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IMPACT OF IMPROPER INHALER USE IN ASTHMA AND COPD PATIENTS

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Abstract

Background: Asthma and chronic obstructive pulmonary disease (COPD) were prevalent chronic respiratory conditions that required long-term inhaled pharmacotherapy for optimal management. Various inhaler devices, included pressurized metered-dose inhalers (pMDIs), dry powder inhalers (DPIs), and soft mist inhalers (SMIs), were widely used. However, improper inhaler technique remained a significant global issue. Common critical errors such as poor hand–breath coordination, inadequate inspiratory flow, and incorrect device positioning reduce effective pulmonary drug deposition. These errors contributed to poor disease control, persistent symptoms, increased exacerbation rates, frequent emergency visits, avoidable hospitalizations, and increased healthcare burden. International guidelines such as GINA and GOLD emphasized the importance of regular inhaler technique assessment, proper training, and individualized device selection.

Objective(s): To assess the prevalence of improper inhaler technique among asthma and COPD patients in local clinical settings and to evaluate its association with symptom severity, frequency of exacerbations, and hospital admissions. Additionally, the study aimed to identify patient-related barriers and support the development of targeted educational interventions.

Methodology: A cross-sectional study was conducted involving 70 patients diagnosed with asthma and COPD who were using inhaled medications. Data was collected using structured questionnaires and clinical assessments, including patient demographics, inhaler technique, medication adherence, symptom control, exacerbation frequency, and healthcare utilization. Inhaler technique was

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evaluated using standardized device-specific checklists. Statistical analysis was performed to determine the association between improper inhaler use and clinical outcomes.

Results: The total of 70 patients participated, the mean and standard deviation of age was 66.07±14.334. The minimum age was 31 and maximum age was 95. The male patients were 41(58.6%) and female were 29(41.4%). The total 24(34.3%) patients have respiratory disease from more than 10 years. Out of 70 patients, 39(55.7%) have asthma and 29(41.4%) have COPD. The total of 40(57.1%) patients currently use an inhaler and 41(58.6%) patients use MDI type of inhaler in which 30(42.9%) patients use inhaler as prescribed. 55./% patients don't know the correct steps to use inhaler, 47.1% patients were not use to shake MDI tape inhaler before use and 51.4% patients never fully exhale before using inhaler, 34.3% were not sure to hold breath after using inhaler, and 51.4% never rinse their mouth after inhaler use. 82.9% patients skip their inhaler dose, 47.1% patients experience worsening of symptoms monthly in which 61.4% visit hospital every month. The total of 77.1% patients have poorly controlled asthma and 55.7 patients have low COPD assessment test score. The crosstabulation between ACT and CAT with shaking the inhaler before use, exhale fully before using inhaler and rinsing mouth after inhaler use shows a statistically significant association with the p-value of (0.035),)0.008), (0.003) and (0.004), (0.001), (0.015) respectively.

Conclusion(s): Improper inhaler technique was expected to be a major contributing factor to poor disease outcomes in asthma and COPD patients. Routine assessment, patient education, and personalized inhaler selection were essential strategies to improve treatment effectiveness and reduce disease burden.

INTRODUCTION

(Abdulredha MH et a1., 2023) elaborates that asthma and chronic obstructive pulmonary disease (COPD) are among the most common long-term respiratory conditions worldwide and represent a major concern for global public health systems. These disorders significantly contribute to illness, death rates, and increasing healthcare costs in both developed and developing regions. Asthma is typically characterized by reversible airway narrowing and heightened airway sensitivity, whereas COPD involves persistent and progressively worsening airflow limitation accompanied by chronic inflammation in the airways. Although their underlying mechanisms differ, both conditions present with similar clinical features such as persistent coughing, wheezing, shortness of breath, and chest tightness, all of which can severely limit daily activities and reduce quality of life. The rising prevalence of these diseases, influenced by factors such as air pollution, tobacco use, occupational exposure, and an aging population, highlights the urgent need for effective and sustained management strategies.(1)

(Adams RJ et a1., 2014) describes that inhaled medications remain the primary treatment approach for both asthma and COPD because they allow drugs to be delivered directly to the lungs. This route of administration enables a rapid therapeutic effect while minimizing systemic side effects compared to oral or injectable medications. Commonly used drugs include bronchodilators, such as short-acting and long-acting beta-agonists and anticholinergic agents, as well as inhaled corticosteroids.

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International guidelines, including those issued by major respiratory organizations, strongly support inhalation therapy as the preferred method of drug delivery due to its proven effectiveness and safety. The main goals of these therapies are to control symptoms, improve pulmonary function, and reduce the frequency and severity of exacerbations.(2)

(Ahmed S et a1., 2024) shows the similarly, COPD management guidelines emphasize the importance of inhaled therapies in improving patient outcomes and quality of life. Long-acting bronchodilators are typically the foundation of treatment and may be used alone or in combination with inhaled corticosteroids, depending on the severity of the disease. However, achieving optimal therapeutic outcomes depends not only on the selection of appropriate medications but also on the patient's ability to use inhaler devices correctly and consistently.(3)

(Basheti IA et a1., 2008) proves proper inhaler technique plays a crucial role in ensuring that an adequate amount of medication reaches the lungs. Evidence suggests that incorrect inhaler use significantly reduces drug delivery to the lower airways, leading to poor treatment outcomes. In real-world settings, improper inhaler handling is frequently observed and has been closely linked to inadequate disease control. Even minor mistakes in technique can substantially decrease the effectiveness of treatment, increasing the likelihood of persistent symptoms and exacerbations. A large number of patients make at least one critical error while using their inhalers. For example, dry powder inhalers require sufficient inspiratory force, which many patients fail to generate, while pressurized metered-dose inhalers require precise coordination between inhalation and actuation, which can be challenging for many individuals. Research consistently shows that such errors are common among patients with asthma and COPD, making incorrect inhaler use a persistent clinical problem.(4)

(Bhattarai A et a1., 2024) shows several types of inhaler-related errors have been identified in clinical practice. These include not shaking the device before use, improper positioning during inhalation, inhaling at an incorrect speed, and failing to hold breath after inhalation. Such mistakes reduce the amount of medication that reaches the lungs and negatively affect treatment efficacy. Importantly, these errors are largely preventable with appropriate patient education, repeated demonstrations, and proper supervision. Studies have demonstrated that targeted educational interventions can significantly enhance inhaler technique and improve clinical outcomes.(5)

