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PHARMACOECONOMIC ANALYSIS AND PRESCRIBING PATTERNS OF PATIENTS SUFFERING FROM ASTHMA IN A TERTIARY CARE HOSPITAL

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Abstract

Asthma is the most common respiratory disease, but the information regarding the Pharmacoeconomics of this disease isn't widely available. Pharmacoeconomics involves the study of medication-related costs in the prescription, diagnosis, and treatment of the disease. It also includes the study of the effects of these medication costs on the financial status of the patients. This helps in the reduction of medication-related costs. The present study was conducted to perform "Pharmacoeconomic Analysis and to study the prescribing patterns in patients suffering from Asthma in BBR Multispecialty Hospital, Balnagar, Hyderabad over a period of 3 months i.e., from December 2021 to February 2022. The primary objective was to perform pharmacoeconomic analysis in asthma patients. The secondary objective was to study the prescription patterns of asthma medication in a tertiary care hospital. This is a consecutive consent, purposive study conducted at BBR Multispecialty Hospital carried out for a period of 3 months from December 2021 to February 2022. All the patients meeting the inclusion and exclusion criteria were informed the details of the study, and consent were obtained. About 110 patients within the age group of 15-70 were collected. The suitable statistical analysis with Microsoft excels was done. The average cost per day of asthma was found to be 79 rupees for mild asthma patients, 432 rupees for moderate asthma patients, and 2161 rupees for severe asthma patients. Among these, the highest cost was found to be 120.4 rupees for Nebulizer Foracort and the least cost was found to be 9.04 rupees for Inhaler Airz FB. The overall healthcare costs can be reduced by evaluation and reassessment of pharmacoeconomic data from manufacturing to dispensing.

Keywords: -Asthma, Tertiary care hospital, Nebulizer, Pharmacoeconomics

INTRODUCTION

The 2015 Global Strategy for Asthma Management and Prevention by the Global Initiative for Asthma (GINA) defined asthma as a heterogeneous disease characterized by chronic airway inflammation and variable remodelling that results in a range of clinical presentations, treatment responses and natural history across the lifecourse of the patient[1]. Asthma involves a history of respiratory symptoms — including wheeze, shortness of breath, chest tightness and cough — that vary over time and in intensity, variable expiratory airflow limitation and airway hyper-responsiveness to a range of stimuli, such as exercise and inhaled irritants. At the population level, a subset of individuals with asthma exhibits an accelerated decline in lung function over their lifetime [2], which, in severe chronic disease, manifests as fixed airflow obstruction. This decline is especially prominent in late-onset asthma [3]. The origin and severity of asthma are driven by strong genetic and environmental factors. Although most cases of asthma begin in childhood in association with IgE-dependent sensitization to common environmental allergens [4], asthma can also emerge later in life. Adult-onset asthma often occurs in the absence of allergy but can be accompanied by intolerance to NSAIDs, rhinosinusitis and nasal polyps [5]. Intolerance to NSAIDs most likely results from reduced production of the anti-bronchoconstrictor prostaglandin E2 under conditions of inflammation. Asthma is often accompanied by co-morbidities including multi-organ allergies, such as allergic rhinitis, conjunctivitis, atopic dermatitis and food allergy, as well as non-allergic disorders, such as obesity, gastro-oesophageal reflux and psychiatric conditions [6]. Asthma is subject to periods of rapid deterioration (or exacerbations) that are provoked by viral infection and exposure to allergens, air pollutants and certain drugs such as aspirin and other NSAIDs [7]. In addition, certain types of asthma can enter spontaneous remission (that is, patients become symptom-free), such as during late childhood and adolescence [8], and can respond to allergen-specific immunotherapy through the acquisition of immunological tolerance [9].

The aim is to perform pharmacoeconomic analysis and prescribing patterns of patients suffering from asthma in a tertiary care hospital. The main objectives are to perform pharmacoeconomic analysis in asthma patients, to study the prescription patterns of asthma medication in a tertiary care hospital.

METHODOLOGY

Inclusion Criteria:

*Patients suffering from Asthma.
*Including inpatients.
*Adults (people in the age group of 15-70).

Exclusion Criteria:

*People who are not able to give consent.
*Patients who are pregnant and pediatrics.

Methods and Materials:

Study Type:

*This type is a (consecutive, consent) purposive sample.

Study Location:

*This study will be conducted at BBR Hospital, Balnagar, Hyderabad.

Study Period:

*This study will be carried out for 3 months starting from 10 December to 20 February.

Sample Size:

*Sample size containing 100-150 patients will be collected.

Plan of Work:
Involves the following steps.

Step-1:
Patient data collection.

Step-2:
Collecting pulmonology and research data.

Step-3:
Above data analysis

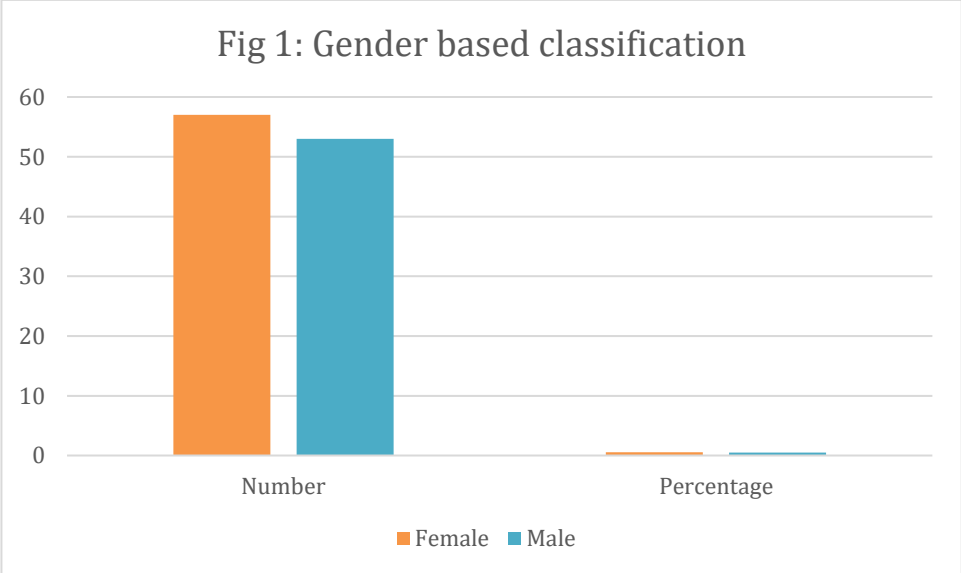
Step-4:
Preparation of final report of the project on anti-asthmatic drugs.

