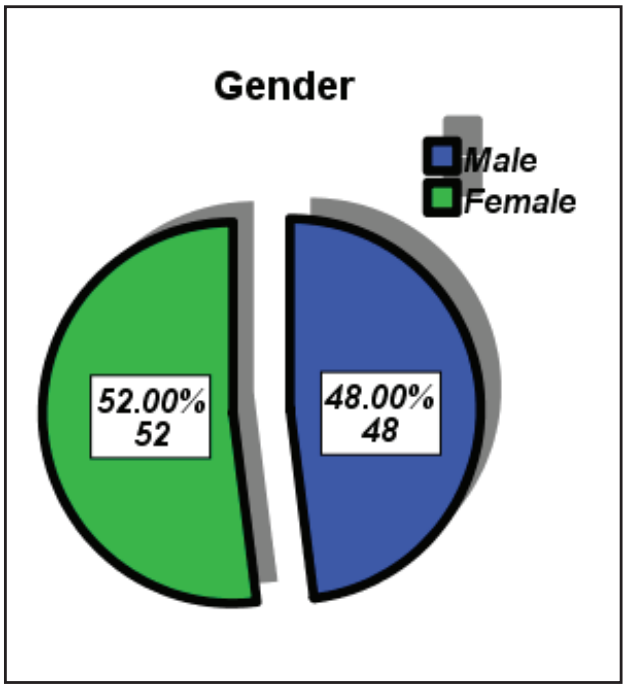

Figure 1. *Frequency distribution of gender.*

Figure 1. The average duration of disease was 19.40 ± 13.87 months Table 1. The mean duration on MDI of the patients was 16.25 ± 9.44 months Table 2. Steps involved in the use of MDI were discussed in our study. The shaking condition was observed in 96 (96%) patients, remove cap was done in 94 (94%) patients, mouth piece insertion done in 62 (62%) patients, correct position of inhaler noted in 62 (62%) patients and exhale process was noted in 18 (18%) patients Table 3.

Press canister process was noted in 100 (100%) patients, inhale simultaneously was noted in 11 (11%) patients, and withholding breath was noted in 13 (13%) patients Table 3.

In this study, steps involved in the use of revolizer were as follows. Open mouth piece till click was done in 95 (95%) patients, insertion of rotacap was correctly done in 97 (97%) patients, close mouth piece till click was observed in 98 (98%) patients and correct exhaling was noted in 96 (96%) patients Table 4.

In our study use of Revolizer correct placement of mouthpiece in mouth was observed in 96 (96%) patients, correct position was revolizer was noted in 95 (95%) patients, deep inhalation was noted in 97 (97%) patients

Table 2. *Summary statistics of duration of MDIs.*

	N	100
DURATION ON MDIS	Mean	16.25
	SD	9.44
	Minimum	1.00
	Maximum	44.00

Table 3. *Frequency distribution of steps involved in MDIs use.*

STEPS OF MDIS USE		FREQUENCY	PERCENT
Shake	Yes	96	96.0
	No	4	4.0
Remove cap	Yes	94	94.0
	No	6	6.0
Put mouth piece in mouth	Yes	62	62.0
	No	38	38.0
Position of inhaler	Yes	43	43.0
	No	57	57.0
Exhale	Yes	18	18.0
	No	82	82.0
Press the canister	Yes	100	100
	No	0	0.0
Inhale simultaneously	Yes	11	11.0
	No	89	89.0
Withholding breath	Yes	13	13.0
	No	87	87.0

Table 4. *Frequency distribution of steps involved in Revolizer use.*

STEPS OF REVOLIZER USE		FREQUENCY	PERCENT
Open mouth piece till click	Yes	95	95.0
	No	5	5.0
Insert rotacap correctly	Yes	97	97.0
	No	3	3.0
Close mouthpiece till click	Yes	98	98.0
	No	2	2.0
Exhale	Yes	96	96.0
	No	4	4.0
Put mouth piece in mouth	**YES**	96	96.0
	No	4	4.0
Position of Revolizer	**YES**	95	95.0
	No	5	5.0
Deep inhalation	**YES**	97	97.0
	No	3	3.0
Withholding breath	**YES**	89	89.0
	No	11	11.0