(Bivolaru S et a1., 20239 claims that in many clinical situations, poor disease control is mistakenly attributed to worsening disease or insufficient medication, while incorrect inhaler technique is often overlooked. This can lead to unnecessary increases in medication doses or the addition of new drugs, which may raise healthcare costs and expose patients to avoidable side effects without addressing the root cause of the problem. Therefore, evaluating inhaler technique should be considered an essential part of routine patient assessment before making any changes to treatment plans.(6)

LITERATURE REVIEW

Fathima M et al. (2020) assessed inhaler usage patterns among patients with asthma and chronic obstructive pulmonary disease (COPD) and reported that approximately 68% of users made at least

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one error during the inhalation process, thereby highlighting the high prevalence of incorrect inhaler technique among patients regardless of age, disease severity, or duration of therapy. These errors were shown to significantly compromise the effective delivery of medication to the lower respiratory tract, leading to inadequate drug deposition in the lungs and ultimately resulting in diminished treatment effectiveness and poor clinical outcomes. The study further emphasized that incorrect inhaler technique directly reduces the effectiveness of bronchodilator therapy, as the medication fails to reach its intended site of action in sufficient quantities, thereby limiting its pharmacological benefits. As a consequence, patients who demonstrated improper inhaler use experienced greater instability in their symptoms, including increased frequency and severity of breathlessness, wheezing, coughing, and overall disease exacerbations, which in turn negatively impacted their quality of life and increased their dependence on emergency medical care and hospital admissions. The most frequently observed errors included poor coordination between actuation and inhalation when using metered-dose inhalers (MDIs), which resulted in a significant portion of the medication being deposited in the oropharyngeal region instead of reaching the lungs, as well as inadequate inspiratory effort when using dry-powder inhalers (DPIs), where insufficient inhalation force prevented proper aerosolization and delivery of the drug to the airways. In addition to these primary errors, the study also identified several other common mistakes such as failure to exhale completely before inhalation, incorrect positioning or handling of the inhaler device, improper sealing of the lips around the mouthpiece, and neglecting to hold the breath after inhalation, all of which further contributed to reduced drug delivery efficiency and suboptimal therapeutic response. These findings clearly demonstrate that inhaler misuse remains a persistent and widespread issue despite the availability of advanced inhaler devices and effective pharmacological treatments, suggesting that gaps in patient education, inadequate demonstration of proper technique by healthcare professionals, and lack of regular follow-up assessments play a crucial role in perpetuating these errors. Therefore, the authors strongly recommended that healthcare providers should incorporate routine and systematic evaluation of inhaler technique into clinical practice, along with repeated patient education, practical demonstrations, and reinforcement sessions, in order to improve inhaler handling skills, enhance medication adherence, optimize drug delivery, and ultimately achieve better clinical outcomes in patients with asthma and COPD.(11)

GINA et al. (2023) conducted a comprehensive study to evaluate the patient-related factors influencing inhaler technique and overall performance among individuals with respiratory diseases such as asthma and chronic obstructive pulmonary disease (COPD), and their findings emphasized that inadequate patient education is one of the primary contributors to inhaler misuse. The study revealed that many patients do not receive sufficient guidance or hands-on training, which leads to improper handling of inhaler devices and ultimately results in suboptimal drug delivery to the lungs. In addition, the authors identified that older age is significantly associated with reduced inhaler proficiency, as elderly patients often face physical limitations such as decreased hand strength, reduced coordination, and impaired dexterity, making it difficult for them to correctly operate inhalation devices. Cognitive impairment was also highlighted as a major contributing factor, as

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patients with memory issues or reduced cognitive function are more likely to forget critical steps in the inhalation process, leading to repeated errors and inconsistent medication use. Furthermore, the study demonstrated that individuals who had not received prior training were almost three times more likely to commit critical mistakes during inhaler use, including incorrect timing between actuation and inhalation, poor coordination, and failure to hold breath after inhalation, all of which significantly reduce medication deposition in the lower airways. These errors directly contribute to poor disease control, increased symptom burden, frequent exacerbations, and reduced quality of life among patients. The study also emphasized that patient-related variables such as educational level, health literacy, and prior experience with inhaler devices play a crucial role in determining inhaler handling skills, as individuals with limited understanding are more prone to misuse the device despite having access to treatment. Based on these findings, the authors strongly recommended that healthcare providers identify patients who are at higher risk of making errors and implement continuous, structured, and targeted educational interventions, including repeated demonstrations, return demonstrations, and regular follow-up assessments to ensure proper technique. Such interventions are essential to reinforce correct inhaler use, improve patient confidence, and enhance long-term treatment outcomes. Overall, the study concluded that addressing patient-related factors through effective education and continuous monitoring is critical for improving inhaler technique, ensuring optimal medication delivery, and achieving better disease control in patients with asthma and COPD.(12)

GINA et a1, (2024) found that patients frequently switched between different inhaler devices without receiving proper retraining, which significantly increased the likelihood of technique-related errors and compromised treatment effectiveness, as each inhaler type requires a distinct method of use and specific coordination skills that patients may not automatically adapt to without guided instruction. This lack of retraining was identified as a critical gap in clinical practice, as patients often assumed that all inhalers function similarly, leading to improper handling and reduced medication delivery to the lungs. The complexity of certain inhaler devices further contributed to incorrect usage, particularly among elderly patients and those with limited health literacy, as intricate steps such as dose preparation, correct positioning, and timing of inhalation increased the risk of mistakes. These challenges were exacerbated when patients were prescribed multiple inhaler types simultaneously, causing confusion and inconsistency in technique. The authors stressed the importance of ensuring patient familiarity with a specific inhaler device and promoting consistent use of the same device whenever possible, as repeated practice with one device can significantly improve technique, confidence, and adherence, ultimately leading to better therapeutic outcomes. Furthermore, Thompson et al. (2020) evaluated the impact of structured inhaler education programs and found that individualized training sessions led to significant improvements in inhaler technique among patients with the asthma and COPD. The study highlighted that the patients who received repeated instruction and hands-on demonstrations were more likely to retain correct inhaler skills over time, as reinforcement helped solidify proper habits and reduce the recurrence of errors. In contrast, patients who received only a single session of education showed a decline in technique

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over time, indicating that one-time instruction is insufficient for long-term skill retention. The findings also emphasized the critical role of regular reassessment during follow-up visits, as continuous monitoring allowed healthcare providers to identify and correct errors promptly, reinforce proper technique, and ensure sustained adherence to treatment protocols, thereby improving overall disease management and clinical outcomes.(13)