RESULTS

Gender	Number	Percentage
Female	57	52%
Male	53	48%

Table 1: Gender-based analysis in asthma patients

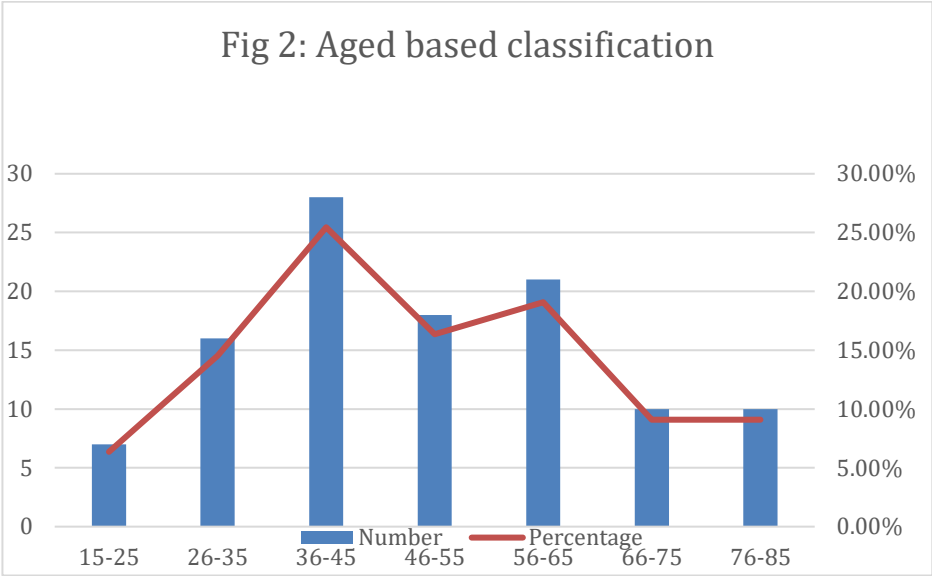
Among 110 patients,57 patients (52%) were found to be female, and 53 patients (48%) were found to be male.



Age	Number	Percentage
15-25	7	6.36%
26-35	16	14.54%
36-45	28	25.45%
46-55	18	16.36%
56-65	21	19.09%
66-75	10	9.09%
76-85	10	9.09%

Table 2: Age-based analysis in asthmatics

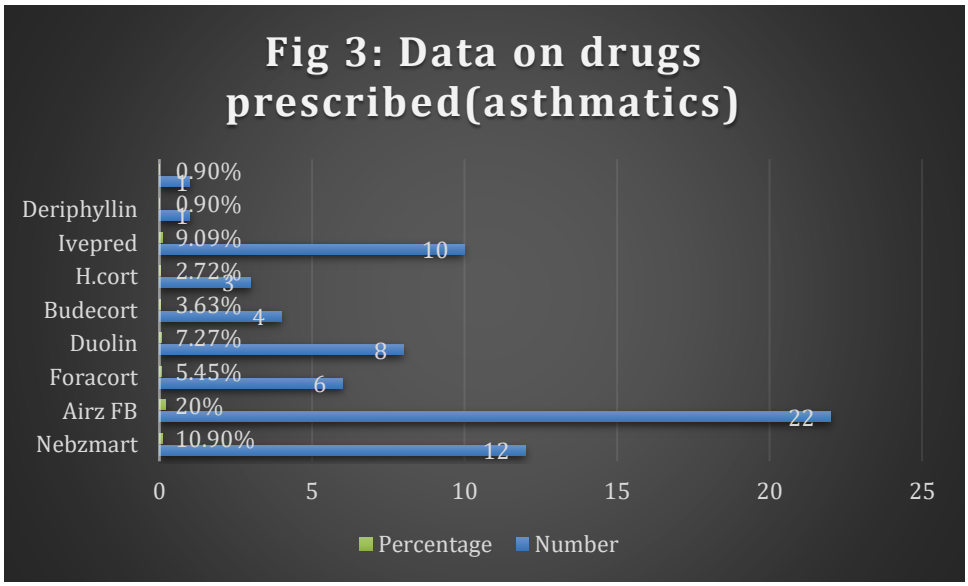
Among all the patients, 7 patients (6.36%) were in the age group 15-25, 16 patients (14.54%) were in the age group 26-35, 28 patients (25.45%) were in the age group 36-45, 18 patients (16.36%) were in the age group 46-55, 21 patients (19.09%) were in the age group 56-65, 10 patients (9.09%) were in the age group 66-75, 10 patients (9.09%) were in the age group 76-85.



Drug	Number	Percentage
Digihaler	12	10.90%
Nebzmart	22	20%
Airz FB	6	5.45%
Foracort	8	7.27%
Duolin	4	3.63%
Budecort	3	2.72%
H.cort	10	9.09%
Ivepred	1	0.90%
Deriphyllin	1	0.90%

Table 3: Data of drugs prescribed in asthma patients:

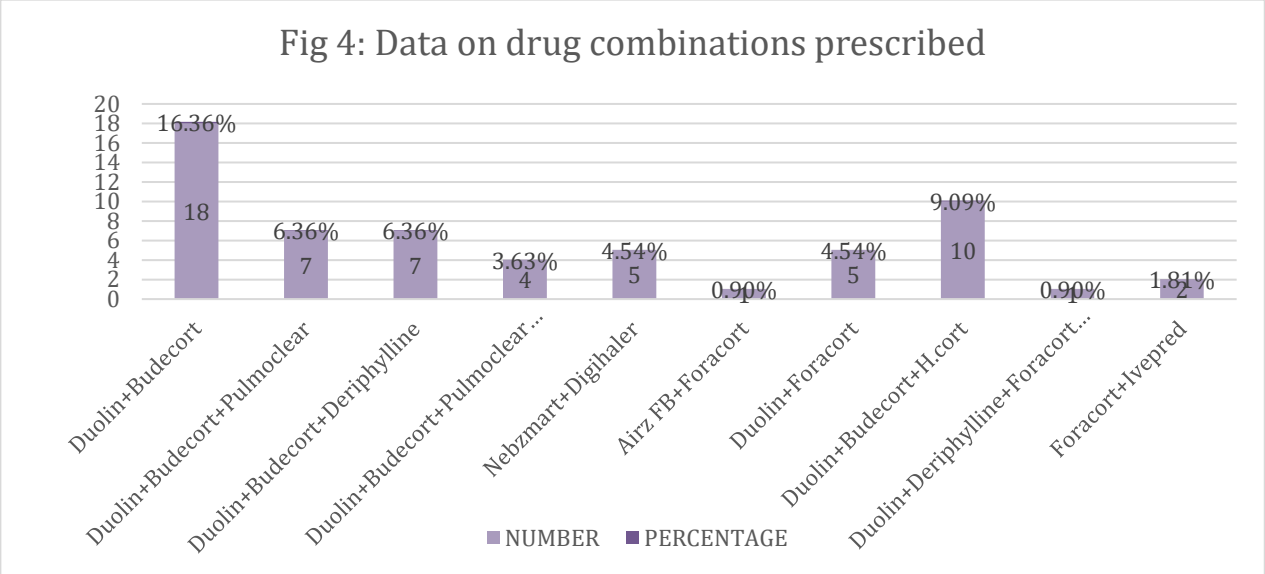
Among all the patients 12 patients(10.90%) were prescribed the Inhaler Digihaler, 22 patients(20%) were prescribed the Nebuliser Nebzmart, 6 patients(5.45%) were prescribed the Inh Airz FB, 8 patients (7.27%) were prescribed the Nebuliser Foracort, 4 patients (3.63%) were prescribed the Nebuliser Duolin, 3 patients (2.72%) were prescribed the Nebuliser Budecort, 10 patients (9.09%) were prescribed the corticosteroid Hydrocortisone, 1 patient(0.90%) was prescribed Corticosteroid Ivepred, 1 patient(0.90%) was prescribed the methylxanthine Deriphyllin.



