



## ASSESSMENT OF COST UTILITY AND COST EFFECTIVE ANALYSIS OF TYPE II DIABETES PATIENTS IN RURAL AREAS OF SALEM DISTRICT

Mohamed Yasir Arafath\*<sup>1</sup>, R. Shankar<sup>2</sup>, B. Arul<sup>3</sup>, Jincy P. P.<sup>4</sup>, Kalaivani S.<sup>4</sup> and Linda P. Lovely<sup>4</sup>

<sup>1</sup>Assistant Professor, Department of Pharmacy Practice, Vinayaka Mission's College of Pharmacy, Yercaud Main Road, Kondappanaickenpatty, Salem, Tamilnadu, India.

<sup>2</sup>Assistant Professor, Department of Community Medicine, Vinayakka Mission's Kirupananda Variyar Medical College & Hospitals, Salem.

<sup>3</sup>Professor & Head, Department of Pharmacy Practice, Vinayaka Mission's College of Pharmacy, Yercaud Main Road, Kondappanaickenpatty, Salem, Tamilnadu, India.

<sup>4</sup>V Year Pharm. D. Students, Vinayaka Mission's College of Pharmacy, Yercaud Main Road, Kondappanaickenpatty, Salem, Tamilnadu, India.

Article Received on  
24 July 2017,

Revised on 13 August 2017,  
Accepted on 03 Sep. 2017

DOI: 10.20959/wjpps201710-10177

### \*Corresponding Author

**Mohamed Yasir Arafath**

Assistant Professor,  
Department of Pharmacy  
Practice, Vinayaka Mission's  
College of Pharmacy,  
Yercaud Main Road,  
Kondappanaickenpatty,  
Salem, Tamilnadu, India.

## INTRODUCTION

### DIABETUS MELLITUS

Diabetes Mellitus is a disorder caused by the total (or relative) absence of insulin, which manifests clinically as an elevated blood glucose. The term diabetes mellitus describes a metabolic disorder of multiple etiologies characterized by chronic hyperglycemia with disturbances of carbohydrate, fat and protein metabolism resulting from defects in insulin secretion, insulin action, or both, the effects of diabetes mellitus include long-term damage, dysfunction and failure of various organs. Diabetes mellitus may present with characteristic symptoms such as thirst, polyuria, blurring of vision, and weight loss. In its most severe forms, ketoacidosis or a non-ketotic hyperosmolar state may develop and lead to stupor, coma and, in absence of effective treatment, death.<sup>[1]</sup>

### **COST-UTILITY ANALYSIS**

Cost-utility analysis is used to determine cost in terms of utilities, especially quantity and quality of life. This type of analysis is controversial because it is difficult to put a value on health status or on an improvement in health status as perceived by different individuals or societies. Unlike cost-benefit analysis, cost-utility analysis is used to compare two different drugs or procedures whose benefits may be different.

Cost-utility analysis expresses the value for money in terms of a single type of health outcome. The ICER in this case is usually expressed as the incremental cost to gain an extra quality-adjusted life-year (QALY). This approach incorporates both increases in survival time (extra life-years) and changes in quality of life (with or without increased survival) into one measure. An increased quality of life is expressed as a utility value on a scale of 0 (dead) to one (perfect quality of life). An increased duration of life of one year (without change in quality of life), or an increase in quality of life from 0.5 to 0.7 utility units for five years, would both result in a gain of one QALY.

This allows for easy comparison across different types of health outcome, but still requires value judgments to be made about increases in the quality of life (utility) associated with different health outcomes. The use of incremental cost-utility ratios enables the cost of achieving a health benefit by treatment with a drug to be assessed against similar ratios calculated for other health interventions (e.g. surgery or screening by mammography). It therefore provides a broader context in which to make judgments about the value for money of using a particular drug.<sup>[2]</sup>

### **COST-EFFECTIVENESS ANALYSIS**

Cost-effectiveness analysis involves a more comprehensive look at drug costs. While cost is measured in monetary terms, effectiveness is determined independently and may be measured in terms of a clinical outcome such as number of lives saved, complications prevented or diseases cured. Cost-effectiveness analysis thus measures the incremental cost of achieving an incremental health benefit expressed as a particular health outcome that varies according to the indication for the drug. Examples of ICERs using this approach are.