GOLD et al. (2023) demonstrated that hands-on training combined with immediate patient feedback plays a crucial role in enhancing skill acquisition and ensuring proper inhaler technique among patients with respiratory conditions such as asthma and COPD. Practical demonstrations allow patients to observe the correct steps, while supervised practice enables them to apply what they have learned under professional guidance, thereby reducing the likelihood of persistent errors. Educational approaches that incorporate visual demonstrations, return demonstrations, and interactive teaching methods have been shown to be significantly more effective than verbal instructions alone, as they engage multiple learning styles and improve both understanding and retention of proper technique. These methods help reinforce correct behaviors by allowing patients to actively participate in the learning process rather than passively receiving information, which leads to better long-term adherence and improved clinical outcomes. Additionally, regular follow-up assessments, particularly those conducted every three months, have been associated with sustained improvement in inhaler technique, as they provide opportunities for reinforcement, correction of mistakes, and updating of patient knowledge. Such periodic evaluations ensure that patients do not gradually revert to incorrect habits over time, which is a common issue in chronic disease management. On the other hand, a significant gap in clinical practice, revealing that healthcare professionals often overestimate patients' ability to correctly use inhalers and tend to assume that once initial instruction is provided, no further guidance is necessary. This overestimation leads to a lack of routine reassessment of inhaler technique after the initial prescription, resulting in unrecognized and ongoing misuse of inhalers. The absence of continuous monitoring and reinforcement contributes to poor medication delivery, suboptimal disease control, and increased risk of exacerbations in patients with asthma and COPD. The study emphasized that without periodic evaluation and feedback, even patients who initially demonstrate correct technique may develop errors over time due to forgetfulness, changes in health status, or improper self-practice. Therefore, the findings strongly support the integration of structured follow-up programs and regular technique assessments into routine clinical care. Such an approach would not only help in identifying and correcting errors early but also improve patient confidence, enhance treatment adherence, and ultimately lead to better health outcomes. Overall, the combined evidence from these studies underscores the importance of continuous education, hands-on training, and systematic follow-up in maintaining effective inhaler use and optimizing therapeutic success in respiratory disease management.(14)

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Materials and Methods

This cross-sectional study was conducted among asthma and COPD patients at Gulab Devi Hospital and Farooq Hospital over a period of four months. The study aimed to evaluate inhaler techniques among patients diagnosed with asthma or chronic obstructive pulmonary disease (COPD). A sample size of 70 patients was included in the study. The sample size was initially calculated using a prevalence-based formula for observational studies with a 95% confidence level and an estimated prevalence of 70% incorrect inhaler technique. Although the calculated sample size was 323 participants, only 70 patients were recruited due to limited patient availability and logistical constraints during the study period.

A non-probability convenience sampling technique was used for participant recruitment. Patients were selected consecutively from outpatient clinics and inpatient wards if they met the inclusion criteria and consented to participate. The study included patients diagnosed with asthma or COPD who were currently using inhaler medications as part of their treatment regimen. Both outpatient and inpatient participants were included. Patients who were not regular inhaler users, had severe cognitive impairment, or refused participation were excluded from the study.

Data collection was carried out using direct patient interviews, observation, and a structured questionnaire/performa over four months. The questionnaire collected demographic details, clinical history, type and duration of inhaler use, and inhaler technique assessment. Patients were asked to demonstrate their inhaler technique using standard inhaler devices such as Metered Dose Inhalers (MDI) and Dry Powder Inhalers (DPI). A standardized checklist based on inhaler technique guidelines was used to assess whether each step was performed correctly or incorrectly. Additional tools included pulse oximetry, where applicable, and manual recording sheets for data entry. No radiological or imaging-based scanning techniques were involved in this study.

The primary outcome of the study was the assessment of inhaler technique, categorized as correct or incorrect based on the standardized checklist. Patients performing all essential inhaler steps accurately were classified as correct users, while those missing one or more critical steps were categorized as incorrect users. Secondary outcomes included the frequency of incorrect inhaler use and its association with demographic and clinical variables. The dependent variable was inhaler technique, while independent variables included age, gender, type of disease, duration of illness, type of inhaler device, and duration of inhaler use.

Ethical guidelines established by Superior University were followed throughout the study. Informed consent was obtained from all participants prior to data collection, and confidentiality of personal and medical information was strictly maintained. Participants were informed about the purpose, procedures, risks, and benefits of the study and were allowed to withdraw at any stage without penalty. Data analysis was conducted using IBM SPSS Statistics. Descriptive statistics were used to summarize demographic characteristics and prevalence of incorrect inhaler techniques, while independent t-tests and chi-square tests were applied to assess associations between inhaler technique errors and clinical outcomes. A p-value of less than 0.05 was considered statistically significant.

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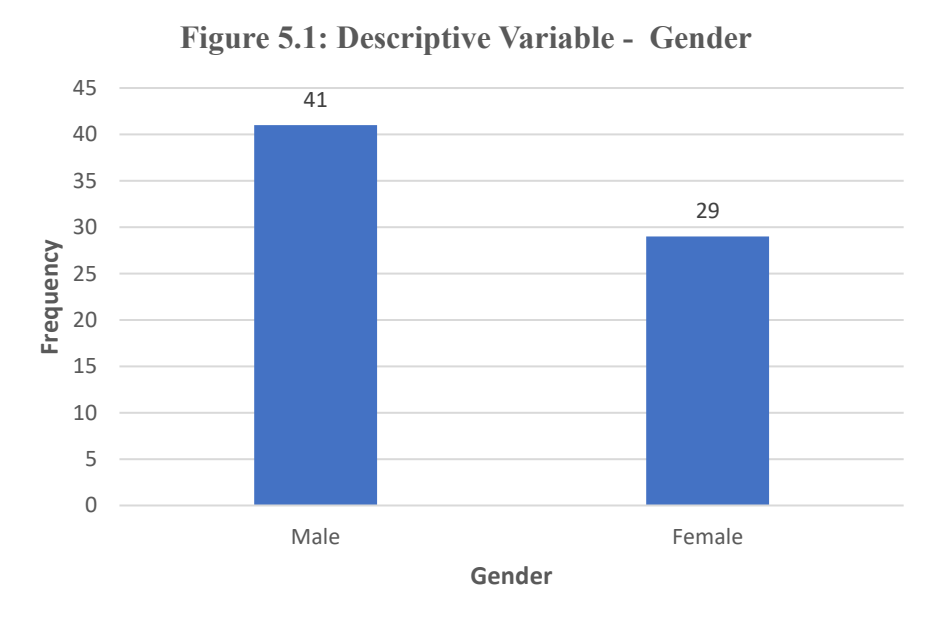
CHAPTER 5
RESULTS