COMBINATIONS	NUMBER	PERCENTAGE
Duolin+Budecort	18	16.36%
Duolin+Budecort+Pulmoclear	7	6.36%
Duolin+Budecort+Deriphylline	7	6.36%
Duolin+Budecort+Pulmoclear+Deriphylline	4	3.63%
Nebzmart+Digihaler	5	4.54%
Airz FB+Foracort	1	0.90%
Duolin+Foracort	5	4.54%
Duolin+Budecort+H.cort	10	9.09%
Duolin+Deriphylline+Foracort+Ivepred	1	0.90%
Foracort+Ivepred	2	1.81%

Table 4: Data on drug combinations prescribed in asthmatics:

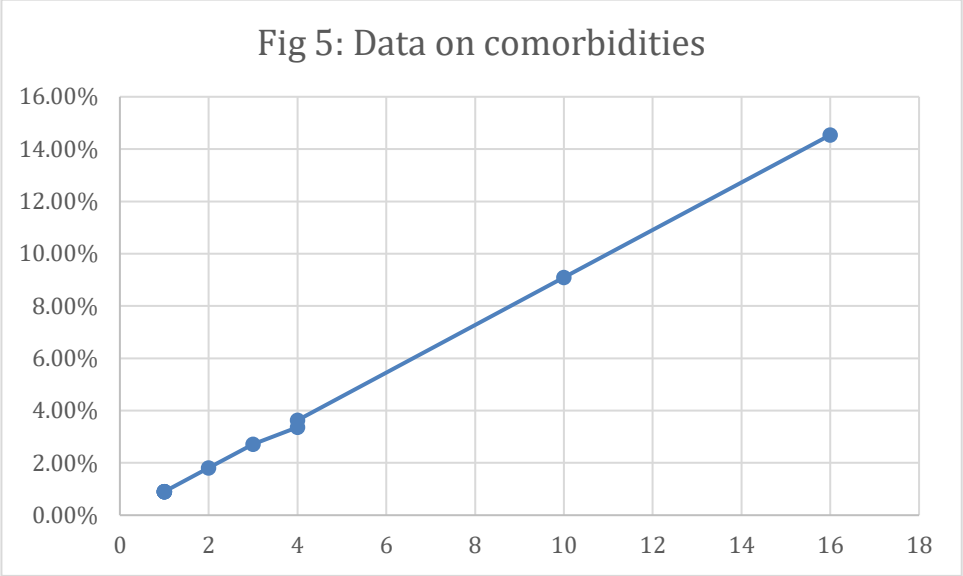
Among all the patients,18 patients (16.36%) were given the combination therapy Duolin+Budecort, 7 patients(6.36%) were given the combination therapy Duolin+Budecort+Pulmoclear, 7 patients (6.36%) were given the combination therapy Duoiln+ Budecort+ Deriphylline, 4 patients(3.63%) were given the combination therapy Duolin+ Budecort+ Pulmoclear+ Deriphylline, 5 patients (4.54%) were given the combination therapy Nebzmart+ Digihaler, 1 patient (0.90%) were given the combination therapy Airz FB+ Foracort, 5 patients (94.54%) were given the combination therapy Duolin + Foracort, 10 patients (9.09%) were given the combination therapy Duolin+ Budecort+ H.Cort, 1 patient(0.90%) was given the combination therapy Duolin+ Deriphylline+ Foracort+ Ivepred, 2 patients(1.81%) were given the combination therapy Foracort+Ivepred.



DISEASE	NUMBER	PERCENTAGE
HTN	16	14.54%
DM	10	9.09%
HYPOTHYROIDISM	4	3.63%
SINUSITIS	4	3.36%
CAD	3	2.72%
GERD	2	1.81%
CORADS	1	0.90%
COVID	1	0.90%
PLEURAL EFFUSION	1	0.90%
HEMIPLEGIA	1	0.90%
SEVERE ASCITES	1	0.90%