- The cost per extra patient achieving a 10 mm Hg fall in blood pressure;
- The cost per extra asthmatic patient achieving a reduction in oral corticosteroid use
- The cost per extra episode of febrile neutropenia avoided; or

- The cost per extra acute rejection episode avoided in patients with kidney transplants.

The result of cost effectiveness analysis are also expressed as a ratio –either as an average cost effectiveness ratio (ACER) or as an incremental cost effectiveness ratio (ICEER).<sup>[3,4]</sup>

## MATERIALS AND METHODS

A Cross sectional study was carried out over a period of six months in Attayampatty and Kondapanaickenpatty rural areas of Salem district, Tamil Nadu. A separate consent form was made for the patient permission purpose and the signature of the patient was taken before starting the study. A suitable data collection form was designed to collect and document the data. A brief uniform coded questionnaire was used. This consisted of 19 items, which included demographic variables and items related to the direct costs and indirect costs of patients. The questions on direct costs were about expenditure on Medications, Laboratory tests and other investigations and Medical consultations. Indirect costs were about Transportation fees and Loss of wages. The questionnaire was administered individually to all diabetic patients after obtaining their consent. Patients above the age of 18 years diagnosed with type II diabetes mellitus, Patients on regular diabetic treatment were included in the study. Patients diagnosed with type 1 diabetes mellitus, Pregnant and lactating women and Patient who are not willing to give the informed consent were excluded from the study.

## RESULTS

Out of the selected 100 diabetic patients, 37(37%) were male and 63(63%) were female, which shows that female are more affected with diabetics than male.

Age wise distribution was made for the patients with different age groups such as 18-30, 31-45, 46-70 and above 70. The numbers of male patients in each group were 0, 6, 26, 5 and female patients were 1, 11, 47, and 4 respectively. The numbers of male patients were 26 and female patients were 47 present in the age group 46-70 is identified.

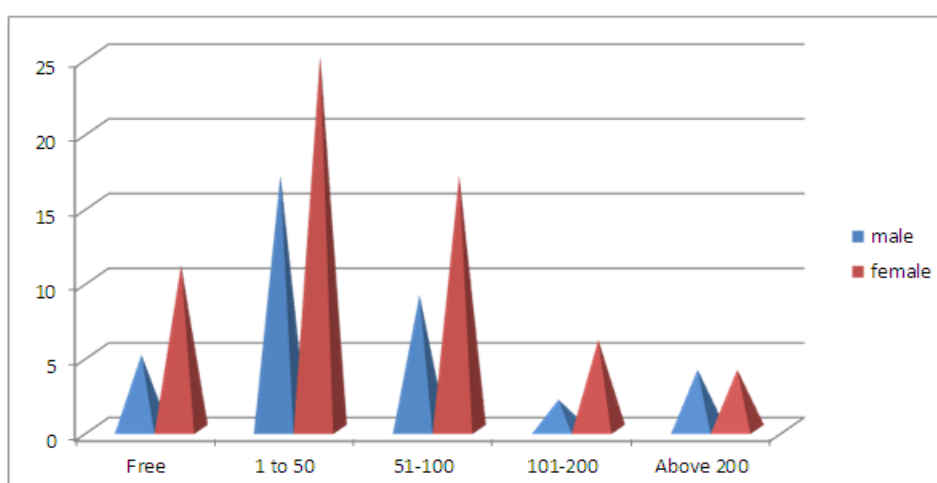
The duration of diabetes among the patients were classified as 0-12 months, 1-5 years, 6-10 years, 11-15 years, 16-20 years and above 20 years. The data shows that the highest percentage of patients in the duration of diabetes mellitus were in category of 1 to 5 years i.e 54.05% in male and 50.79% in female.

The number of patients with family history of diabetics were 14(37.83%) and 29(46.03%) in male and female respectively.

Out of 100 patients, 55 patients were checking their blood glucose level and 60 patients were consulting their physician regularly (i.e., monthly once). In such cases, direct costs have increased while comparing with other patients.