Table 5.2: Descriptive Variables – Demographic Characteristics

Descriptive Variables – Demographic Characteristics			
Variable		Frequency	Percentage
Gender	Male	41	58.6
	Female	29	41.4
Duration of respiratory disease	<1 year	10	14.3
	1-5 years	19	27.1
	5-10 years	17	24.3
	>10 years	24	34.3
Type of respiratory disease	Asthma	39	55.7
	COPD	29	41.4
	Both	2	2.9



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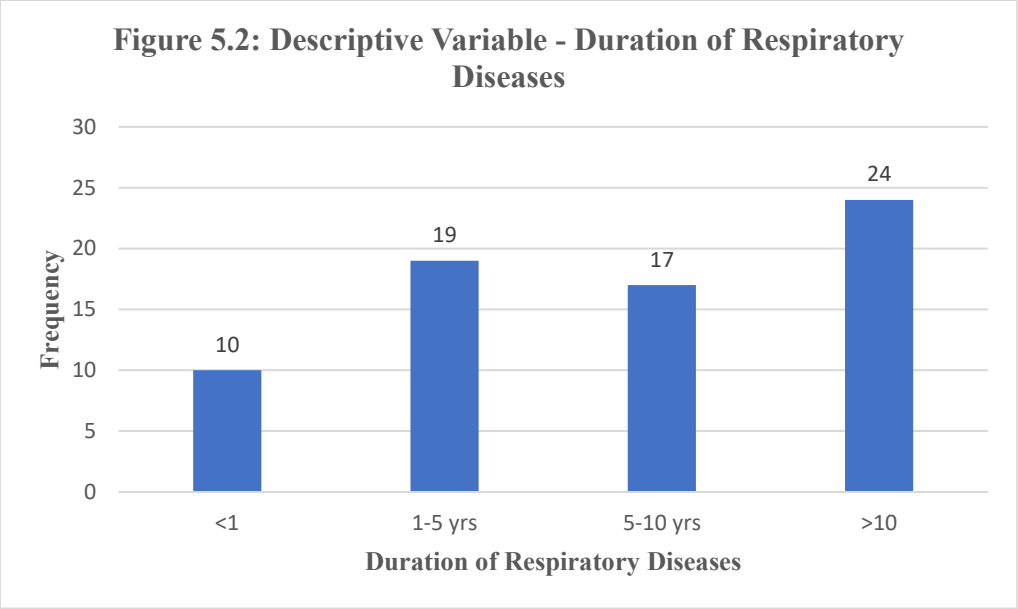

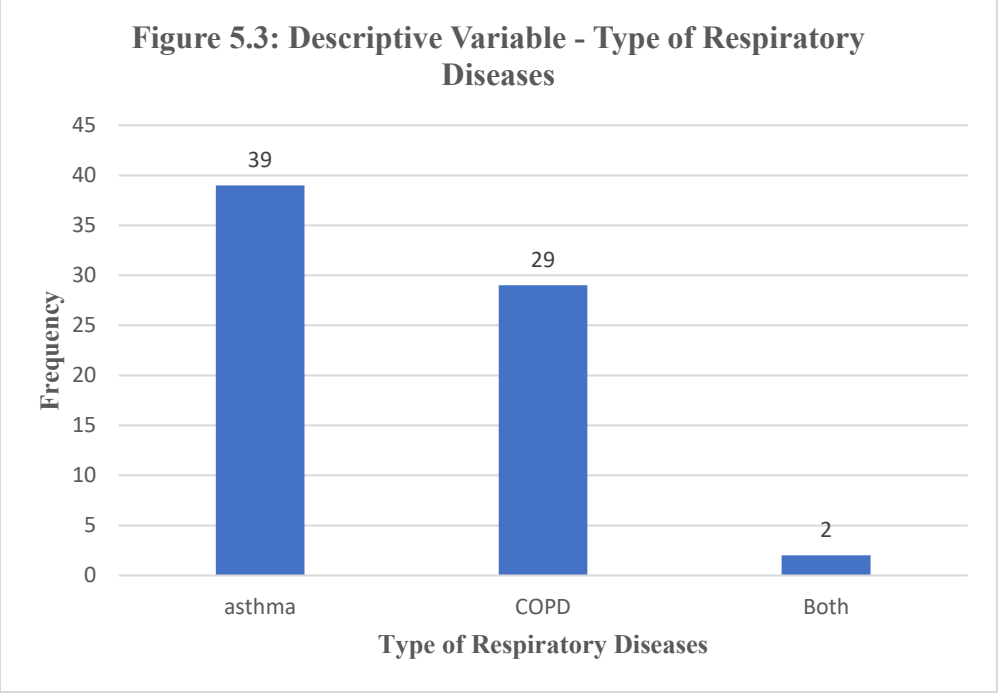

Table 5.2 shows the demographic characteristics of patients. Out of 70 patients, 41 were male and 29 were female. Patients who have duration of respiratory disease less than 1 year were 10(14.3%), from 1-5 years were 19(27.1%), from 5-10 years were 17(24.3%), and above 10 years were 24(34.3%).

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Patients who have asthma were 39(55.7%), who have COPD were 29(41.4%) and who have both asthma and COPD were 2(2.9%).

Table 5.3: Descriptive Variables – Inhaler Usage

Descriptive Variables - Inhaler Usage			
Variable		**Frequency**	**Percentage**
Do you currently use an inhaler	Yes	40	57.1
	No	30	42.9
Types of inhaler	MDI	41	58.6
	DPI	16	22.9
	Both	13	18.6
How often do you use your inhaler as prescribed	Always	3	4.3
	Often	26	37.1
	Sometimes	30	42.9
	Rarely	11	15.7

Table 5.3 shows the descriptive variables of inhaler usage. Patients who currently use an inhaler were 40(57.1%) and who do not currently use an inhaler were 30(42.9%). Patients who use MDI inhaler type were 41(58.6%), who use DPI inhaler type were 16(22.9%) and who use both inhaler types were 13(18.6%). Patients who always use their inhaler as prescribed were 3(4.3%), who often inhaler as prescribed were 26(37.1%), who use inhaler sometimes as prescribed were 30(42.9%), and who rarely use inhaler as prescribed were 11(15.7%).

