

“Assessment Of Cost Utility, Cost Effective And Cost Minimization Analysis Of Chronic Obstructive Pulmonary Disease Patients In Rural Areas Of Salem District”

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ABSTRACT

The goal of this study is to assess the cost utility, cost effective and cost minimization analysis of chronic obstructive pulmonary disease patients in rural areas of Salem district, Tamil Nadu. Cross-sectional study was conducted among 100 patients in rural areas of Kondappanaickenpatty, Attayampatty over a period of six months (November 2020- April 2021). Among 100 COPD patients, 66 were male and 34 were female. Cost Utility Analysis shows that 52 patients had a total cost between 10001-20000 INR. Cost Effective Analysis shows that patients who were consulting in government hospital spent only indirect cost (AVE7,706.84 INR). But patients who were consulting in private hospital spent both direct and indirect cost (AVE 20,176.73 INR). Cost Minimization analysis shows that the brand drugs which were prescribed to the study population such as Proventil (Inhaler), Budecort (Inhaler) and Efcorlin (Injection) are found to be very expensive but generic drugs by Jan Aushadhi is very less in cost when compare to alternate brands. Hence, we conclude that the treatment strategies practiced in both private and government hospital is similar, but the cost utilized is higher for patients who were consulting in private hospital than government hospitals. Patients in rural areas are better advised to take treatment in government hospitals thereby we can reduce the economic burden of patients and prefer generic drugs which are available at Jan

Aushadhi store will reduce the cost of illness in the management of COPD.

Keywords: COPD, Cost-Utility Analysis, Cost-Effective Analysis, Cost-Minimization Analysis

INTRODUCTION

Chronic Obstructive Pulmonary Disease (COPD) 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 and influenced by host factors including abnormal lung development^[1]. COPD has been defined as an airflow obstruction with a reduced FEV1/FVC ratio of less than or if FEV1 is $\geq 80\%$ of predicted normal, a diagnosis of COPD should only be made in the presence of respiratory symptoms, for example breathlessness or cough^[2].

COPD is most common cause of death globally likely to be the third leading cause. Low- and middle- income countries (LMIC) are having majority of COPD related deaths in which India and China accounts the two third of these. Currently in India, deaths due to COPD are four times higher than the deaths in developed countries. In LMICs such as India, lower socioeconomic status, including poor nutrition and childhood poverty, limited education and health literacy, as well as higher exposure to particulate matter in the air, are major causes of increased mortality due to COPD^[3,4].

In 2005, **Murthy and Sastry *et al*** reported that the incidence of COPD is higher in rural vs. urban India, with lower socioeconomic status being one of the major causes^[5]. In 2012, **Sajesh *et al*** studied cost of acute exacerbation of COPD in patients attending tertiary level government hospitals in Kerala, South India in which he concluded the total treatment cost was highly correlated with the disease severity ($p < 0.01$). Costs of management of acute exacerbation of COPD are exceptionally low in government hospitals in India compared to data obtained from developed countries^[6].

The current economic burden of COPD in India is not clearly estimated, although **Patel *et al*** calculated direct medical costs were up to Indian Rupees (INR) 5876.00 (US\$88.23) per patient from admission to discharge among hospitalised patients, with the cost of medicines constituting a substantial proportion, at over five times the hospital charges^[7].

Cost-utility analysis is used to estimate cost in terms of utilities, including quantity and quality of life. Cost-utility analysis is used to compare two different drugs or procedures whose benefits may be different. Direct costs were defined as the cost of admission, consultation, medications, diagnostics (e.g., radiologic and laboratory studies) and indirect costs includes transportation during the current hospitalization and follow-up visits to health facilities during the same episode. In this study, Cost- effective analysis aims at figuring out an estimate of treatment expense in government versus private hospitals. Cost- minimization is a tool used in Pharmacoeconomics and is applied when comparing two or more drugs of equal efficacy and equal tolerability. The main objective of this method is to select the least costly one among multiple equivalent interventions. CMA shows only a “cost savings” of one program or treatment over another^[8].

Pharmacoeconomic studies strives to guide the optimal utilization of health care resources. Since, there are limited data regarding the economic impact of patients with COPD in India, especially in rural areas of Tamil Nadu, we undertook this study to assess the cost utility, costeffective and cost minimization by calculating direct and indirect costs in patients with COPD in rural areas of Salem district, Tamil Nadu. This study was planned with the following objectives: (1) To analyze the health-care cost utilized by COPD patients in rural areas. (2) To identify the cost effectiveness of COPD patients based on type of hospital visit. (3) To minimize the economic burden for treatment of COPD patients.