**Table: 1 Comparison of cost utilized for lab investigation.**

S.No	Cost for blood test	Number of patient			Average fees per visit
		Male	female	Total	
1	Free	8	15	23	Nil
2	1-50	17	25	42	45.59
3	51-100	9	17	26	84.80
4	101-200	3	6	9	135.00
	<b>TOTAL</b>	<b>37</b>	<b>63</b>	<b>100</b>	<b>141.07</b>

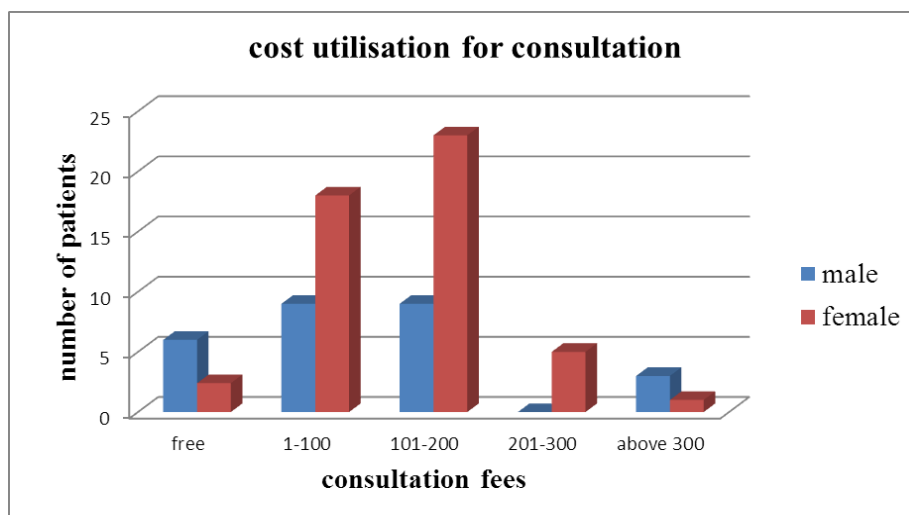


**Figure: 1 Comparison of cost utilized for lab investigation.**

Out of 100 patients 42 patients (42%) were spending INR 50 to check their blood glucose level per month. Government hospitals provide free blood check up, 16 patients were checking their blood glucose level in government hospitals.

**Table: 2 Comparison of cost utilized for consultation.**

S.No	Cost for consultation	Number of patient			Average
		Male	Female	Total	
1	Free	6	16	23	Nil
2	1 – 100	9	18	27	87.77
3	101-200	9	23	42	178.57
4	201-300	0	8	8	278.57
	<b>TOTAL</b>	<b>37</b>	<b>63</b>	<b>100</b>	<b>158.44</b>

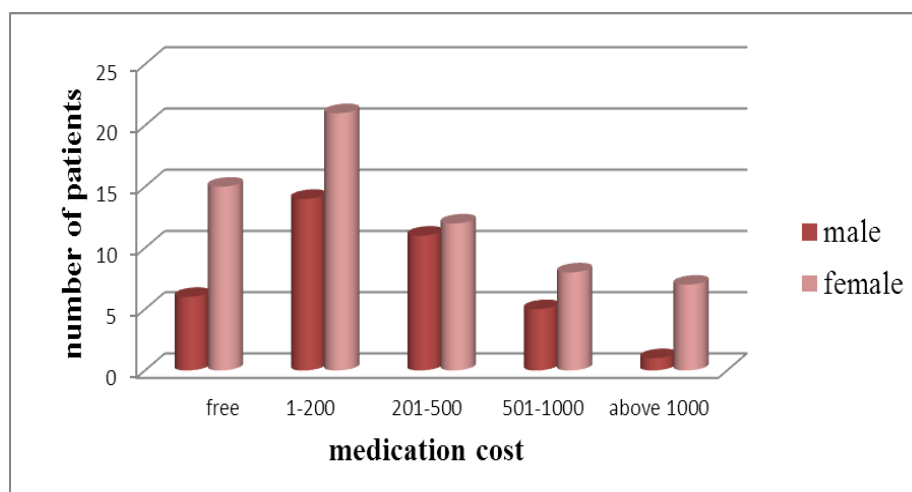


**Figure: 2 Comparison of cost utilized for consultation.**

The consultation fee for 100 patients is determined. Out of 100 patients about 42 patients was spending INR 101 to 200 (INR Average = 178.57). 23 patients were consulting in government hospital where there is no consultation fee. The total average cost for consultation per visit is INR 158.44.