Table 5: Demographic data on comorbidities

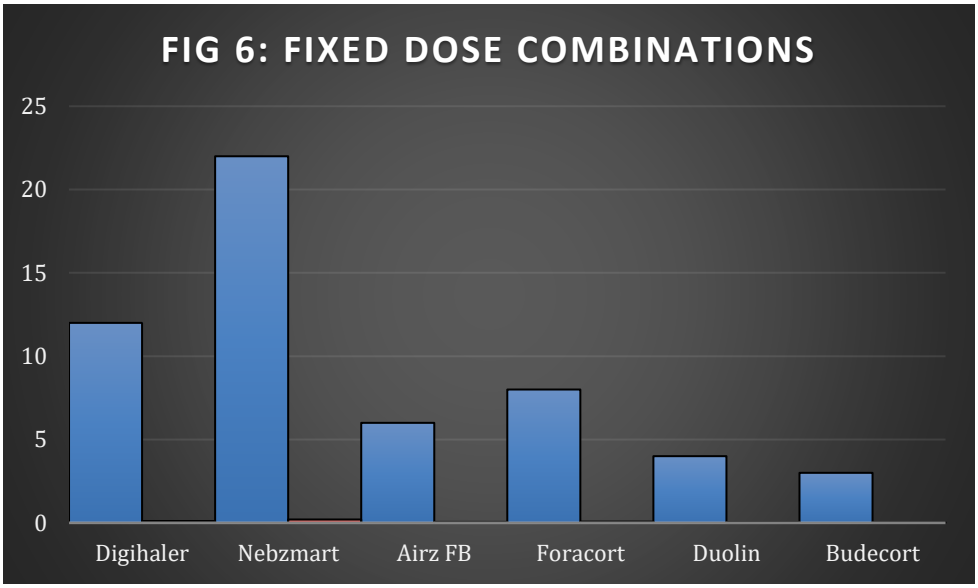
16 patients(14.54%) were found to be suffering from hypertension, 10 patients(9.09%) were found to be suffering from DM, 4 patients (3.63%) were found to be suffering from hypothyroidism, 4 patients (3.36%) were found to be suffering from sinusitis, 3 patients (2.72%) were found to be suffering from CAD, 2 patients(1.81%) were found to be suffering from GERD, 1 patient(0.90%) was found to be suffering from CORADS, 1 patient (0.90%) was found to be suffering from COVID, 1 patient (0.90%) was found to be suffering from Pleural effusion, 1 patient(0.90%) was found to be suffering from Hemiplegia, 1 patient(0.90%) was found to be suffering from severe ascites.



FIXED-DOSE COMBINATION	NUMBER	PERCENTAGE
Digihaler	12	10.90%
Nebzmart	22	20%
Airz FB	6	5.45%
Foracort	8	7.27%
Duolin	4	3.63%
Budecort	3	2.72%

Table 6: Data of fixed-dose combination

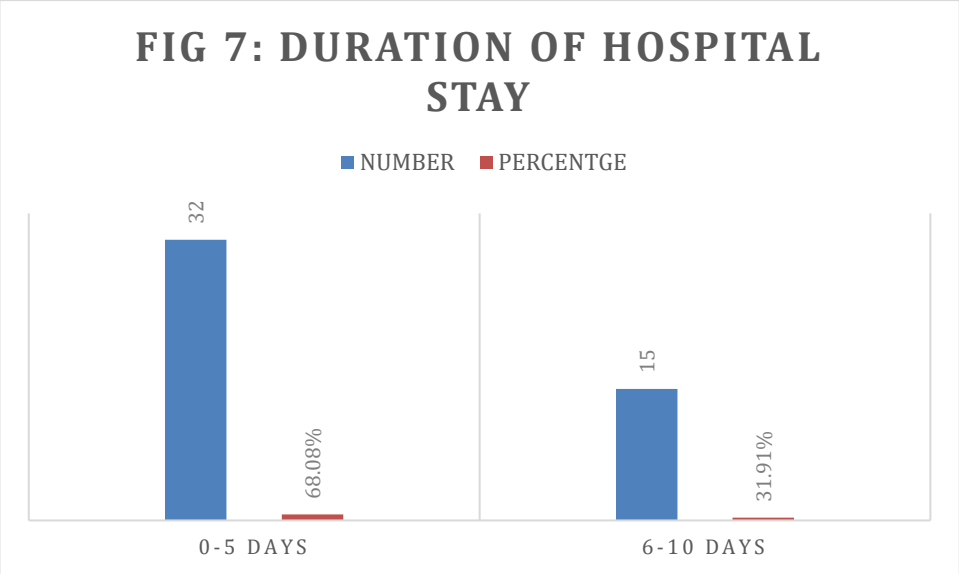
12 patients (10.90%) were prescribed the Inhaler Digihaler, 22 patients (20%) were prescribed the Nebuliser Nebzmart, 6 patients (5.45%) were prescribed the Inhaler Airz FB, 8 patients (7.27%) were prescribed the nebulizer Foracort, 4 patients (3.63%) were prescribed the Nebuliser Duolin, 3 patients (2.72%) were prescribed the nebulizer Budecort.



DURATION OF HOSPITAL STAY	NUMBER	PERCENTAGE
0-5 DAYS	32	68.08%
6-10 DAYS	15	31.91%

Table 7: Analysis of the duration of hospital stay

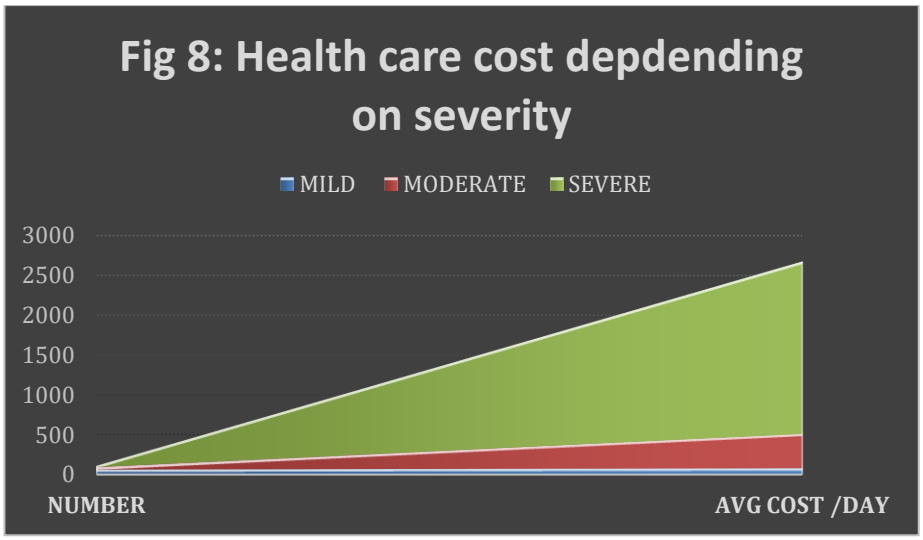
32 patients (68.08%) were hospitalized for 0-5 days,15 patients (31.91%) were hospitalized for 6-10days.



ILLNESS		
SEVERITY	NUMBER	AVG COST /DAY
MILD	63	79
MODERATE	32	432.73
SEVERE	15	2161

Table 8: Data on analysis of health care cost based on the severity of illness

Among all the patients, 63 patients were suffering from mild asthma and the average cost per day is rs.79,32 patients were suffering from moderate asthma the average cost per day is rs.432.73,15 patients were suffering from severe asthma and avg cost per day is rs.2161.

