

Research Article

DOI: <http://dx.doi.org/10.22192/ijamr.2021.08.09.001>

A Descriptive study on Compliance and Efficacy of Inhaler technique in Obstructive Airway Disease patients in Respiratory Medicine Department at a Tertiary care hospital

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Abstract

A Descriptive study on compliance and efficacy of inhaler technique in patients with Obstructive Airway Disease in Respiratory Medicine Department at a Tertiary care Hospital, Coimbatore.

Objectives:

To assess the inhalation technique in the patient attending Respiratory outpatient department.

To identify the errors made by the patients.

To prevent exacerbation of disease and also to improve quality of life by educating and correcting the errors made by the patients.

Methodology:

It is a Non- Randomized, Descriptive Observational study was done on 100 patients with previously diagnosed Obstructive Airway Disease (**Bronchial Asthma** and **Chronic Obstructive Pulmonary Disease**) who were attending the Respiratory Outpatient Department of a Tertiary care hospital, Coimbatore between December-2020 and May-2021. The study consists of Male and Female patients of Obstructive Airway Disease based of Spirometry results. In this study two types of Inhalers were used they are;

Dry powder inhaler (DPI)

Metered dose inhaler (MDI)

The patients were made to demonstrate the inhaler technique with their inhalers. After the demonstration the patient's inhalation technique was evaluated by the scoring system. Then the errors made by the patients will be noted and corrected by teaching the proper inhalation techniques.

Keywords

Obstructive Airway Disease,
Spirometry,
DPI,
MDI.
Inhalers.

Results:

The Demographic data of the patients are given in the table. No significant associations were found between age, education, occupation and demographic variation with the technique of inhalation.

Among 100 patients, only 32 patients are able to perform inhaler technique correctly. 68 patients were following the incorrect techniques. Among those 68 patients, 27 were on MDI and 41 were using DPI. The details of the patients and the errors they made are tabulated.

Conclusion:

There is a significant association between the proper use of inhaler technique and good clinical asthma control. Health professional should educate patients about inhalation technique during their first visit and constantly ask patients to bring inhaler in successive visits so that technique, compliance and effective clinical control can be assessed for better outcomes.

Introduction

Bronchial Asthma and Chronic Obstructive Pulmonary Disease are Obstructive Airway Disease which affects more and more people worldwide; Asthma is a heterogeneous disease, usually characterized by chronic airway inflammation. It is defined by the history of respiratory symptoms such as wheeze, shortness of breath, chest tightness and cough that vary over the time and in intensity, together with variable expiratory airflow limitation.

Chronic Obstructive Pulmonary Disease is a common, preventable and treatable disease that is characterized by persistent respiratory symptoms and airflow limitation that is due to airway and/or alveolar abnormalities usually caused by significant exposure to noxious particles or gases.

In Bronchial Asthma and Chronic Obstructive Pulmonary Disease, Inhalation therapy remains the mainstay of treatment, in which medications are administered directly to the airways, providing a higher local concentration and a lower risk of systemic adverse effects.

The Dry Powder inhaler (DPI) and Metered Dose Inhaler (MDI) with spacer are the most commonly preferred pulmonary drug delivered methods. Improper inhalation technique and Inhaler misuse have been commonly seen in clinical settings and which leads to:

-) Increased inhaler use
-) Decreased Bronchodilation
-) Reduced patients adherence to the treatment regiment
-) Poor drug delivery
-) Poor Disease Control

Aim:

The Aim of the study is to assess the compliance and efficacy of inhaler technique in patients with Obstructive Airway Disease and to educate and correct the errors made by the patients during demonstration. By educating the proper inhalation technique we can prevent the acute exacerbation of disease and can also improve the patient's quality of life.

Need for the study

Bronchial Asthma and Chronic Obstructive Pulmonary Disease are two major Airway inflammatory diseases. **Atopic or Genetic predisposition and Smoking** is the two major risk factors of Obstructive Airway Diseases respectively.

Following poor and incorrect inhalation techniques prevents patient with Bronchial Asthma and Chronic obstructive airway Disease from receiving the required amount of medication. Regardless of the type of inhaler device prescribed, patients are unlikely to use inhalers correctly unless they receive clear

instruction, including a physical demonstration. The risk of misusing inhalers is particularly high in elderly and most debilitated patients. Brief verbal instruction on proper technique, with the physical demonstration is effective when repeated over time and can improve clinical outcomes. Assessing the inhaler technique is useful for guiding the appropriate inhaler prescribing and correcting the poor inhalation technique before escalating the drug therapy.