**Table 3: Comparison of cost utilized for medication.**

S.No	Medication Cost	Number of patient			Average INR
		Male	female	Total	
1	Free	6	15	21	Nil
2	1-200	14	21	35	92.50
3	201-500	11	12	23	354.82
4	501-1000	5	8	13	695.94
5	Above 1000	1	7	8	1710.75
	<b>TOTAL</b>	<b>37</b>	<b>63</b>	<b>100</b>	<b>432.05</b>

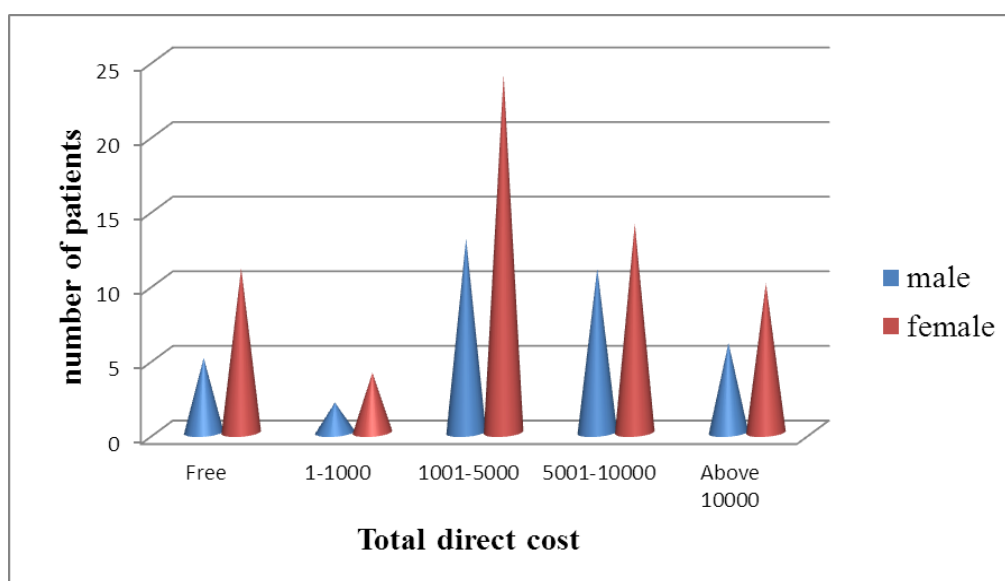


**Figure: 3 Comparison of cost utilized for medication.**

Out of 100 patients, 21 patients were consulting in government hospital where they providing free medication. The average medication cost per month for patient who consulting in private hospitals INR 432.05.

**Table: 4 Comparison of total direct cost per annum.**

S.No	Total annual Cost	Number of patient			Average INR annual cost
		Male	female	Total	
1	Free	5	10	15	Nil
2	1-1000	2	4	6	528.16
3	1001-5000	13	25	38	2959.47
4	5001-10000	11	14	25	7169.84
5	Above 10000	6	10	16	15888.7
	<b>TOTAL</b>	<b>37</b>	<b>63</b>	<b>100</b>	<b>6459.93</b>

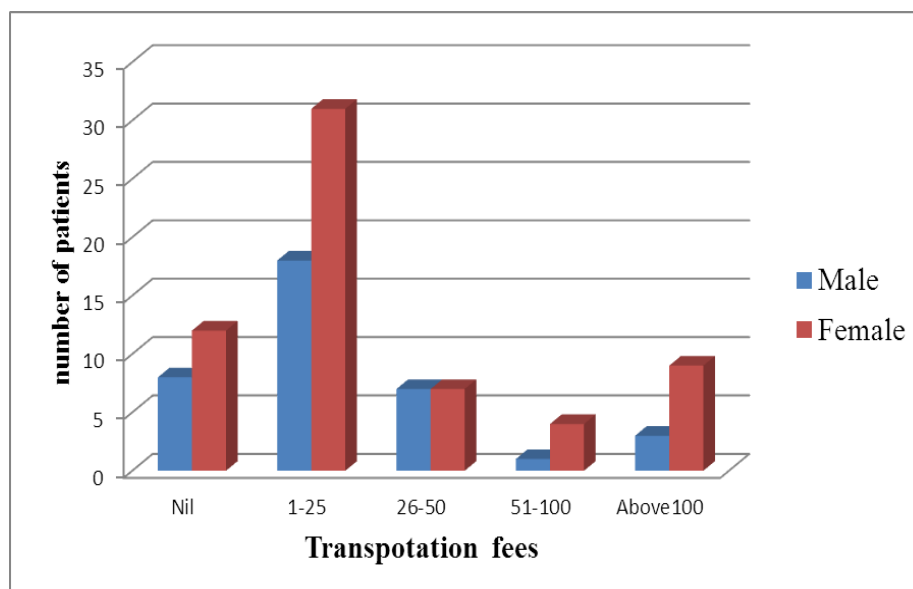


**Figure: 4 Comparison of total direct cost per annum.**

The total direct cost which includes laboratory investigation fees, medication cost and consulting fee for management of DM, The average direct cost per annum is estimated as INR 6459.93.