Table 5.4: Descriptive Variables – Knowledge and Techniques

Descriptive Variables - Knowledge and Techniques			
Variables		**Frequency**	**Percentage**
Do you know the correct steps to use your inhaler	Yes	31	44.3
	No	39	55.7
Do you shake the inhaler before use (MDI)	Sometimes	10	14.3
	Never	27	38.6
	Not sure	33	47.1
Do you exhale fully before using the inhaler	Sometimes	6	8.6
	Never	36	51.4
	Not sure	28	40.0

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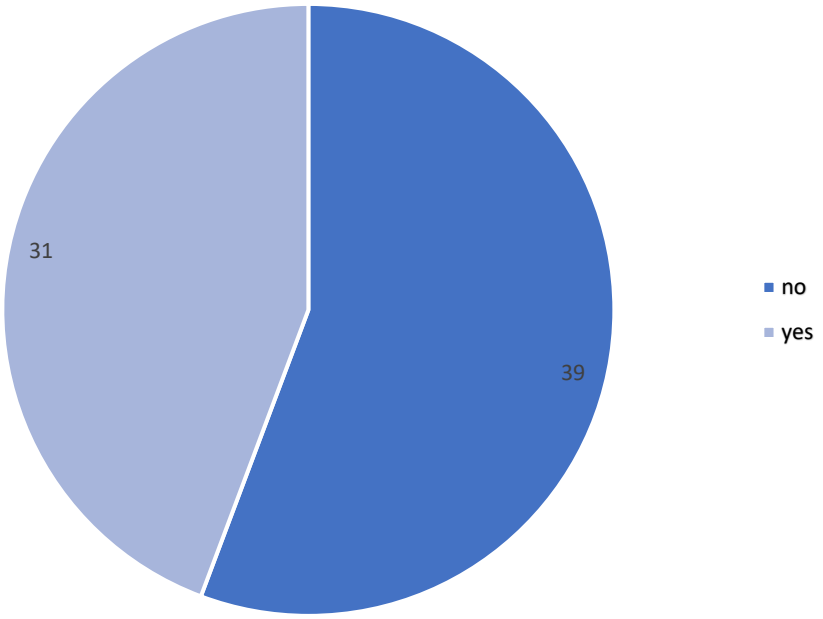
Do you hold your breath after inhaling the medication	Sometime	23	32.9
	Never	23	32.9
	Not sure	24	34.3
Do you rinse your mouth after corticosteroids inhaler use	Sometimes	19	27.1
	Never	36	51.4
	Not sure	15	21.4

Figure 5.4: Descriptive variable - Do you know the correct steps to you inhaler



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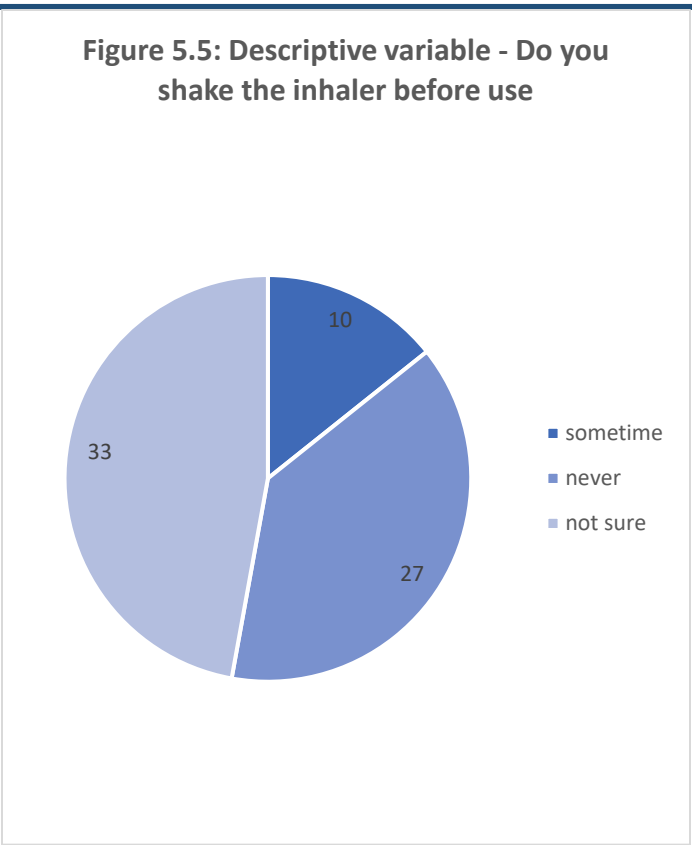