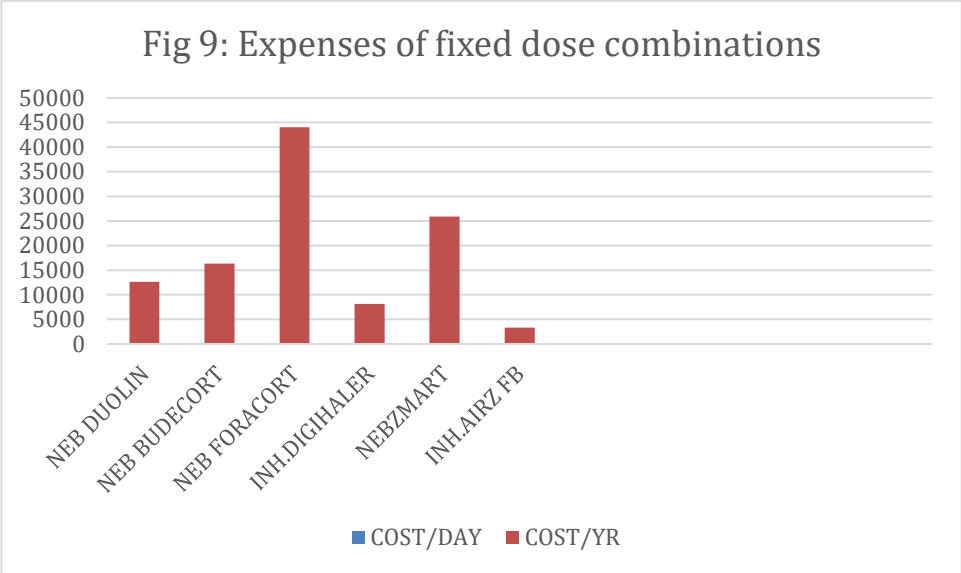


FIXED-DOSE COMBINATION	COST/DAY	COST/YR
NEB DUOLIN	34.5	12592.5
NEB BUDECORT	44.6	16279
NEB FORACORT	120.4	43946

INH.DIGIHALER	22.32	8146.8
NEBZMART	70.8	25842
INH.AIRZ FB	9.04	3299.6

Table 9: Expenses of fixed-dose combinations

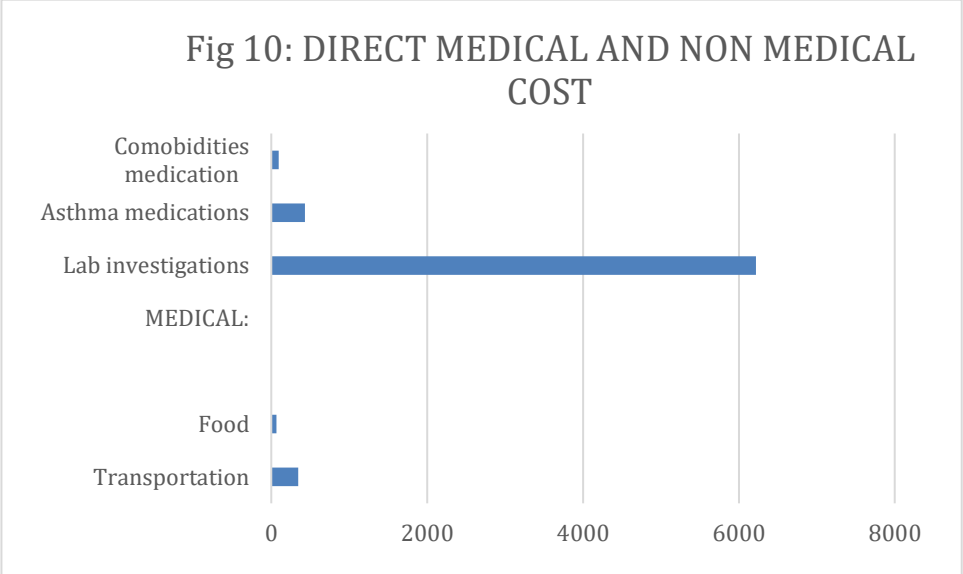
Cost of nebulizer Duolin per day was found to be rs.34.5 and per year was found to be rs.12592.5, cost of nebulizer Budecort per day was found to be rs.44.6 and per year was rs.16279, cost of nebulizer Foracort per day was found to be rs.120.4 and per year cost was rs.43946, cost of inhaler Digihaler per day was found to be rs.22.32 and per year cost was rs.8146.8, cost of nebulizer Nebzmart per day was found to be rs.70.8 and per year cost was rs.25842, cost of inhaler Airz FB per day was found to be rs.9.04 and per year the cost was rs.3299.6.



DIRECT MEDICAL AND NON-MEDICAL COST	
COMPONENTS OF COST	TOTAL COST
NON-MEDICAL:	
Transportation	345
Food	65
MEDICAL:	
Lab investigations	6221
Asthma medications	432
Comorbidities medication	94.13

Table 10: Data of direct medical and nonmedical costs

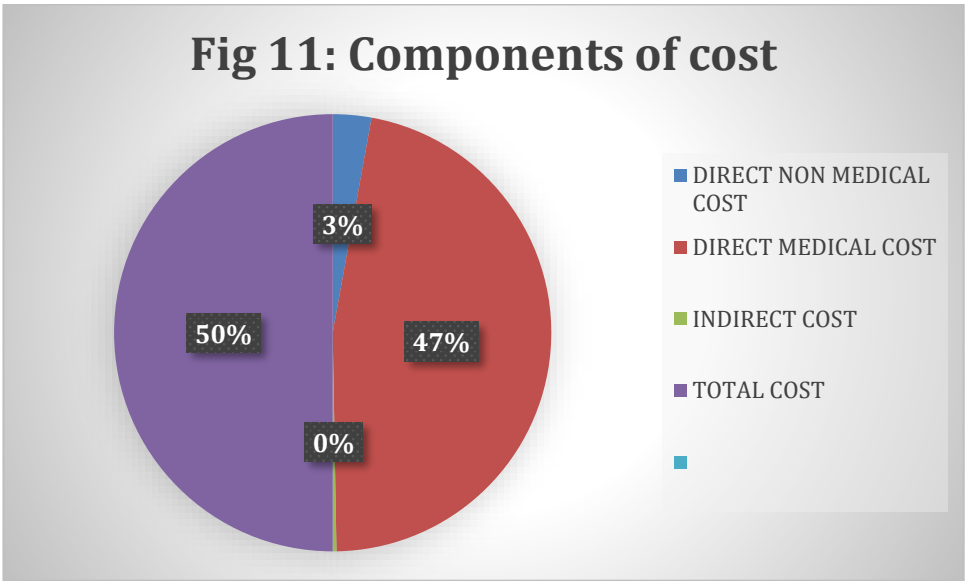
Nonmedical components include transportation and food which costs Rs.345 and Rs.65 respectively. Medical components include lab investigations, asthma medication, and comorbidities medication which costs Rs.6221, Rs.43,2 and Rs.94.13 respectively