**Table: 5 Comparison of transportation fees per visit**

S.No	Transportation fees	Number of patient			Average
		Male	Female	Total	
1	Nil	8	12	20	Nil
2	1-25	18	31	49	15.81
3	26-50	7	7	14	40.14
4	51-100	1	4	5	86.00
5	Above 100	3	9	12	375.00
	<b>TOTAL</b>	<b>37</b>	<b>63</b>	<b>100</b>	<b>78.33</b>

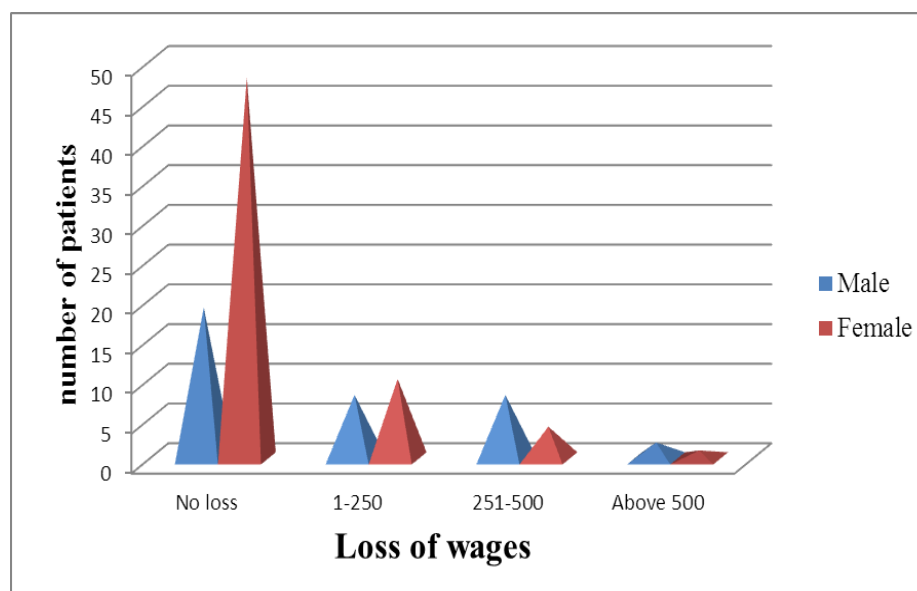


**Figure: 5 Comparison of transportation fees per visit.**

Out of 100 patients, 80 patients spending amount for transportation. The average cost for transportation per month is INR 78.33.

**Table: 6 Comparison of loss of wages per visit.**

S.No	Loss of wages per visit	Number of patient			Average
		Male	Female	Total	
1	No loss	19	48	67	Nil
2	1-250	8	10	18	154.44
3	251-500	8	4	12	341.67
4	Above 500	2	1	3	900
	<b>TOTAL</b>	<b>37</b>	<b>63</b>	<b>100</b>	<b>290.33</b>