Figure 5.5: Descriptive variable - Do you shake the inhaler before use

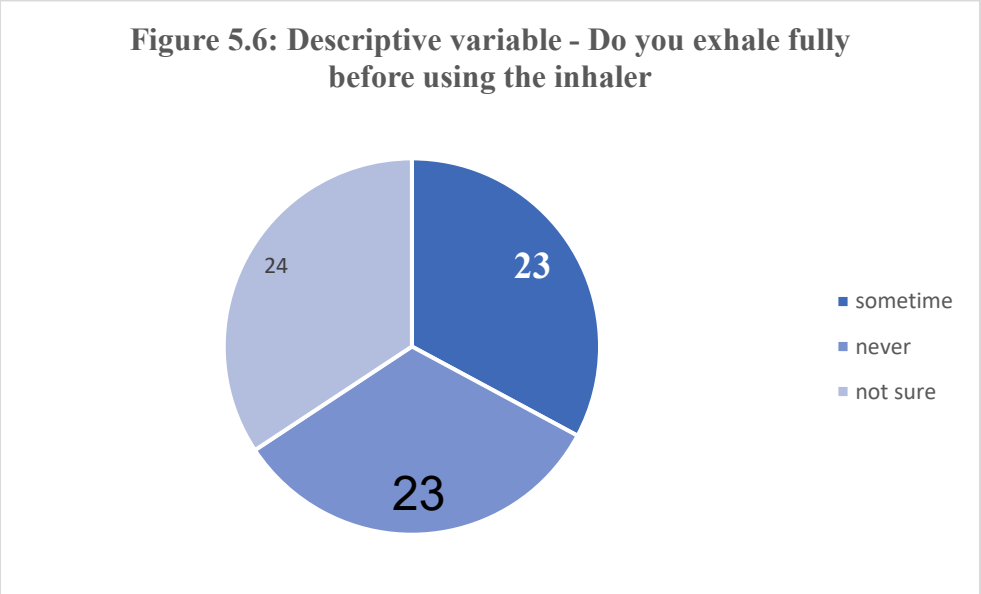

Figure 5.6: Descriptive variable - Do you exhale fully before using the inhaler

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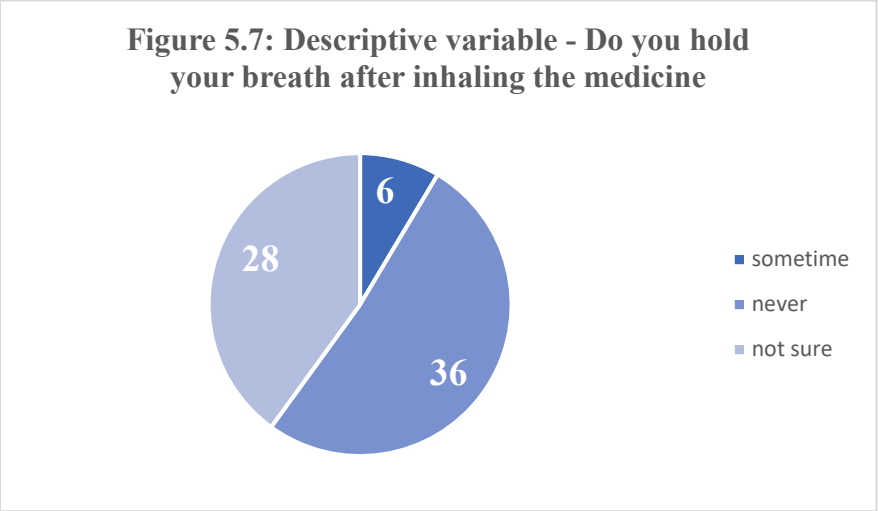

Figure 5.7: Descriptive variable - Do you hold your breath after inhaling the medicine

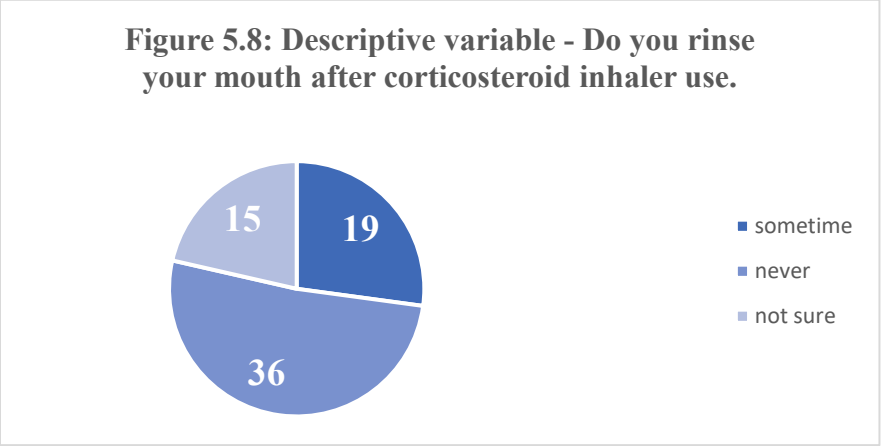

Figure 5.8: Descriptive variable - Do you rinse your mouth after corticosteroid inhaler use.

Table 5.4 shows the descriptive variables of knowledge and techniques. Patients who know the correct steps to use their inhaler were 31(44.3%), while 39(55.7%) patients don't know correct steps to use inhaler. Patients who shake their inhaler MDI before use sometime were 10(14.3%), never shake their inhaler were 27(38.6%), not sure to shake or not to shake were 33(47.1%). Patients who fully exhale before using the inhaler sometimes were 6(8.6%), never fully exhale were 36(51.4%), not sure to exhale fully were 28(40.0%). Patients who hold their breath after inhaling the medicine sometimes were 23(32.9%), never hold breath were 23(32.9%), not sure to hold breath were 24(34.3%). Patients who rinse their mouth after corticosteroids inhaler use sometimes were 19(27.1%), never rinse their mouth were 36(51.4%), not sure to rinse their mouth were 15(21.4%).

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Table 5.5 - Descriptive Variables – Adherence and Barriers

Descriptive Variable / Adherence and Barriers			
Variable		**Frequency**	**Percentage**
Do you skip inhaler dose	Yes	58	82.9
	No	12	17.1
If yes reason for skipping	Forgetfulness	34	48.6
	Difficulty using inhaler	10	14.3
	Feeling better	14	20.0
	None	12	17.1
Have you ever received a refresher on inhaler techniques	Yes	21	30.0
	No	49	70.0
Confidence in inhaler use	Very confident	21	30.0
	Somewhat confident	42	60.0
	Not confident	7	10.0

Table 5.5 shows the descriptive variables of adherence and barriers. Patients who skip their inhaler dose were 58(82.9%) and who don't skip the inhaler dose were 12(17.1%). Patients with reason of skipping dose with forgetfulness were 34(48.6%), difficulty using inhaler were 10(14.3%), feeling better were 14(20.0%). Patients who received refresher on inhaler techniques were 21(30.0%), and who don't receive a refresher were 49(70.0%). Patients who were very confident in inhaler use were 21(30.0%), somewhat confident were 42(60.0%), not confident were 7(10.0%).

Table 5.6: Descriptive Variable – Clinical Consequences

Descriptive Variables – Clinical Consequences			
Variable		**Frequency**	**Percentage**
Frequency of worsening symptoms	Daily	3	4.3
	Weekly	22	31.4
	Monthly	33	47.1
	Never	12	17.1
Hospital visit in last year due to exacerbation	Every month	43	61.4
	Within 3-6 months	18	25.7
	Within 6-9 months	6	8.6
	More than 1 year	3	4.3
Hospitalization due to improper inhaler use	Yes	29	41.4
	No	17	24.3
	Not sure	24	34.3

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Does improper inhaler use effects quality of life	Yes	16	22.9
	No	12	17.1
	Not sure	42	60.0
Do you experience inhaler side effects	No	70	100.0

Table 5.6 shows the descriptive characteristics of clinical consequences. Patients whose symptoms get worsens on daily basis were 3(4.3%), weekly were 22(31.4%), monthly 33(47.1%), never were 12(17.1%). Patients who visit hospital every month due to exacerbation were 43(61.4%), within 3-6months were 18(25.7%), within 6-9 months were 6(8.6%), more than 1 year were 3(4.3%). Patients who got hospitalised due to improper inhaler use were 29(41.4%), who don't get hospitalised were 17(24.3%). Patients who feel that improper inhaler use effects quality of life were 16(22.9%), don't feel were 12(17.1%). While, none of patinets experience inhaler side effects.