MATERIALS AND METHODS

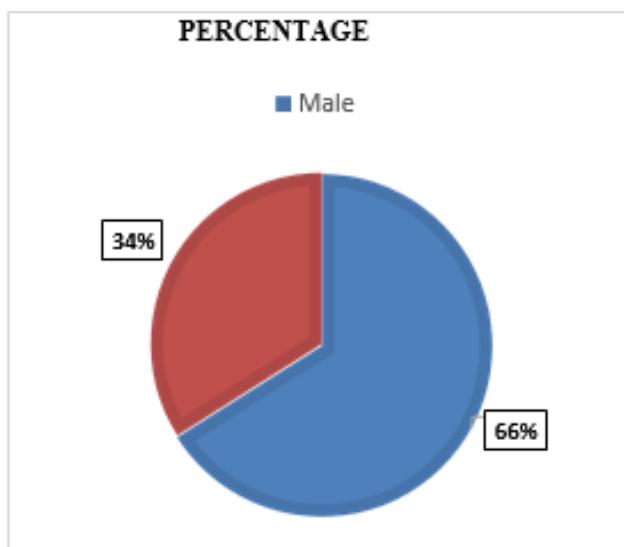
A cross-sectional study was carried out over a period of six months in rural areas of Kondappanaickanpatty, Attayampatty of Salem district, Tamil nadu. A suitable data collection form was designed to collect and document the respective details provided by patients. Patients above the age of 18 years diagnosed with COPD, those under regular treatment, patients of both gender and with or without comorbidity were included in this study. Pregnant and lactating women, patient who are not willing to give the informed consent were excluded. A consent form was made for the patient permission purpose and the signature of the patient was taken before starting the study and patient details were collected. A brief uniform coded questionnaire of 15 items was used, in which demographic variables and items related to the direct costs and indirect costs of patients were included. The questionnaire was administered individually to all COPD patients after obtaining their consent ^[11].

RESULTS AND DISCUSSION

Table 1: Distribution Based On Gender

S.NO	GENDER	NUMBER OF PATIENTS N=100	PERCENTAGE (%)
1.	Male	66	66
2.	Female	34	34
	Total	100	100

Figure 1: Distribution Based On Gender

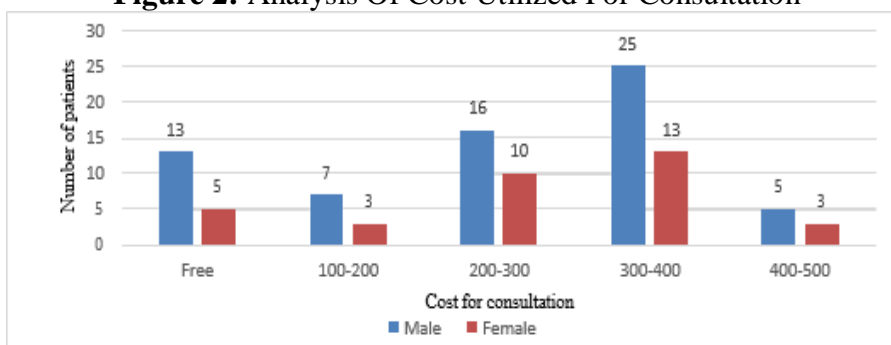


The cases were classified according to gender in which 66 were males and 34 were female patients.

Table 2: Analysis Of Cost Utilized For Consultation

S.NO	COST FOR CONSULTATION(INR)	NUMBER OF PATIENTS		
		MALE	FEMALE	TOTAL
1	Free	13	5	18
2	100-200	7	3	10
3	201-300	16	10	26
4	301-400	25	13	38
5	401-500	5	3	8
	Total	66	34	100