Statement of the problem:

Observational study on compliance and efficacy of inhaler technique in Obstructive Airway Disease patients in Respiratory Medicine Department at a Tertiary care hospital, Coimbatore.

Operational definitions:

Compliance	It refers to the consistency and accuracy with which a patient follows the regimen prescribed by a physician.
Efficacy	It refers to the limit or extent to which a regimen or technique precedes a beneficial result under the condition.
Inhaler technique	It refers to the manner of the performance in using an appropriate for administering medicines by inhalation.
Obstructive airway disease	Refers to Bronchial Asthma and Chronic Obstructive pulmonary Disease.
Respiratory medicine	The medical specialty that deals with diseases involving respiratory tract.
Tertiary care hospital	The place of multi specialty hospital for treatment performed by medical specialist.
Gold	The Global initiative for chronic obstructive lung disease guidelines define COPD as a disease state categorized by airflow limitation that is not fully reversible.
Gina	The Global initiative for Asthma is a medical guidelines organization which works with public health officials and health care professionals globally to reduce Asthma prevalence, morbidity and mortality.

Hypothesis:

Null Hypothesis: There is no significant relationship between the proper usage of inhaler techniques and the demographic variables.

Alternative hypothesis: There is a significant relationship between the proper usage of inhaler techniques and the demographic variables.

Limitations:

The study is limited to,
 Patients of age 10-80 years of age
 Patients who were all given oral consent to participate in the study
 Patients attending the Respiratory Medicine outpatient department.

Review of Literature

Review of literature is a critical summary or research on a topic of interest, generally prepared to put a research problem or to identify gaps and weakness in prior studies so as to justify a new investigation.

Pablo Manriquez, Ana Maria Acuna et AL., (October-2015)

This was a descriptive cross sectional study conducted in the region of Valparaiso, Chile march and may of 2014. The sample consisted of male and female patients with a diagnosis of Bronchial Asthma based on Spirometry in accordance with the Global initiative fir Asthma criteria.

Claudia Gregoriano, Thomas Dieterle et AL.,(December-2020)

For this Cross sectional analysis, 165 Asthma and COPD patients were analyzed. Correct application of inhaler devices was tested using pre-defined checklist for each inhaler type. QOL and symptom control were investigated using COPD Assessment Test (CAT) and Asthma Control Test (ACT). Spirometry was used to measure Forced Vital Capacity (FVC) and Forced Expiratory Volume in one second (FEV1).

Jens Schriber, Tina Sonnenburg et AL.,(2020)

Prospective, open label cross sectional study in which 105 patients with Asthma (58%) on COPD (42%) participated. Validated checklists were used to objectively assess inhaler technique and errors with 10 different placebo devices. For each device, patients were asked to test the handling, to assess the device properties and to name the device that they would most or least prefer.

Maha Al Ammari, Khixra Sultana et AL.,(May-2016)

This cross sectional observational study was conducted in 47 Asthmatic and COPD patients using inhaler devices. The study took place at King Abdulaziz Medical City, Riyadh, Saudi Arabia between September and December 2013. Two Pharmacists independently assessed inhaler technique with a validated checklist.

Bharti Chogtu et AL., (february-2017)

It was an observational, prospective, cross sectional study conducted in patients with Bronchial Asthma. After obtaining clearance from the institutions. Ethics committee [letter no.IEC-514(2013)], the study was initiated. The study was carried out from November 2013 to March 2015 in the Department of Pulmonary Medicine in a Tertiary care Hospital. A written informed consent was taken, and patients were enrolled in the study as per the inclusion criteria.

Akansha Das et AL., (2016)

The present cross sectional study was conducted in 2015, in a tertiary care Hospital in Navi, Mumbai for 6 months from January to July 2016. The patients suffering from Bronchial Asthma and Chronic obstructive pulmonary disease visiting the Respiratory Medicine outpatient department were included in the study, after getting their consent and containing approval from the institutional review board. Patients not fluent in Hindi, English and Marathi were excluded from the study as they were unable to effectively communicate during the interview. Detailed history and demographic data of each patient were recorded and clinical examination was done. Each patient was asked to demonstrate the inhaler technique in the presence of the Health care professional which was subsequently assessed using a standard checklist. The written informed consent was obtained from the participants.