Table 5.7: Descriptive Variable – Patient Education and Support

Descriptive Variable – Patient Education and Support			
Variable		**Frequency**	**Percentage**
Would you like inhaler technique training	Yes	66	94.3
	No	4	5.7
Preferred support method	Healthcare demonstration	60	85.7
	Video tutorial	6	8.6
	None	4	5.7

Table 5.7 shows the descriptive variables of patient education and support. Patients who like inhaler training technique were 66(94.3%) and who don't like were 4(5.7%). Patients who prefer healthcare demonstration support method were 60(85.7%), video tutorial were 6(8.6%).

Table 5.8: Descriptive Variables – Asthma Control Test (ACT)

Descriptive Variables - Asthma Control Test (ACT)			
Variable		**Frequency**	**Percentage**
Asthma Control Test (ACT)	20-25 well controlled	6	8.6
	16-19 not well controlled	10	14.3
	<15 poor controlled	54	77.1

Table 5.8 shows the descriptive variables of ACT. Patient who have well controlled asthma were 6(8.6%), not well controlled were 10(14.3%), poor controlled asthma was 54(77.1%).

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Table 5.9: Descriptive Variables – COPD Assessment Test (CAT)

Descriptive Variables - COPD Assessment Test (CAT)			
Variable		Frequency	Percentage
COPD Assessment Test (CAT)	0-10 Low	39	55.7
	11-20 Medium	8	11.4
	21-30 High	23	32.9

Table 5.9 shows the descriptive variables of COPD assessment test. Patients who got COPD test scoring were 39(55.7%), medium were 8(11.4%), high were 23(32.9%).

Table 5.10: Crosstabulation between Asthma Control Test (ACT) and Knowledge and Techniques.

Crosstabulation between Asthma Control Test (ACT) and Knowledge and Techniques					
Variables		20-25 (well controlled)	16-19 (not well controlled)	<15 (poorly controlled)	P-value
Do you know the correct steps to use your inhaler	Yes	3	3	25	0.608
	No	3	7	29	
Do you shake the inhaler before use (MDI)	Sometime	3	0	7	**0.035**
	Never	3	4	20	
	Not sure	0	6	27	
Do you exhale fully before using the inhaler	Sometimes	3	7	13	**0.008**
	Never	3	3	17	
	Not sure	0	0	24	
Do you hold your breath after inhaling the medication	Sometimes	0	0	6	0.563
	Never	3	7	26	
	Not sure	3	3	22	
Do you rinse your mouth after corticosteroids inhaler use	Sometimes	0	7	12	**0.002**
	Never	6	3	27	
	Not sure	0	0	15	

Table 5.10 shows the crosstabulation between asthma control test and knowledge and techniques of inhalers. The crosstabulation between knowledge of correct steps to use inhaler and ACT shows insignificant association with the p-value of 0.608. The crosstabulation between knowledge of shaking inhaler before use and ACT shows significant association with the p-value of 0.035. The crosstabulation between technique of exhaling fully before using an inhaler and ACT shows

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significant association with the p-value of 0.008. The crosstabulation between the technique of holding breath after using inhaler and ACT shows insignificant association with the p-value of 0.563. The crosstabulation between rinsing mouth after using corticosteroid inhaler use and ACT shows significant association with the p-value of 0.002.

Table 5.11: Crosstabulation between COPD Assessment Test and Knowledge and Techniques.

Crosstabulation between COPD Assessment Test and Knowledge and Techniques					
Variables		**0-10 (Low)**	**11-20 (Medium)**	**21-30 (High)**	**P-value**
Do you know the correct steps to use your inhaler	Yes	15	3	13	0.353
	No	24	5	10	
Do you shake the inhaler before use (MDI)	Sometimes	7	3	0	**0.004**
	Never	10	5	12	
	Not sure	22	0	11	
Do you exhale fully before using the inhaler	Sometimes	20	0	3	**0.001**
	Never	12	6	5	
	Not sure	7	2	15	
Do you hold your breath after inhaling the medication	Sometimes	3	0	3	0.569
	Never	20	6	10	
	Not sure	16	2	10	
Do you rinse your mouth after corticosteroids inhaler use	Sometimes	10	3	6	**0.015**
	Never	22	0	14	
	Not sure	7	5	3	

Table 5.11 shows the crosstabulation between COPD assessment test and knowledge and techniques of inhalers. The crosstabulation between knowledge of correct steps to use inhaler and CAT shows insignificant association with the p-value of 0.353. The crosstabulation between knowledge of shaking inhaler before use and CAT shows significant association with the p-value of 0.004. The crosstabulation between technique of exhaling fully before using an inhaler and CAT shows significant association with the p-value of 0.001. The crosstabulation between the technique of holding breath after using inhaler and CAT shows insignificant association with the p-value of 0.569. The crosstabulation between rinsing mouth after using corticosteroid inhaler use and ACT shows significant association with the p-value of 0.015.

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CHPATER 6
DISCUSSION

Both studies included comparable patient groups with asthma and COPD, although the earlier study had equal representation (35) each, while the current study showed a slightly higher proportion of asthma patients (55.7%) compared to COPD (41.4%). Gender distribution aligns across findings, with COPD being more common among males,. The previous study reported 80% males in COPD group verses 45.7% in asthma, while the current study also showed a male predominance overall (58.6%). Smoking status further strengthens the correlation. The earlier study demo9nstrated a substantially higher proportion of current smokers in COPD patients (40%) as compared to asthma patients (14.3%), which is consistent with the known risk profile of COPD and supports the diagnostic distribution observed in the current study. The earlier study found the DPI inhalers were more commonly used than MDI in both asthma and COPD groups. Most importantly, this study shows that using the inhaler correctly (like shaking it, breathing out completely before using it, and rinsing your mouth after) is linked to better health results, based on ACT and CAT scores. These results support the earlier study's observation that people use inhalers for different lengths of time (longer for asthma than for COPD), indicating that just using the inhaler for a long time doesn't guarantee it is used correctly or that it will work well. (Abdulredha MD et a1., 2023)