Figure 2: Analysis Of Cost Utilized For Consultation

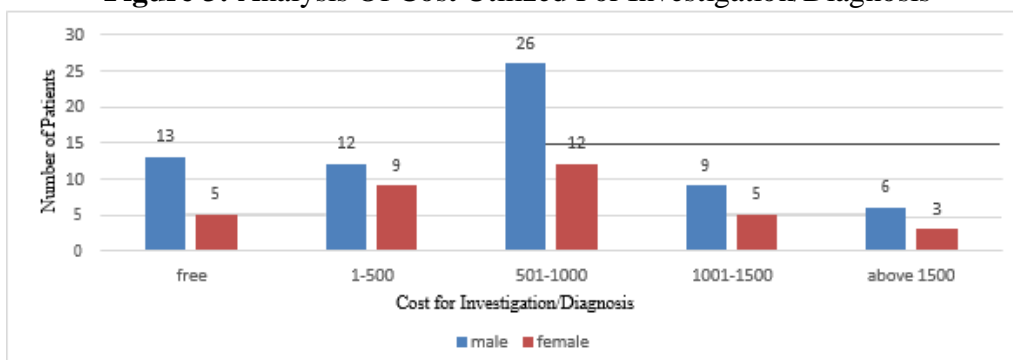


The cost utilized for consultation were compared among 100 patients in which 18 patients were consulting in government hospital where there is no consultation cost and maximum number of patients (38) were spending about 301-400 INR.

Table 3: Analysis Of Cost Utilized For Investigation/Diagnosis

S.NO	COST FOR INVESTIGATION/ DIAGNOSIS (INR)	NUMBER OF PATIENTS			AVERAGE COST (INR)
		MALE	FEMALE	TOTAL	
1	Free	13	5	18	0
2	1-500	12	9	21	387.14
3	501-1000	26	12	38	782.73
4	1001-1500	9	5	14	1338.93
5	Above 1500	6	3	9	1966.66
	Total	66	34	100	1119.50

Figure 3: Analysis Of Cost Utilized For Investigation/Diagnosis

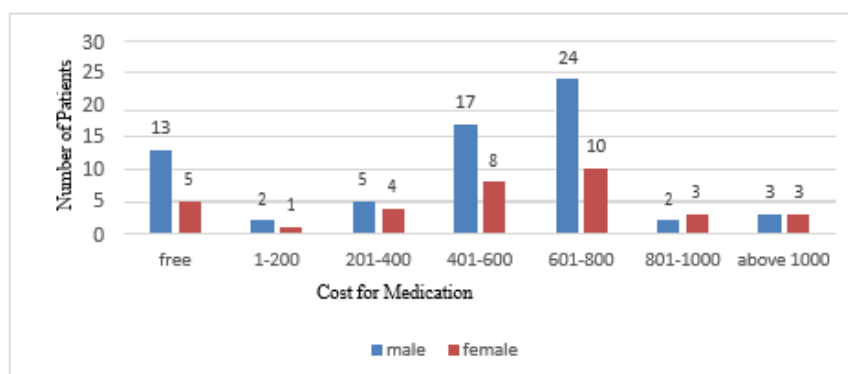


The cost utilized for investigation/diagnosis were compared among 100 patients in which 18 patients were doing investigations in government sector where there is no expense and maximum number of patients (38) were spending about 501-1000 INR per visit.

Table 4: Analysis Of Cost Utilized For Medication

S.NO	COST FOR MEDICATION	NUMBER OF PATIENTS			AVERAGE INR
		MALE	FEMALE	TOTAL	
1	Free	13	5	18	Nil
2	1-200	2	1	3	150.00
3	201-400	5	4	9	311.00
4	401-600	17	8	25	499.88
5	601-800	24	10	34	693.29
6	801-1000	2	3	5	903.00
7	Above 1000	3	3	6	1535.83
	Total	66	34	100	682.16

Figure 4: Analysis Of Cost Utilized For Medication

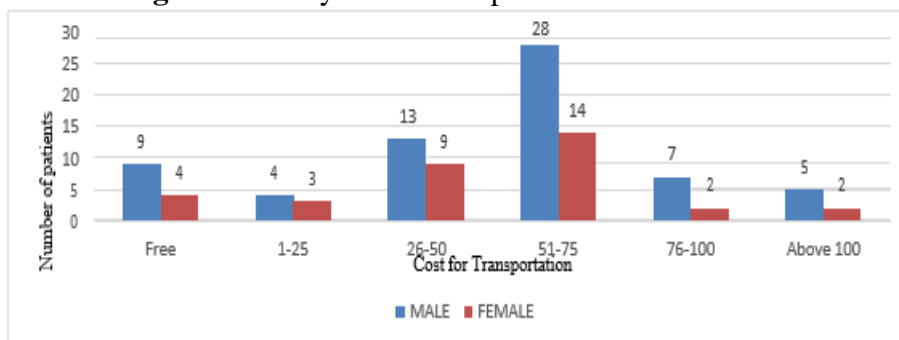


The costs utilized for medication were compared among 100 patients in which 18 patients were getting medications free of cost from government hospitals. Maximum Number of patients (34) were spending about 601-800 INR for their medication. 6 patients were spending more than above 1000. Total average cost utilized for medication is estimated at 682.16 INR.