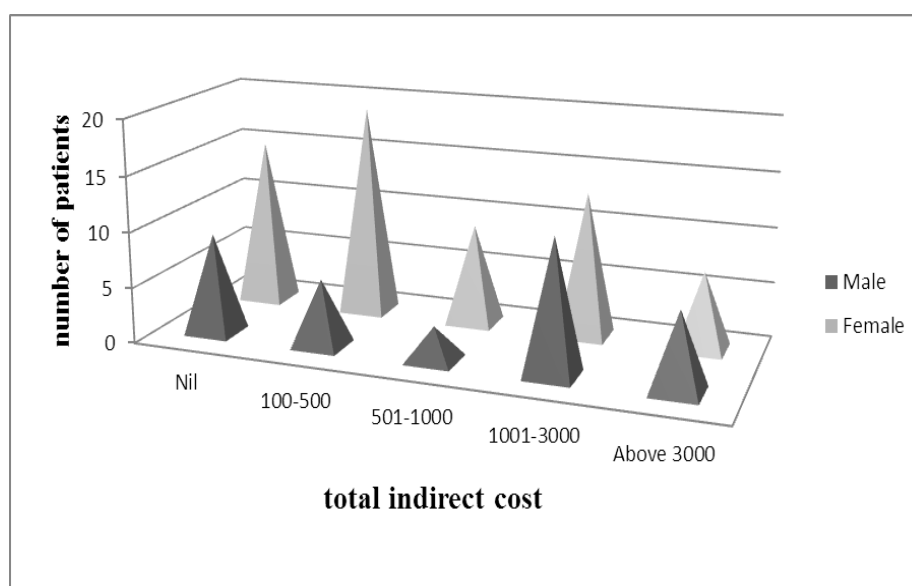


**Figure: 6 Comparison of loss of wages per visit.**

Out of 100 patients, 33 patients were losing their daily wages per visit. The average loss of wage per visit amounted to INR 290.30.

**Table: 7 Comparison of total indirect cost per annum.**

S.No	Total indirect cost	Number of patient			Average INR annual cost
		Male	female	Total	
1	Nil	4	9	13	Nil
2	100-500	11	27	38	155.89
3	501-1000	3	9	12	681.66
4	1001-3000	12	12	24	1863.33
5	Above 3000	7	6	13	9141.53
	<b>TOTAL</b>	<b>37</b>	<b>63</b>	<b>100</b>	<b>2042.11</b>



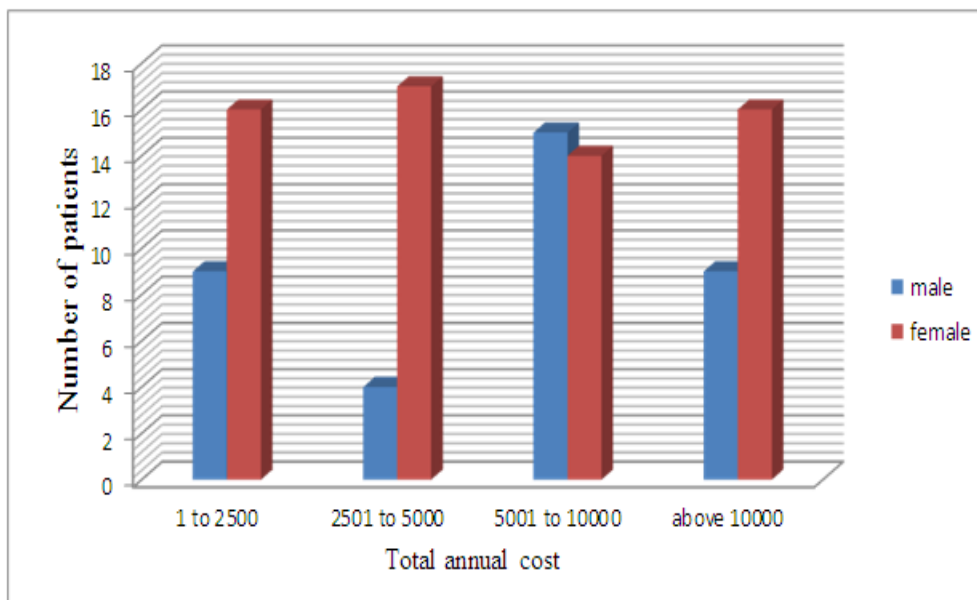
**FIGURE: 7 Comparison of total indirect cost per annum.**

The total indirect cost which includes transportation fees, loss of wages and other expenses for management of DM, and the average indirect cost per annum are estimated as INR 2042.11.

**Table 8: Comparison of total cost per annum.**

S.No	Total cost	Number of patient			Average INR annual cost
		Male	female	Total	
1	1 to 2500	9	16	25	977.61
2	2501 to 5000	4	17	21	3663.71
3	5001 to 10000	15	14	29	7261.05
4	above 10000	9	16	25	16610.86
	<b>TOTAL</b>	<b>37</b>	<b>63</b>	<b>100</b>	<b>7299.06</b>