COMPONENTS OF COST	COST
DIRECT NON-MEDICAL COST	410
DIRECT MEDICAL COST	6747
INDIRECT COST	40
TOTAL COST	7197

Table 11: Data on components of cost

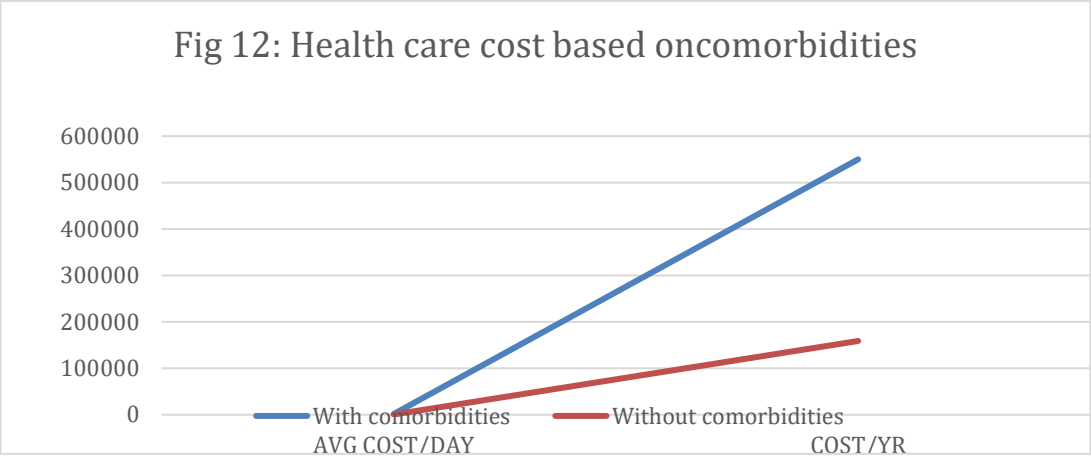
The direct non-medical cost was Rs.410, the Direct medical cost was Rs.6747, the Indirect cost was Rs.40, and the total cost was Rs.7197.



HEALTHCARE COSTS BASED ON COMORBIDITIES		
CONDITION	AVG COST/DAY	COST/YR
With comorbidities	1507	550055
Without comorbidities	432	158775

Table 12: Data of healthcare cost based on comorbidities:

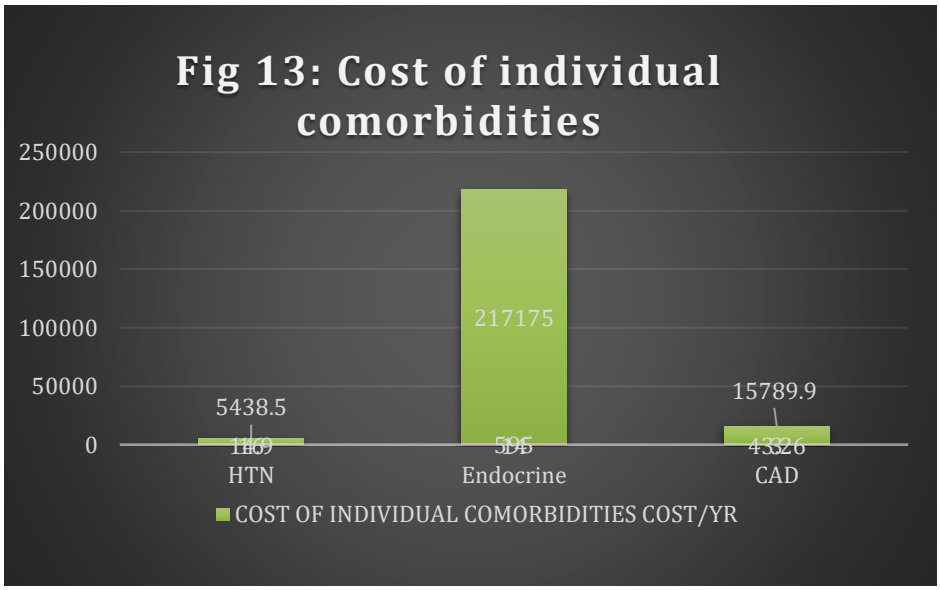
The average cost per day of a patient with comorbidities was Rs.1507 and per year was Rs. 5500the 55, the average cost per day of a patient without comorbidities was Rs.432 and per year was Rs.158775.



COST OF INDIVIDUAL COMORBIDITIES				
VARIABLE	MORBID CONDITION	NUMBER OF PATIENTS	COST/DAY	COST/YR
	HTN	16	14.9	5438.5
	Endocrine	14	595	217175
	CAD	3	43.26	15789.9

Table 13: Data on analysis of the cost of individual comorbidities**:**

The cost per day of the patient with hypertension was Rs.14.9 and per year was Rs.543 8.5, the cost per day of the patient with endocrine disorders was Rs.595 and per year was 217175, the cost per day of the patient with CAD was Rs.43.26 and per year was 15789.9.

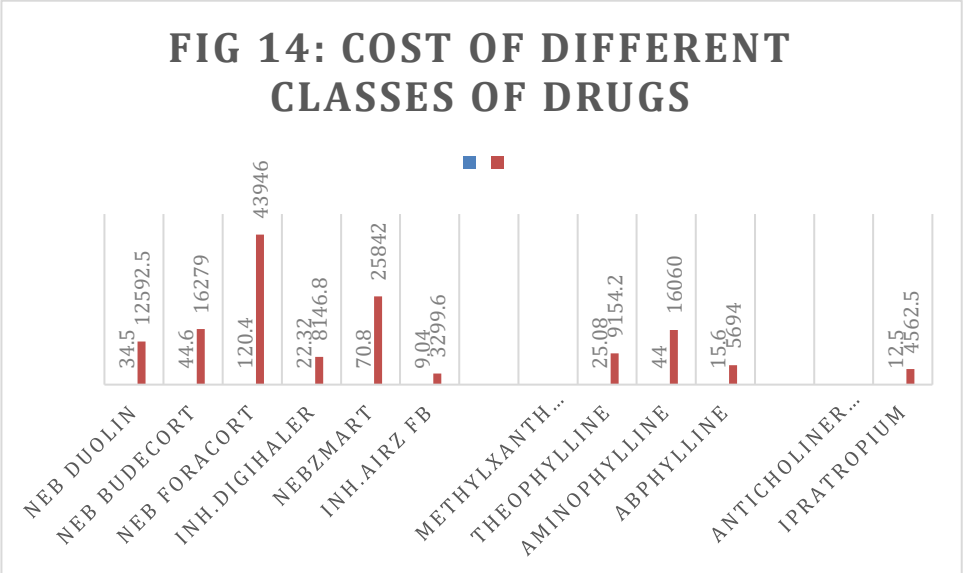


DRUG CLASS	COST/DAYCOST/YR	COST/YR
BETA 2 SYMPATHOMIMETICS		
NEB DUOLIN	34.5	12592.5
NEB BUDECORT	44.6	16279
NEB FORACORT	120.4	43946