Table 5: Analysis Of Transportation Cost Per Visit

S.NO	COST FOR TRANSPORTATION (INR)	NUMBER OF PATIENT			AVERAGE COST (INR)
		MALE	FEMALE	TOTAL	
1	Free	9	4	13	0
2	1-25	4	3	7	18.42
3	26-50	13	9	22	38.45
4	51-75	28	14	42	63.83
5	76-100	7	2	9	79.88
6	Above 100	5	2	7	129.71
	Total	66	34	100	66.06

Figure 5: Analysis Of Transportation Cost Per Visit

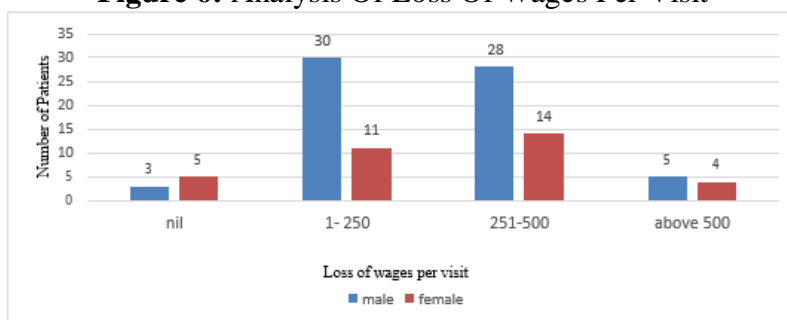


Transportation cost per visit was compared among 100 patients in whom 42 patients were spending 51-75 INR (AVE 63.83 INR). Total average cost utilized for transportation per visit is estimated at 66.06 INR.

Table 6: Analysis Of Loss Of Wages Per Visit

S.NO	LOSS OF WAGES PER VISIT (INR)	NUMBER OF PATIENT			AVERAGE (INR)
		MALE	FEMALE	TOTAL	
1	No loss	3	5	8	0
2	1-250	30	11	41	164.26
3	251-500	28	14	42	345.38
4	Above 500	5	4	9	531.88
	Total	66	34	100	347.17

Figure 6: Analysis Of Loss Of Wages Per Visit

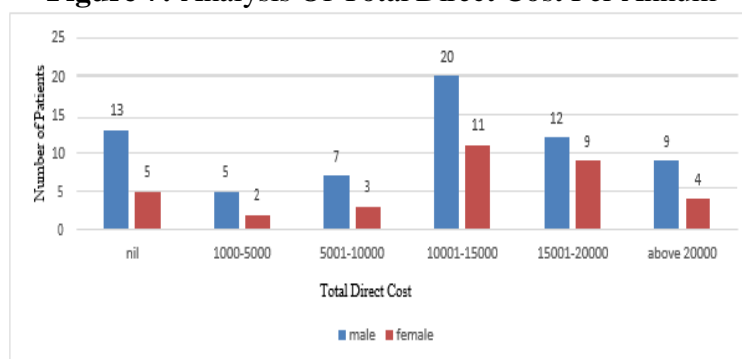


Loss of wages per visit was compared among 100 patients in whom 8 patients had no impact on loss of wages on their hospital visit. 9 patients had loss above 500 INR (AVE 531.88). Average loss of wages per visit is estimated at 347.17 INR.