Table 5*. Frequency distribution of ease of use of MDI.*

		FREQUENCY	PERCENT
Ease of use of MDIs	Yes	7	7.0
	No	93	93.0
	Total	100	100.0

Table 6. *Comparison of ease of use of MDI with revolizer.*

		EASE OF USE OF MDIs		TOTAL	*P*-VALUE
		YES	NO		
Ease of use of Revolizer	Yes	1	93	94	<0.001
		14.3%	100.0%	94.0%	
	No	6	0	6	
		85.7%	0.0%	6.0%	
Total		7	93	100	
		100.0%	100.0%	100.0%	

and withholding breath was noted in 89 (89%) patients Table 4.

The ease of use of MDIs was found in 7 (7%) patients Table 5.

There is statistically significant difference was found between the comparison of ease of use of MDI and ease of use of revolizer. The ease was use of revolizer was significantly found in more number of patients as compared to MDI i.e., p-value ≤ 0.001 (Table 6).

According to this study among patients with age ≤ 45 years the ease of use of revolizer was observed in 47 (88.7%) patients while among patients with age > 45 years the ease of use of revolizer was observed in 47(100%) patients. This difference was statistically significant, i.e., p-value = 0.028 (Table 7).

Among male patients, the ease of use of revolizer was observed in 45(93.8%) patients, while among female patients the ease of use of revolizer was observed in 49(94.2%) patients. This difference was statistically insignificant, i.e., p-value = 1.00 (Table 7).

In this study, among patients with duration of disease ≤20 months the ease of use of Revolizer was observed in 58 (90.6%) patients while among patients with a duration of disease >20 months the ease of use of Revolizer was observed in 36 (100%) patients. This difference was statistically insignificant, i.e., p-value = 0.085 (Table 7).

Among patients having a body mass index ≤ 25 kg/m^2, the ease of use of Revolizer was observed in 92 (95.8%) patients, while among patients having a body mass index > 25 kg/m^2 the ease of use of Revolizer was observed in

Table 7. *Comparison of ease of use of revolizer with different variables.*

		EASE OF USE OF REVOLIZER		TOTAL	
		YES	NO		
Age (years)	≤ 45	47	6	53	0.028
		88.7%	11.3%	100.0%	
	>45	47	0	47	
		100.0%	0.0%	100.0%	
Total		94	6	100	
		94.0%	6.0%	100.0%	
Gender	Male	45	3	48	1.000
		93.8%	6.2%	100.0%	
	Female	49	3	52	
		94.2%	5.8%	100.0%	
Total		94	6	100	
		94.0%	6.0%	100%	
Time duration of disease (months)	≤ 20	58	6	64	0.085
		90.6%	9.4%	100.0%	
	>20	36	0	36	
		100.0%	0.0%	100.0%	
Total		94	6	100	
		94.0%	6.0%	100.0%	
Duration of use of MDIs (months)		68	6	74	0.335
		91.9%	8.1%	100.0%	
		26	0	26	
		100.0%	0.0%	100.0%	
Total		94	6	100	
		94.0%	6.0%	100.0%	

2(50%) patients. This difference was statistically significant, i.e., *p*-value = 0.017 (Table 7).

Among patients having a duration of use of MDI ≤ 20 months, the ease of use of Revolizer was observed in 68 (91.9%) patients, while among patients having a duration of use of MDIs >20 months, the ease of use of Revolizer was observed in 26(100%) patients. This difference was statistically insignificant, i.e., *p*-value = 0.335 Table 7.

Discussion

Recent years have seen an exponential increase in the types of inhaler devices both in the world over. However, not all inhalers are patient-friendly and easy to use, with each having their own advantages and disadvantages [11,12].

In our study, the ease of use of Revolizer was found in 94(94%) patients is statistically significant difference. The ease-of-use of Revolizer was significantly found in more number of patients, i.e., *p*-value ≤ 0.001. Some of the studies are discussed below showing their results.

The primary factors determining the choice of an inhaler device should be efficacy and safety [13].

Researches have showed that more than 85% patients found Revolizer easy to use as compared to 15% patients who found MDIs the easy one [5].