Research Methodology

Research methodology is a set of technique used in research. This simply means a guide to research and how it is conducted. It describes and analysis methods, throws more light on their limitations and resources, clarify their pre-suppositions and consequences, relating their potentialities to the twilight zone at the frontiers of knowledge (**Chinelo Igwenagu-2016**).

The chapter deals with the methods adapted for the study and includes the description of the **research design, setting of the study, variables, population, sample, sample size, sampling**

technique, criteria for sample selection, description of the tool, method of data collection and data analysis.

Research design:

Research design, is the overall plan for connecting the conceptual research problems to pertinent and achievable empirical research (Creswell-2014).

Setting of the study:

The study was conducted in the patients who have been diagnosed with Bronchial Asthma and COPD in the Respiratory department of a Tertiary care Hospital.

Variables:

The Demographic variables were **Age, Sex, Educational status, Smoking habit, Occupation, Type of inhalers used, Co-morbid, Type of airway obstructive disease.**

Population:

The population of this study consists of patients with Obstructive airway disease, who attends the Respiratory Medicine outpatient department of a Tertiary care hospital, Coimbatore.

Sample:

The sample of the study consisted of both male and female patients who diagnosed to have Bronchial Asthma or COPD previously based on Spirometry.

Sample size:

The sample size was 100 Bronchial Asthma and COPD patients.

Sampling technique:

Sampling is a process of selecting representative units from an entire population of a study. A Non random sampling was selected.

Criteria for sample selection:

Inclusive Criteria:

Patient of age from 10-80 years of age
Patient who attends the outpatient Respiratory medicine department.

Exclusive criteria:

Patient below 10 years and above 80 years Of age
Patients with poor dentures
Patients dependent on caregiver.

Description of the tool:

Part 1: It consisted of Demographic variables of the patients with Airway obstructive disease.

Part 2: It consisted of questionnaire with score regarding inhaler technique usage.

Method of data collection:

Tools for data collection: Structured questionnaire and inhaler technique demonstration.

The data collection was started from 15 January to 30 May 2021. To conduct the study we obtained permission from the Head of the department of Respiratory. 100 patients with Airway obstructive diseases were selected. The brief detail about the study was explained to the participants. An oral consent was obtained from the patients. Every patient was made to demonstrate the inhalation technique of own. Then the mistakes made by the patients were noted and corrected by teaching proper inhalation technique. The purpose of following proper inhalation technique was clearly explained to the patients.

Checklist for dry powder inhaler

S.No	Steps	Score
1	Open cap	1
2	Flip open mouth piece	1
3	Remove capsule from blister and place in chamber	1
4	Close mouth piece in chamber	1
5	Press red piercing button in once and release (do not shake)	3
6	Breathe out gently, away from the inhaler	1
7	Place mouth piece between teeth without biting and close the lips to form a seal	2
8	Breathe in slowly and deeply, so capsule vibrate	3
9	Keep breathing as long as possible	2
10	While holding breath, remove inhaler from the mouth	1
11	Breath out gently, away from the inhaler	1
12	Repeat the steps from 7 to 11 take the full dose	1
13	Open mouth piece and remove capsule	1
14	Close mouth piece and cap	1
	Total	20

Checklist for metered dose inhaler with spacer

S.No	Steps	Score
1	Remove the cap of inhaler	1
2	Hold the inhaler upright and shake well	3
3	Insert the inhaler upright into spacer	1
4	Breath out gently, away from the inhaler	1
5	Place mouthpiece between teeth without biting it and close lips to form a good seal	1
6	Start to breath in slowly through mouth and at the same time, press down firmly on canister	3
7	Continue to breathe in slowly and deeply	4
8	Hold breath for at least 10 seconds	2
9	Breathe out gently away from the inhaler	1
10	If an extra dose is needed, repeat steps 6 to 8	1
11	Replace the cap and disassemble the spacer	1
12	Rinse the mouth with water or mouthwash (only for steroid containing inhalers)	1
	Total	20

Data analysis and Interpretations

techniques and will be present in the form of tables.