Table 7: Analysis Of Total Direct Cost Per Annum

S.NO	TOTAL DIRECT COST (INR)	NUMBER OF PATIENTS			AVERAGE (INR)
		MALE	FEMALE	TOTAL	
1.	Nil	13	5	18	0
2.	1000-5000	5	2	7	3014.28
3.	5001-10000	7	3	10	7414.00
4.	10001-15000	20	11	31	12749.35
5.	15001-20000	12	9	21	17229.52
6.	Above 20000	9	4	13	21942.30
	Total	66	34	100	12469.89

Figure 7: Analysis Of Total Direct Cost Per Annum



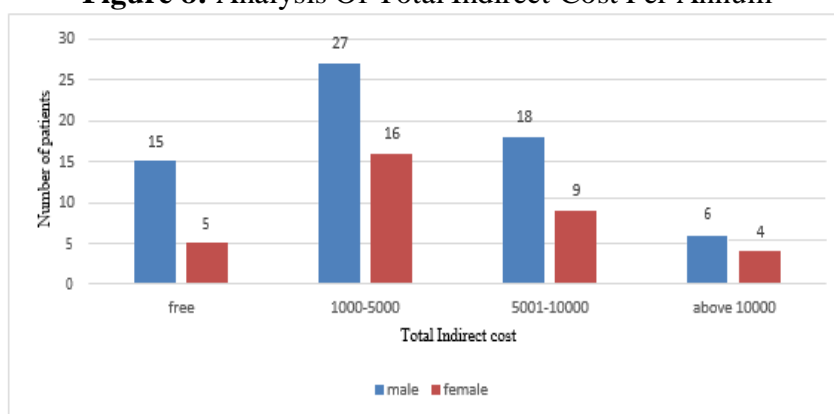
The total direct costs per annum were compared among 100 patients in which 31 patients were

spending about 10,001-15,000 INR (AVE 12749.35 INR). Average annual direct cost per patient is estimated at 12,469.89 INR. It correlates with study carried out by Aleemuddin Naveed^[9] *et al* that shows COPD accounts for 16,514 INR in annual direct cost costs per patient per year.

Table 8: Analysis Of Total Indirect Cost Per Annum

S.NO	TOTAL INDIRECT COST (INR)	NUMBER OF PATIENTS			AVERAGE (INR)
		MALE	FEMALE	TOTAL	
1	Free	15	5	20	0
2	1000-5000	27	16	43	2982.02
3	5001-10000	18	9	27	7205.51
4	Above 10000	6	4	10	12933.1
	Total	66	34	100	7706.84

Figure 8: Analysis Of Total Indirect Cost Per Annum

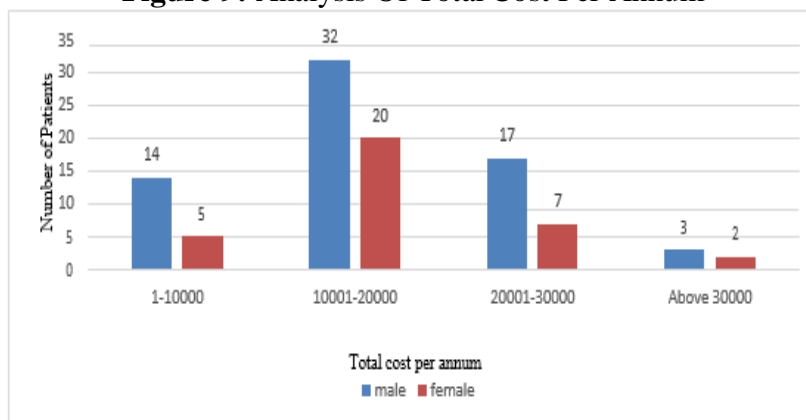


The total indirect cost per annum were compared among 100 patients in which 43 patients were spending about 1,000-5,000 INR (AVE 2,982.02). Average annual indirect cost per patient is estimated at 7,706.84 INR.

Table 9: Analysis Of Total Cost Per Annum

S.NO	TOTAL COST PER ANNUM (INR)	NUMBER OF PATIENTS			AVERAGE COST (INR)
		MALE	FEMALE	TOTAL	
1.	1-10000	14	5	19	8326.31
2.	10001-20000	32	20	52	15885.19
3.	20001-30000	17	7	24	25869.16
4.	Above 30000	3	2	5	30626.26
	Total	66	34	100	20176.73

Figure 9: Analysis Of Total Cost Per Annum



The total costs per annum were compared among 100 patients in whom 52 patients were spending 10,001-20,000 INR for treating COPD. Average annual cost per patient is estimated at 20,176.73 INR.