INH.DIGIHALER	22.32	8146.8
NEBZMART	70.8	25842
INH.AIRZ FB	9.04	3299.6
METHYLXANTHINES		
Theophylline	25.08	9154.2
Aminophylline	44	16060
Abphylline	15.6	5694
ANTICHOLINERGICS		
Ipratropium	12.5	4562.5

Table 14: Data on the cost of different classes of drugs:

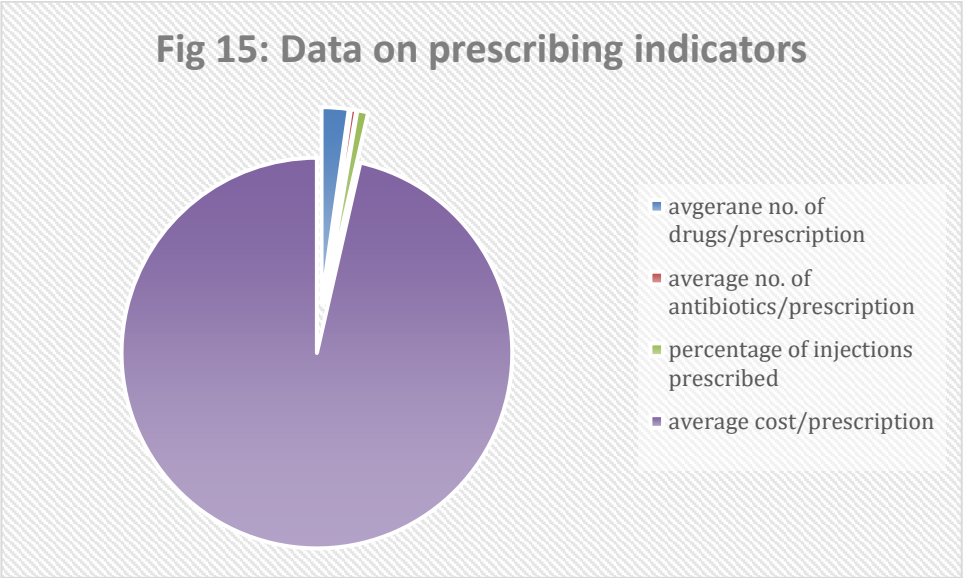
Class 1: Beta 2 sympathomimetics: Cost of nebulizer Duolin per day was found to be rs.34.5 and per year was found to be rs.12592.5, cost of nebulizer Budecort per day was found to be rs.44.6 and per year was rs.16279, cost of nebulizer Foracort per day was found to be rs.120.4 and per year cost was rs.43946, cost of inhaler Digihaler per day was found to be rs.22.32 and per year cost was rs.8146.8, cost of nebulizer Nebzmart per day was found to be rs.70.8 and per year cost was rs.25842, cost of inhaler Airz FB per day was found to be rs.9.04 and per year the cost was rs.3299.6.
Class 2: Methylxanthines: Cost of theophylline per day was Rs.25.08 and per year was Rs.9154.2, cost of aminophylline per day was Rs.44 and per year was Rs 16060, cost of abphylline per day was Rs.15.6 and per year Rs.5694.
Class 3: Anticholinergics: The cost of ipratropium per day was Rs.12.5 and per year was Rs.4562.5.



PRESCRIBING INDICATORS	
PRESCRIBING INDICATORS	RESULTS
average no. of drugs/prescription	10
average no. of antibiotics/prescription	2
Average no. of injections prescribed	4
average cost/prescription	432

Table 15: Data on prescribing indicators:

An average number of drugs per prescription was found to be 10, an average number of antibiotics per prescription was 2, an average number of injections prescribed was 4, and the average cost per prescription was Rs.432.



DISCUSSION

The study aimed to analyze the pharmacoeconomic data and prescribing patterns of patients suffering from asthma in a tertiary care hospital. The study was conducted at BBR Multispecialty Hospital in Balnagar, Hyderabad for 6 months i.e., from October 2021 to March 2022. All the necessary and relevant data from patient history, treatment charts, and laboratory data were collected.

Gender-based analysis in asthma patients

Among 110 patients,57 patients (52%) were found to be female, and 53 patients (48%) were found to be male.

Age-based analysis in asthmatics

Among all the patients, 7 patients (6.36%) were in the age group 15-25, 16 patients (14.54%) were in the age group 26-35, 28 patients(25.45%) were in the age group 36-45, 18 patients(16.36%) were in the age group 46-55, 21 patients (19.09%) were in the age group 56-65, 10 patients(9.09%) were in the age group 66-75, 10 patients (9.09%) were in the age group 76-85.

Data of drugs prescribed in asthma patients:

Among all the patients 12 patients(10.90%) were prescribed the Inhaler Digihaler, 22 patients(20%) were prescribed the Nebuliser Nebzmart, 6 patients(5.45%) were prescribed the Inh Ariz FB, 8 patients (7.27%) were prescribed the Nebuliser Foracort, 4 patients (3.63%) were prescribed the Nebuliser Duolin, 3 patients (2.72%) were prescribed the Nebuliser Budecort, 10 patients (9.09%) were prescribed the corticosteroid Hydrocortisone, 1 patient(0.90%) was prescribed Corticosteroid Ivepred, 1 patient(0.90%) was prescribed the methylxanthine Deriphylline. Nebulizer Nebzmart was prescribed the most as it has the least number of side effects, Ivepred and Deriphylline were prescribed individually the least as they were given in combination therapy more.