Data will be analyzed according to the objectives of the study and by using appropriate statistical

Distribution of patients according to sociodemographic variables

Parameters		Number of patients	Percentage
Age	11-20	3	3%
	21-30	15	15%
	31-40	5	5%
	41-50	18	18%
	51-60	23	23%
	61-70	20	20%
	71-80	16	16%
Gender	Male	50	50%
	Female	50	50%
Educational status	Literate	59	59%
	Illiterate	41	41%
Smoking status	Smoker	35	35%
	Non-smoker	65	65%
Occupational status	Student	5	5%
	Service/job	31	31%
	Labours/ physical work	24	24%
	Retired / unemployed	40	40%
Types of airway obstructive disease	Bronchial asthma	59	59%
	Chronic obstructive pulmonary disease	41	41%
Co-morbidities	Present	43	43%
	Absent	57	57%
Type of inhalers	DPI	60	60%
	MDI	40	40%

Description about the subjects

From the above table, it describes the distribution of demographic variables, is clearly understood that with regard of age about 3% of patients of all between the age group 11-20 years, about 15% of them fall between the age 21-30 years, about 5% of them fall between the age 31-40 years, about 18% of them fall between the age 41-50 years, about 23% of them fall between the age 51-60 years, about 20% of them fall between the age 61-70 years and about 16% of them fall between the age 71-80 years.

The age group involves both Male and Female.

The table represents the study involves the 50% of Male and 50% of Female.

The table shows that Education status of the patients into two categories was Literate about 59% and Illiterate about 41%.

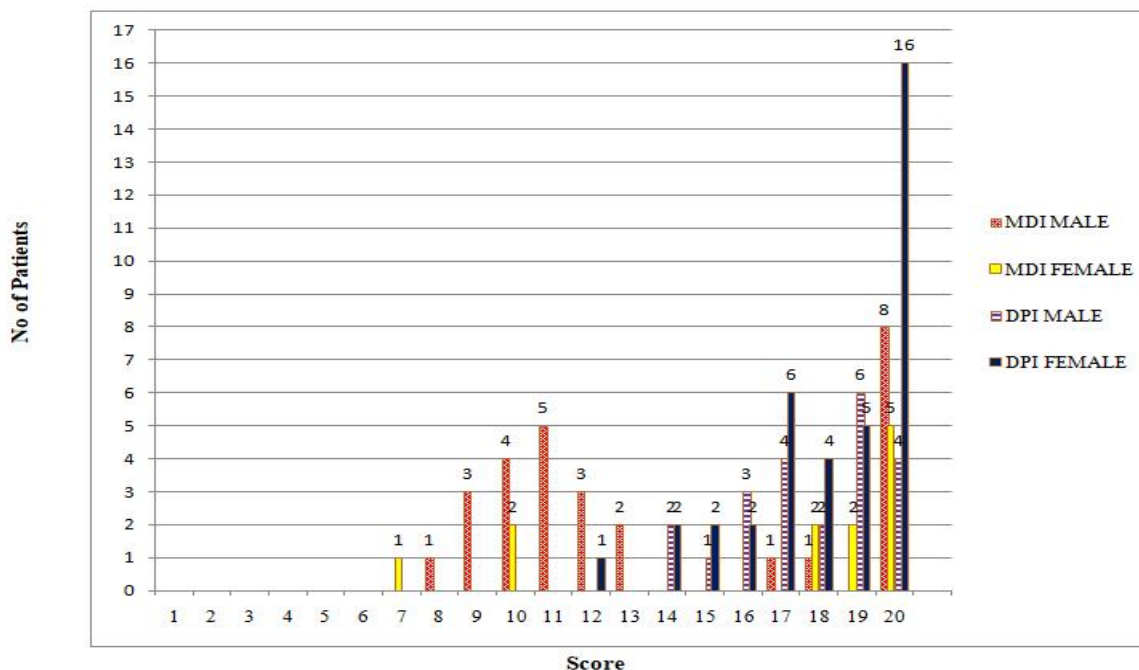
The table shows the Smoking status of the inhaler using patients, where 35% of them were Smokers and 65% of them were Non-Smokers.

The table shows the Occupation of the patients with obstructive airway disease, where 5% of patient were students, 31% of patient's occupation were Service/Job, 24% of patients were Labour/Physical worker and the rest 40% were Unemployed/Retired.

The table shows the Types of obstructive airway disease, which were Bronchial Asthma about 59% and chronic obstructive pulmonary disease about 41%.

The table shows the patients having the co morbidities such as Systemic Hypertension and Type II Diabetes Mellitus, about 43% of patients are having co morbidities and about 51% of them are not having above co morbidities.