The earlier study looked at 450 asthma patients, but the current study only included 70 patients with different diagnoses. Among these, 55.7% had asthma, 414% had COPD, and 2. 9% had both conditions. The last study found that there were fewer males, making up 39. % of participants, while the current study has a larger number of males at 58.6% In the previous study, 45% of patients used an inhaler, while in the current study, 57.1% used one But both studies show that just using an inhaler doesn't guarantee good control of the disease. The earlier study showed that using inhalers was closely linked to not getting proper follow-up, not having enough asthma education, not controlling asthma well (low ACT scores), more emergency visits, and a shorter time dealing with the illness. The current study showed that most patients did not follow the rules, with only 4.3% using their inhalers as they were supposed to. Both studies agree that it is important to have knowledge and education. The earlier study found that not knowing enough about asthma (OR = 1.65) and not having regular check-ups (OR = 1.73) are important reasons for using inhalers incorrectly. The study found that using inhalers the right way like shaking them, breathing out fully before using them, and rinsing the mouth afterward was linked to better health results. This was shown by higher scores on the ACT and CAT tests. (Yin CC et a1., 2026)

The study had 70 patients, where 55.7% had asthma, 41.4% had COPD, and 2.9% had both conditions. The average age of the patients was about 66 years old. In comparison, the earlier study included 120 patients, with the same number of people having asthma and COPD. The current study looked more at clinical results and relationships, while the previous study focused on mistakes in using inhalers and differences between devices. In this study, 57.1% of patients said they used inhalers, but only 4.3% of them used them the way they were supposed to. This shows that many did not follow the instructions. In the same way, the earlier study showed a big difference between

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how well patients thought they could use inhalers and how well they actually did. Even though 98.3% of COPD patients thought they knew how to use inhalers, 94.2% made at least one mistake when using them. This shows that what people say they know doesn't always match how they actually do things. A major strength of this study is showing that using inhalers correctly is linked to better health results. Doing things the right way like shaking the inhaler, breathing out completely before using it, and rinsing your mouth afterward was clearly linked to better ACT and CAT scores. The earlier study adds to this by showing that many people make mistakes when using inhalers. (Ahmed S et a1., 2024)

The current study included 70 patients, with an average age of about 66 years. Among them, 55.7% had asthma and 41.4% In contrast, the previous study involved 300 patients. In this study, 57. % of patients said they used inhalers, but only 4.3% followed the instructions exactly, showing that many did not stick to the guidelines. The earlier study found that 82. 3% of patients made at least one mistake when using their inhalers, showing that many people use them incorrectly. The main difference is what is being studied. The study looked at how using inhalers correctly affects health results. It found that doing things like shaking the inhaler, breathing out all the way before using it, and rinsing your mouth afterward is linked to better scores on tests that measure asthma control and symptoms. In contrast, the earlier study looked at how often people make mistakes with inhalers and what causes those mistakes. The previous study found that the number of mistakes made with different inhalers varied a lot. The most mistakes were made with metered-dose inhalers (94.3%), then with dry powder inhalers (82.0%), metered-dose inhalers using spacers (78%), and the fewest mistakes were with nebulizers (70%) ($p = 0.005$) Also, education and training were very important. Patients who couldn't read or learned by themselves made many more mistakes than educated patients or those who were taught by healthcare workers. (Yung K and Cheng SL)

The earlier study had more people involved (130) and the average age was older (about 74 years). In contrast, the current study had 70 participants who were younger on average (about 66 years) and had a bigger age range (from 31 to 95 years old). The current study only gives information about gender, showing that more males were involved (58.6%). In the last study, 82.3% of the participants had breathing problems, and 56.2% had moderate to severe illness. In this study, they looked at specific illnesses: 55.7% had asthma and 41.4% had COPD Also, 34.3% of the people had their illness for more than 10 years. Also, 77.1% had asthma that was not well managed, showing that many people have difficulties with their condition. Many people misused inhalers in both studies. The last study found that 71.6% of people made mistakes using their inhalers, and 31.1% made serious mistakes. The current study showed that many patients did not use their inhalers correctly. More than half did not know the right steps to take. Common mistakes included forgetting to shake the inhaler (47.1%), not breathing out before using it (51.4%), not holding their breath after using it (34.3%), and not rinsing their mouth afterwards (51.4%). These results show that using inhalers the wrong way is still a big problem for many people. This study shows that many patients have trouble following their medication instructions. About 82.9% of them missed some doses, and only 42.9% used their inhalers correctly. There were important links between ACT/CAT scores and

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actions like shaking the inhaler, breathing out before using it, and rinsing the mouth ($p < 0.05$). The earlier study connected how well the lungs work with smoking habits and mistakes made with inhalers, but it looked more at what causes these issues rather than the results. (Maricoto T et a1.,

CONCLUSION(S)

This study concludes that most of the patients were male and have respiratory disease from more than 10 years. Most of the patients were suffering from asthma rather than COPD. Most of the patients were currently using MDI type of inhaler. Many patients lack knowledge and techniques about using inhaler like shaking inhaler before using, hold breath after taking inhaler and rinsing mouth after using inhaler. Patients skips inhaler dose with the reason of forgetnees and haven't received any refresher and we're somewhat confident while using inhaler. Symptoms in asthma patients got worsen monthly and they have to visit hospital and get hospitalized than in COPD patients. After ACT and CAT evaluation, patients have poorly controlled asthma and have low COPD assessment score. The crosstabulation between shaking inhaler, exhale fully before using inhaler and rinsing mouth after using inhaler with ACT and CAT shows significant association and a positive correlation.

7.2: RECOMMENDATION(S)

The study recommends strengthening patient education on inhaler use through structured and regular training programs delivered by healthcare providers, with a strong emphasis on practical demonstrations since they are most effective for patient understanding. Periodic refresher sessions should be introduced to reinforce correct technique, particularly for patients who have never received formal training. Additional supportive tools such as video tutorials, printed brochures, and mobile reminders can further enhance patient comprehension and reduce forgetfulness. Personalized counseling should also be provided to address individual barriers, misconceptions about medication discontinuation, and device handling difficulties. Routine assessment of inhaler technique during every clinical visit is essential, with immediate correction of any identified errors. Furthermore, adherence can be improved through medication reminders, simplified treatment regimens, and active involvement of family members. Healthcare institutions should formally integrate inhaler technique evaluation and education into standard respiratory disease management protocols.

The study has several limitations that should be considered when interpreting the findings. The relatively small sample size of 70 participants and single-center design restrict the generalizability of the results to broader populations and different healthcare settings. In addition, reliance on self-reported information regarding inhaler use and adherence introduces potential recall and social desirability bias. The cross-sectional nature of the study limits the ability to establish causal relationships between inhaler technique and clinical outcomes. Furthermore, inhaler techniques were not objectively validated using advanced clinical assessment tools, which may affect accuracy. Other important influencing factors such as socioeconomic status, education level, comorbidities,

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and access to healthcare services were not comprehensively explored, which may have impacted the study findings.

CHAPTER 8
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