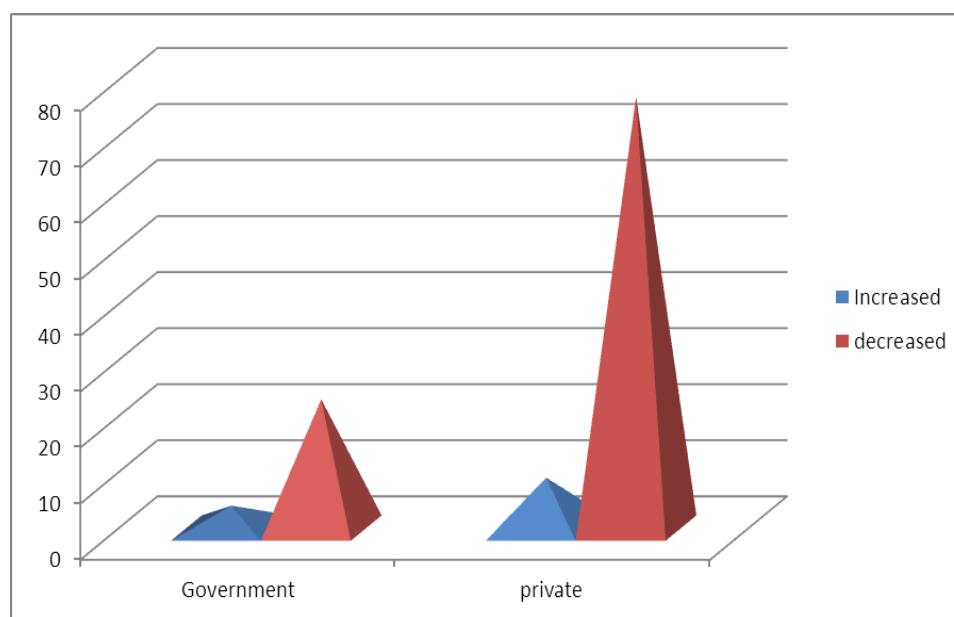


**Figure: 8 Comparison of total cost per annum.**

The total annual cost which includes addition of direct and indirect cost for management of DM, average total cost per annum is estimated as INR 7299.06.

**TABLE: 9 COMPARISONS OF CHANGES IN BLOOD SUGAR LEVEL**

S.No	Type of hospital	Changes in blood sugar level				Total
		Increased	Percentage	Decreased	Percentage	
1	Government	4	11.2%	19	88.8%	<b>23</b>
2	Private	9	11.6%	68	88.4%	<b>77</b>
	<b>Total</b>	<b>13</b>	<b>13%</b>	<b>87</b>	<b>87%</b>	<b>100</b>



**Figure 9: Comparisons of Changes in Blood Sugar Level.**

Out of 100 patients, 77% of patients were consulting in private hospital, 23% of patients were consulting in Government hospital. In which 11.6% of patients who were consulting in private hospital, 11.2% of patients who were consulting in government hospital had no effect of treatment. Their blood glucose level was increased from previous consultation. Therefore the effect of treatment in both government and private hospital result in approximately equal percent (88%).

**Table: 10 Cost Utility Analysis**

S.No	Type of cost	Average
1	Direct cost	6459.93
2	Indirect cost	2042.11
3	Total cost	7299.04

The Average total direct annual treatment costs of DM among patients without complications in rural areas are estimated as INR 6459.93. The average total indirect annual treatment costs of DM among patients without complications in rural areas is estimated as INR 2042.115. The average total cost per annum is estimated as INR 7299.47.

**Table: 11 Cost Effective Analysis.**

S.No	Type of hospital	Number of cases	Average INR annual cost
1	Government	23	1085.05
2	Private	77	8610.43

Patients who were consulting in government hospital spent only indirect cost (AVE INR 1085.05). But patients who were consulting in private hospital spent both direct and indirect cost (AVE INR 8610.43).

## CONCLUSION

The cost utilized for treatment of diabetes is assessed by estimating direct and indirect cost. Direct cost includes lab investigation fees, consultation fees and medication cost. An indirect cost includes transportation fees and loses of wages.

Annual Direct and Indirect cost was calculated for individual patients. Total cost utility was estimated by adding direct and indirect cost.

The Average total direct annual treatment cost of DM among patients without complications in rural areas is estimated as INR 6459.93. The average total indirect annual treatment costs

of DM among patients without complications in rural areas is estimated as INR 2042.115. The average total cost per annum is estimated as INR 7299.47.

Patients who were consulting in government hospital spent only indirect cost (AVE INR 1085.05). But patients who were consulting in private hospital spent both direct and indirect cost (AVE INR 8610.43).

From this study, we can conclude that effectiveness of treatment in both private and government hospital is similar, but the cost utility is higher for patients who were consulting in private hospital than government hospitals. Patients in rural areas should advised to take treatment in government hospitals thereby we can reduce the economic burden of diabetes.

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