Table 10: Cost Utility Analysis

S.NO	TYPE OF COST	AVERAGE
1.	Direct cost	12469.89
2.	Indirect cost	7706.84
3.	Total cost	20176.73

Figure 10: Cost Utility Analysis

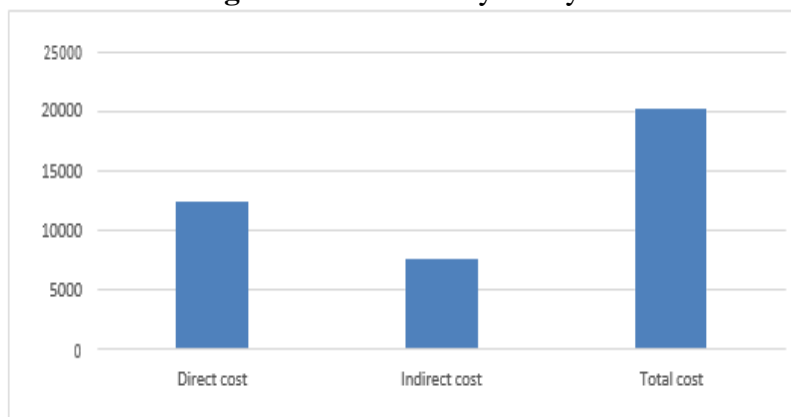


Table 11: Cost Effective Analysis

S.NO	TYPES OF HOSPITAL	AVERAGE ANNUAL COST (INR)
1.	Government	7706.84
2.	Private	20176.73

Patients who were consulting in government hospital spent only indirect cost (AVE 7,706.84 INR). But patients who were consulting in private hospital spent both direct and indirect cost (AVE 20,176.73 INR). It correlates with study conducted by Meenakshi Shah ^[10] *et al* that shows mean

cost incurred per COPD patient per year was 5,654.16 INR in government setup and 35,290.28 INR for private setup.

Figure 11: Cost Effective Analysis

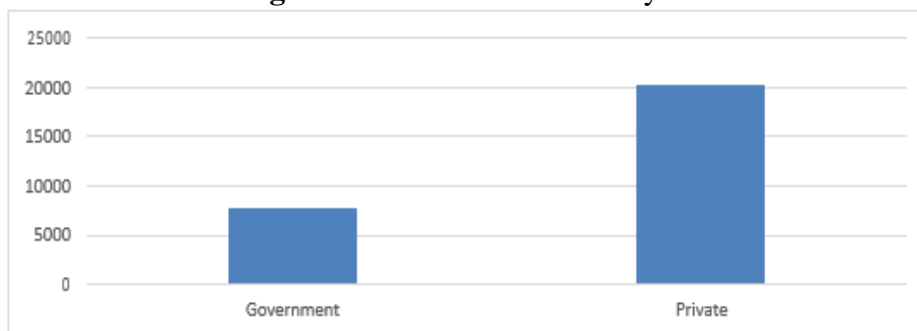


Table 12: Cost Minimization Analysis

S. NO	DRUGNAME	PRESCRIBED BRAND	PRICE OF PRESCRIBED BRAND	ALTERNATIVE BRAND	ALTERNATIVE BRAND PRICE	JAN AUSHADHI (GENERIC PRICE)
1.	Salbutamol (Inhaler) 100mcg	Proventil100mcg	82.91 INR	Bronkonat100mcg	75.64INR	45.00INR
				Salbair 100mcg	76.45INR	
				Asthalin 100mcg	79.03INR	
2.	Budesonide	Budecort100mcg	217.75INR	Budez 100mcg	185.00INR	131.00INR
				Pulmicort100mcg	195.12INR	
				Derinide 100mcg	198.04INR	
3.	Hydrocortisone (Inj)	Efcorlin Inj100mg	72.40 INR	Cort-S 100mg	42.30INR	20.00INR

The branded drugs which were prescribed to the study population such as Proventil (Inhaler), Budecort (Inhaler) and Efcorlin (Injection) are found to be very expensive but generic drugs provided by Jan Aushadhi is very less in cost when compared to alternate brands.

CONCLUSION

From this study, we can conclude that the treatment strategies in both private and government hospital is similar, but the cost utilized is higher for patients who were consulting in private hospital than government hospitals. Patients in rural areas are better advised to take treatment in government hospitals thereby we can reduce the economic burden of patients and prefer generic drugs which are available at Jan Aushadhi store will reduce the cost of illness in the management of COPD.

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