The table shows the Type of inhalers used in the obstructive airway disease by the patients, about 60% of them using Dry Powder Inhalers and about 40% of them using Metered Dose Inhalers.



The scores in patients using MDI and DPI

The above graph represents the Scores calculated from the checklist of the Dry Powder Inhaler and Metered Dose Inhaler performed by Males and Females in the Tertiary care hospital.

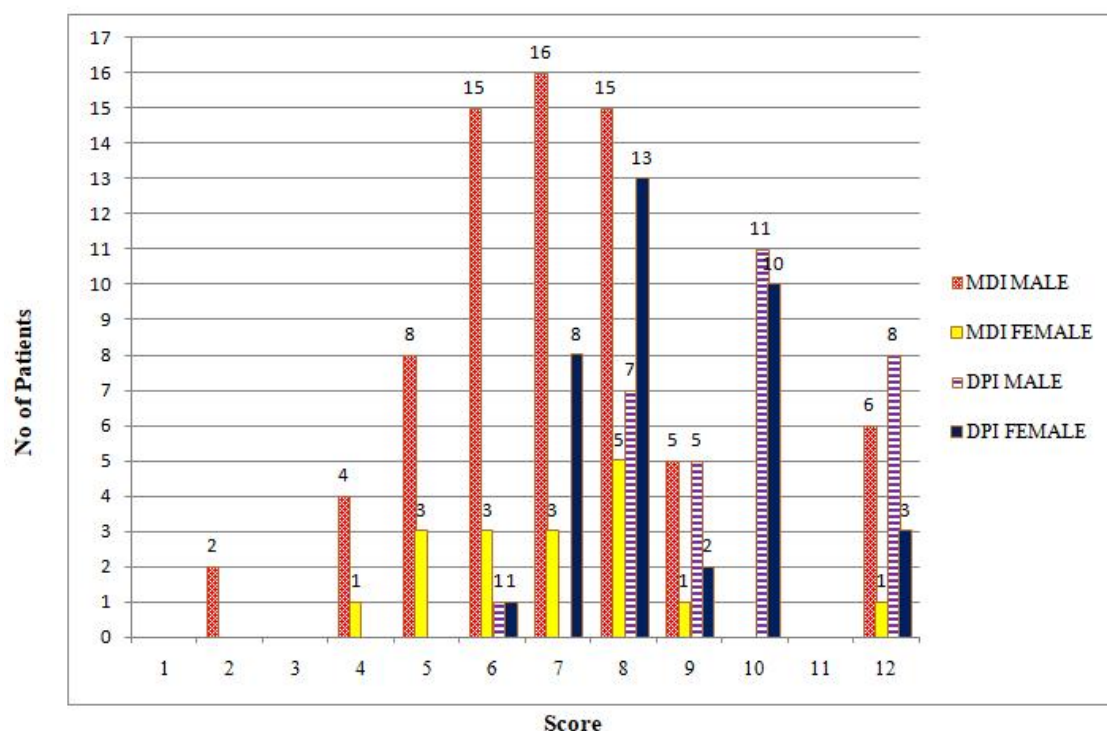
The graph shows that each scores from 1 to 20 performed by Number of persons.

The graph shows the 100 patients scoring with the category of Male and Female also with the Type of Inhalers (DPI & MDI) used.

The above graph shows that the highest score 20 is obtained by 16% of Females who using DPI, 4% of Males who using DPI, 5% of Females who using MDI and 8% of Males using MDI.

The lowest score of 7 was obtained by 1% of Female using MDI, and the score 8 was obtained by 1% of Male using MDI.

The graph shows that MDI using patients had more number of lowest scores in the study and DPI using patients had the more number of highest scoring patients.



The errors in patients using MDI and DPI

The above graph represents the errors which identifies from the checklist of the DPI and MDI performed by Males and Females in the Hospital.

The graph shows the errors in each steps of checklist in DPI and MDI performed by number of patients.

The graph shows the 68 patients who performed the Incorrect technique in using the inhalers.

The above graph shows 16% of Male using MDI

had more number of errors in 7th step of MDI checklist and 5% of Females using MDI had more errors in 8th step of MDI checklist.

It shows 11% of Male using DPI had more number of errors in the 10th step and 13# of Female using DPI had more number of errors in 8th step.

The graph shows that MDI using Females had the less number of errors in using inhalers and MDI using Males had the more number of errors in using inhaler than others.