Data on drug combinations prescribed in asthmatics:

Among all the patients,18 patients (16.36%) were given the combination therapy Duolin+Budecort, 7 patients(6.36%) were given the combination therapy Duolin+Budecort+Pulmoclear, 7 patients(6.36%) were given the combination therapy Duoiln+ Budecort+ Deriphylline, 4 patients(3.63%) were given the combination therapy Duolin+ Budecort+ Pulmoclear+ Deriphylline, 5 patients (4.54%) were given the combination therapy Nebzmart+ Digihaler, 1 patient (0.90%) were given the combination therapy Airz FB+ Foracort, 5 patients (94.54%) were given the combination therapy Duolin + Foracort, 10 patients (9.09%) were given the combination therapy Duolin+ Budecort+ H.Cort, 1 patient(0.90%) was given the combination therapy Duolin+ Deriphylline+ Foracort+ Ivepred, 2 patients(1.81%) were given the combination therapy Foracort+Ivepred. A combination of Duolin+Budecort was prescribed the most as the efficacy of the combination is proven to be more.

Demographic data on comorbidities:
16 patients(14.54%) were found to be suffering from hypertension, 10 patients(9.09%) were found to be suffering from DM, 4 patients (3.63%) were found to be suffering from hypothyroidism, 4 patients (3.36%) were found to be suffering from sinusitis, 3 patients (2.72%) were found to be suffering from CAD, 2 patients(1.81%) were found to be suffering from GERD, 1 patient(0.90%) was found to be suffering from CORDS, 1 patient (0.90%) was found to be suffering from COVID, 1 patient (0.90%) was found to be suffering from Pleural effusion, 1 patient(0.90%) was found to be suffering from Hemiplegia, 1 patient (0.90%) was found to be suffering from severe ascites. Hypertension and diabetes have a higher prevalence in the case of asthmatics.

Data of fixed-dose combination:
12 patients (10.90%) were prescribed the Inhaler Digihaler, 22 patients (20%) were prescribed the Nebuliser Nebzmart, 6 patients(5.45%) were prescribed the Inhaler Ariz FB, 8 patients (7.27%) were prescribed the nebulizer Foracort, 4 patients (3.63%) were prescribed the Nebuliser Duolin, 3 patients (2.72%) were prescribed the nebulizer Budecort. Nebuliser Budecort was prescribed the least as they have more number of side effects.

Analysis of the duration of hospital stay:
32 patients(68.08%) were hospitalized for 0-5 days,15 patients(31.91%) were hospitalized for 6-10days. Hospitalization increases the risk of rehospitalization within the next year.
Data on analysis of health care cost based on the severity of illness:
Among all the patients, 63 patients were suffering from mild asthma. The average cost per day is rs.79,32 for patients suffering from moderate asthma. The average cost per day is rs.432.73,15 patients were suffering from severe asthma and avg cost per day is rs.2161. The health care costs increase with the severity of the disease.

Expenses of fixed-dose combinations:
Cost of nebulizer Duolin per day was found to be rs.34.5 and per year was found to be rs.12592.5, cost of nebulizer Budecort per day was found to be rs.44.6 and per year was rs.16279, cost of nebulizer Foracort per day was found to be rs.120.4 and per year cost was rs.43946, cost of inhaler Digihaler per day was found to be rs.22.32 and per year cost was rs.8146.8, cost of nebulizer Nebzmart per day was found to be rs.70.8 and per year the cost was rs.25842, cost of inhaler Airz FB per day was found to be rs.9.04 and the cost was rs.3299.6.

Data of direct medical and nonmedical costs:
Nonmedical components include transportation and food, which cost Rs.345 and Rs.65.
Medical components include lab investigations, asthma medication, and comorbidities medication which costs Rs.6221, Rs.432, and Rs.94.13 respectively. Lab investigations make up the majority of medical costs.

Data on components of cost:
The direct nonmedical cost was Rs.410, the Direct medical cost was Rs.6747, the Indirect cost was Rs.40, and the Total cost was Rs.7197.

Data of healthcare cost based on comorbidities:
The average cost per day of a patient with comorbidities was Rs.1507 and per year was Rs. 550055, the average cost per day of a patient without comorbidities was Rs.432 and per year was Rs.1587.
The cost per year tends to increase exponentially. with the presence of comorbidities.

Data on analysis of the cost of individual comorbidities:
The cost per day of the patient with hypertension was Rs.14.9 and per year was Rs.5438.5, the cost per day of the patient with endocrine disorders was Rs.595 and per year was 217175, the cost per day

of the patient with CAD was Rs.43.26 and per year was 15789.9. The cost of these comorbid drugs added to the cost of regular asthma drugs.

Data on the cost of different classes of drugs:
Class 1: Beta 2 sympathomimetics: Cost of nebulizer Duolin per day was found to be rs.34.5 and per year was found to be rs.12592.5, cost of nebulizer Budecort per day was found to be rs.44.6 and per year was rs.16279, cost of nebulizer Foracort per day was found to be rs.120.4 and per year cost was rs.43946, cost of inhaler Digihaler per day was found to be rs.22.32 and per year cost was rs.8146.8, cost of nebulizer Nebzmart per day was found to be rs.70.8 and per year cost was rs.25842, cost of inhaler Ariz FB per day was found to be rs.9.04 and the cost was rs.3299.6.

Class 2: Methylxanthines: Cost of theophylline per day was Rs.25.08 and per year was Rs.9154.2, cost of aminophylline per day was Rs.44 and per year was Rs 16060, cost of apophyllite per day was Rs.15.6 and per year Rs.5694.
Class 3: Anticholinergics: The cost of ipratropium per day was Rs.12.5 and per year was Rs.4562.5.
Data on prescribing indicators:
An average number of drugs per prescription was found to be 10, an average number of antibiotics per prescription was 2, an average number of injections prescribed was 4, and the average cost per prescription was Rs.432.

CONCLUSION

The average cost per day of asthma was found to be 79 rupees for mild asthma patients, 432 rupees for moderate asthma patients, and 2161 rupees for severe asthma patients. Among these, the highest cost was found to be 120.4 rupees for Nebulizer Foracort and the least cost was found to be 9.04 rupees for Inhaler Airz FB. The overall healthcare costs can be reduced by evaluation and reassessment of pharmacoeconomic data from manufacturing to dispensing. The prescription data of asthma patients showed the following patterns: The first pattern was found to be unnecessary and excessive use of antibiotics and the use of tablets even with the presence of Inhalers. In all the prescriptions antibiotics were prescribed even in the absence of infections, this leads to an increase in resistance to antibiotics. Use of tablets in both presence or absence of Inhalers. According to GINA Guidelines, Inhalers should be preferred over tablets in case of asthma, but the majority of prescriptions depended on tablets like Deriphylline unnecessarily. This leads to an increase in the economic burden on the patients. Further research needs to be done on the inappropriate use of tablets.

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