The first systematic literature review of clinical effectiveness (and cost-effectiveness) of inhaler devices used in COPD (and asthma) was published in 2001 [14]. It is equally important to take the patient preference into account for an inhalation device and this approach is also recommended by the Global Initiative of Asthma Management [15].

DPIs are the widely prescribed inhalation devices globally [16]. Revolizer, a novel DPI, is widely marketed. Like our study few studies have assessed the handling, preference, and satisfaction with different DPIs in asthma and COPD [15,17,18]. More than 75% participants found the Revolizer favorable in terms of shape, color, handling, comfort, portability, and inhalation technique. Patient preference for an inhalation device has the potential to improve satisfaction with the device as well as therapy [19,20].

A study by Aggarwal et al. [21] documented in their study findings that MDIs were associated with better disease control and treatment adherence among subjects with

asthma. Both MDI and DPI are likely to provide equivalent treatment satisfaction.

It is suggested that the patient should be involved in the choice of the inhaler device that they like, feel comfortable with, and can use even when breathless and incapable of high inspiratory flow rates. Revolizers are easy to use as there is less coordination needed, visible along with audible feedback mechanisms, and ergonomic design.

So as the Revolizer device showed ease of use in more than 95% patients in our study, so it is recommended that in future this device may be a useful alternative to MDIs for patients who struggle with coordination.

Conclusion

In this single-center study, most asthmatic patients found the Revolizer device easier to use compared to MDIs. Device familiarity and design may contribute to improved adherence. Larger, multicenter studies with standardized evaluation tools are recommended.

What is new?

Multiple devices are being used for the treatment of asthma, including MDIs and revolizers. Use of revolizers is easy resuting in treatment adherence and less hospital admissions due to asthma exacerbations.

Previous studies have showed that DPI's are easy to use as compared to MDI's in patients of asthma. This study emphasized the fact that more than 90% of patients preferred DPI's as a new treatment device. This satisfaction leads to better adherence to treatment, effectiveness, and disease control.

List of Abbreviations

DPI	Dry powder inhaler
MDI	Metered-dose inhaler
OPD	out-patient department

Conflicts of interest

The authors declare that they have no conflict of interest regarding the publication of this article.

Funding

None.

Consent to participate

NA.

Ethical approval

Ethical approval was obtained from the ethics committee of our institution and generally accepted guidelines governing such research work (Reference number: No.Hosp-1(1)/17). Date: 15-6-2025.

Author details

Anum Ashfaq[1], Rabiya Ashfaq[1], Muhammad Atif Beg[1]