Errors in metered dose inhaler with spacer

Step	Errors
Hold the inhaler upright and shake well	2
Breath out gently, away from the inhaler	5
Place mouthpiece between teeth without biting it and close lips to form a good seal	11
Start to breath in slowly through mouth and at the same time, press down firmly on canister	18
Continue to breathe in slowly and deeply	19
Hold breath for at least 10 seconds	20
Breathe out gently away from the inhaler	6
Rinse the mouth with water or mouthwash (only for steroid containing inhalers)	7

Errors in dry powder inhaler

Step	Errors
Breathe out gently, away from the inhaler	2
Place mouth piece between teeth without biting and close the lips to form a seal	8
Breathe in slowly and deeply, so capsule vibrate	20
Keep breathing as long as possible	7
While holding breath, remove inhaler from the mouth	21
Repeat the steps from 7 to 11 take the full dose	11

Results

The Demographic data of the patients are given in the table. No significant associations were found between age, education, occupation and demographic variation with the technique of inhalation.

Among 100 patients, only 32 patients are able to perform inhaler technique correctly. Among 68 doing incorrect technique, 27 patients were on MDI and 41 patients were had DPI. The details of the patients and the errors they made are tabulated.

Parameters		n%	Incorrect users	X ²	P
Age	11-20	3	3	33.65	21.03
	21-30	15	2		
	31-40	5	1		
	41-50	18	15		
	51-60	23	18		
	61-70	20	15		
	71-80	16	14		
Gender	Male	50	38	2.94	3.84
	Female	50	30		
Educational status	Literate	59	32	12.51	3.84
	Illiterate	41	36		
Smoking status	Smoker	35	29	5.45	3.84
	Non-smoker	65	39		
Occupational status	Student	5	3	4.5	12.59
	Service/job	31	18		
	Labours/ physical work	24	15		
	Retired / unemployed	40	32		
Types of airway obstructive disease	Bronchial asthma	59	35	4.96	3.84
	Chronic obstructive pulmonary disease	41	33		

Co-morbidities	Present	43	11	32	1.41	3.84
	Absent	57	21	36		
Type of inhalers	DPI	60	19	41	0.007	3.84
	MDI	40	13	27		
P<0.05						

Patients made errors in one or more steps of the inhaler technique. In our settings, most common form of inhaler therapy was DPI. When we assessed the technique of using DPI, the most common error was the patient fails holding breath for 10 seconds. It was observed in 21 patients. Another error observed was failure to do forceful and deep inhalation, which is the most crucial in effective drug delivery to airways. According to the GINA guidelines when we assessed clinical control of symptoms in relation to inhaler technique, 31 (31%) patients had poor or partial clinical control with incorrect technique. It indicates the poor inhaler technique is the most important risk factor for poor clinical control. This study indicates the asthma control status is significantly associated with inhalation technique. No significant association was seen between side effects associated with inhaler and the technique or dosage.

It is important that active measures should be taken to improve patient's basic knowledge regarding Obstructive Airway disease diagnosis and inhaler technique. Apart from the current guidelines demonstrating complete steps of use of different inhalers, verbal guidance and visual demonstration on small groups or video tutorials should also be provided to improve measures. It is important to determine patient's preference while prescribing inhaler for the first time so that compliance and acceptance for prescribed device will be better.

Conclusion

There is a significant association between the proper use of inhaler technique and good clinical asthma control. Health professional should educate patients about inhalation technique during their first visit and constantly ask patients to bring inhaler in successive visits so that technique,

compliance and effective clinical control can be assessed for better outcomes. The Demographic data of the patients are given in the table. No significant associations were found between age, education, occupation and demographic variation with the technique of inhalation.

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Access this Article in Online	
	Website: www.ijarm.com
	Subject: Medical Sciences
Quick Response Code	
DOI: 10.22192/ijamr.2021.08.09.001	

How to cite this article:

G. Aswini, V.K.B. Jeyaa Janane, T. Kamali, V. Nandhini, M. Srividhya, M. Swetha. (2021). A Descriptive study on Compliance and Efficacy of Inhaler technique in Obstructive Airway Disease patients in Respiratory Medicine Department at a Tertiary care hospital. Int. J. Adv. Multidiscip. Res. 8(9): 1-12.

DOI: <http://dx.doi.org/10.22192/ijamr.2021.08.09.001>