1. Specialist in General Medicine, Pakistan Atomic Energy Commission General Hospital, Islamabad, Pakistan

References

1. World Health Organization. Asthma: fact sheet No 307. Updated November 2013. Available from: http://www who int/topics/asthma/es 2016
2. Hantulik P, Wittig K, Henschel Y, Ochse J, Vahteristo M, Rytila P. Usage and usability of one dry powder inhaler compared to other inhalers at therapy start: an open, non-interventional observational study in Poland and Germany. Pneumonol Alergol Pol. 2015;83(5):365–77. https://doi.org/10.5603/PiAP.2015.0059
3. Svedsater H, Dale P, Garrill K, Walker R, Woepse MW. Qualitative assessment of attributes and ease of use of the ELLIPTA™ dry powder inhaler for delivery of maintenance therapy for asthma and COPD. BMC Pulm Med. 2013;13(1):72. https://doi.org/10.1186/1471-2466-13-72
4. van der Palen J, Thomas M, Chrystyn H, Sharma RK, van der Valk PD, Goosens M, et al. A randomised open-label cross-over study of inhaler errors, preference and time to achieve correct inhaler use in patients with COPD or asthma: comparison of ELLIPTA with other inhaler devices. NPJ Prim Care Respir Med. 2016;26(1):16079. https://doi.org/10.1038/npjpcrm.2016.79
5. Virchow JC, Weuthen T, Harmer QJ, Jones S. Identifying the features of an easy-to-use and intuitive dry powder inhaler for asthma and chronic obstructive pulmonary disease therapy: results from a 28-day device handling study, and an airflow resistance study. Expert Opin Drug Deliv. 2014;11(12):1849–57. https://doi.org/10.1517/17425247.2014.949236
6. Rajan SK, Gogtay JA. Ease-of-use, preference, confidence, and satisfaction with Revolizer(®), a novel dry powder inhaler, in an Indian population. Lung India. 2014;31(4):366–74. https://doi.org/10.4103/0970-2113.142122
7. Vos T, Allen C, Arora M, Barber RM, Bhutta ZA, Brown A, et al. Global, regional, and national incidence, prevalence, and years lived with disability for 310 diseases and injuries, 1990-2015: a systematic analysis for the Global Burden of Disease Study 2015. Lancet. 2016;388(10053):1545–602.
8. Wang H, Naghavi M, Allen C, Barber RM, Bhutta ZA, Carter A, et al. Global, regional, and national life expectancy, all-cause mortality, and cause-specific mortality for 249 causes of death, 1980-2015: a systematic analysis for the Global Burden of Disease Study 2015. Lancet. 2016;388(10053):1459–544.
9. Anandan C, Nurmatov U, van Schayck OC, Sheikh A. Is the prevalence of asthma declining? Systematic review of epidemiological studies. Allergy. 2010;65(2):152–67. https://doi.org/10.1111/j.1398-9995.2009.02244.x
10. Manniche L. Sacred luxuries: fragrance, aromatherapy, and cosmetics in ancient Egypt. Ithaca, NY: Cornell University Press; 1999.
11. Bousquet J, Dahl R, Khaltaev N. Global alliance against chronic respiratory diseases. Allergy. 2007;62(3):216–23. https://doi.org/10.1111/j.1398-9995.2007.01307.x
12. Dolovich MB, Ahrens RC, Hess DR, Anderson P, Dhand R, Rau JL, et alDevice selection and outcomes of aerosol therapy: evidence-based guidelines: American College of Chest Physicians/American College of Asthma, Allergy, and Immunology. Chest. 2005;127(1):335–71.
13. Vincken W, Dekhuijzen PR, Barnes P; ADMIT Group. The ADMIT series - issues in inhalation therapy. 4) How to choose inhaler devices for the treatment of COPD. Prim Care Respir J. 2010;19(1):10–20. https://doi.org/10.4104/pcrj.2009.00062
14. Brocklebank D, Ram F, Wright J, Barry P, Cates C, Davies L, et al. Comparison of the effectiveness of inhaler devices

in asthma and chronic obstructive airways disease: a systematic review of the literature. Health Technol Assess. 2001;5(26):1–149. https://doi.org/10.3310/hta5260
15. Giner J, Torrejon M, Ramos A, Casan P, Granel C, Plaza V, et al. Patient preference in the choice of dry powder inhalers. Arch Bronconeumol ((English Edition)). 2004;40(3):106–9. https://doi.org/10.1016/S1579-2129(06)70074-X
16. Atkins PJ. Dry powder inhalers: an overview. Respir Care. 2005;50(10):1304–12.
17. Schulte M, Osseiran K, Betz R, Wencker M, Brand P, Meyer T, et al. Handling of and preferences for available dry powder inhaler systems by patients with asthma and COPD. J Aerosol Med Pulm Drug Deliv. 2008;21(4):321–8. https://doi.org/10.1089/jamp.2007.0634
18. Small M, Anderson P, Vickers A, Kay S, Fermer S. Importance of inhaler-device satisfaction in asthma treatment: real-world observations of physician-observed compliance and clinical/patient-reported outcomes. Adv Ther. 2011;28(3):202–12. https://doi.org/10.1007/s12325-010-0108-4
19. Chrystyn H. Do patients show the same level of adherence with all dry powder inhalers? Int J Clin Pract Suppl. 2005;59(149):19–25. https://doi.org/10.1111/j.1368-504X.2005.00723.x
20. Anderson P. Patient preference for and satisfaction with inhaler devices. Eur Respir Rev. 2005;14(96):109–16. https://doi.org/10.1183/09059180.05.00009606
21. Aggarwal AN, Kumari R, Grover S. Patient satisfaction with inhaled medication for asthma. Respir Care. 2018;63(7):859–64. https://doi.org/10.4187/respcare.05544