



## A STUDY ON COST ANALYSIS IN DIABETIC PATIENTS WITH CARDIOVASCULAR COMPLICATIONS

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### ABSTRACT

**Background:** Diabetes is a chronic disease that occurs either when the pancreas does not produce insulin or when the body cannot effectively use the insulin it produces. **Objective:** To evaluate the average investigation and medication cost for T2DM with CV complication. To evaluate the total average cost (Direct medical and direct non-medical) for T2DM and T2DM with CV complication. To evaluate the total average cost (Direct and indirect cost) for T2DM and T2DM with CV complication. To assess the economic burden of T2DM with other complications. **Methodology:** A prospective study was conducted in the medicine and surgery department of govt medical college and hospital, Nagapattinam. **Result-** The commonly occurring cv complication was found to be hypertension, which constitutes about 58.4% of total patients. The direct medical cost is the highest in patients with hypertension, ischemic heart disease and atherosclerosis. Rs 5400. The total cost is highest in patients with hypertension and atherosclerosis, totalling Rs 26280. From the current data it was found that CVS complications increase the economic burden among patients with T2DM.

**KEYWORDS :** Direct cost, indirect cost, economic burden

### INTRODUCTION

Pharmacoeconomics has been defined as the description and analysis of the costs of drug therapy to healthcare systems and society. It identifies, measures, and compares the costs and consequences of pharmaceutical products and services. Pharmacoeconomics studies categorize costs into four types: direct medical, direct non-medical, indirect, and intangible. Direct costs refer to those paid directly to healthcare services (i.e., associated with patients' treatment). They can be classified into medical or non-medical direct costs, depending on whether they refer to actual medical procedures or other ancillary associated costs (direct non-medical). Indirect costs refer to those experienced by patients' family, or society as the loss of earnings or productivity resulting from patients' illness. Intangible costs are attributed to the amount of suffering that occurs due to illness or healthcare intervention. There are four ways to measure the outcome: cost-minimization analysis (CMA), cost-benefit analysis (CBA), cost-effectiveness analysis (CEA), and cost-utility analysis (CUA). Each type of outcome management is associated with a different type of pharmacoeconomic analysis.

### Diabetes Mellitus

Diabetes is a chronic disease that occurs either when the pancreas does not produce enough insulin or when the body cannot effectively use the insulin it produces. Insulin is a hormone that regulates blood glucose. Hyperglycemia, also called raised blood glucose or raised blood sugar, is a common effect of uncontrolled diabetes and over time leads to serious damage to many of the body's systems, especially nerves and blood vessels.

### Aim And Objective

- To evaluate the average investigation and medication cost for T2DM with CV complication.
- To evaluate the total average cost (direct medical and direct non-medical) for T2DM and T2DM with CV complication.

- To evaluate the total average cost (direct and indirect cost) for T2DM and T2DM with CV complications.
- To assess the economic burden of T2DM with other complications.

### MATERIALS AND METHOD

Observational Prospective study

**Place Of Study:** Medicine and surgery department of government medical college hospital, Nagapattinam

**Study Duration:** 6 Months (April – September 2023)

### Inclusion Criteria

- Patients of either gender at more than 35 years of age have T2DM.
- Patients who are diagnosed with T2DM and T2DM along with its CV complications (HTN, Atherosclerosis, CHD, HF, Angina, MI and stroke) during the study period.
- Patients who are willing to participate in the study.
- Patients who are diagnosed with T2DM with other comorbidities

### Exclusion Criteria

- Patients aged below 35 years and having T2DM.
- Patients without T2DM with CVD are vulnerable populations without geriatrics.
- Patients who did not agree to participate in the study.

### Ethical Consideration

The study involved patients visiting the T2DM patient's department who were enrolled after obtaining their consent and was conducted in accordance with ethical standards, ensuring the rights and welfare of the participants were respected at all stage of the study

### RESULT

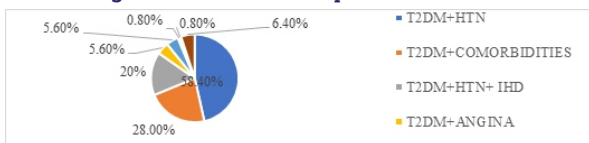
A total of 125 patients were prescribed for T2DM and other complications. Among 125 patients, 72 were identified as female patients and 53 were identified as male patients.

Among them, patients aged between 51 – 60 years were highly affected by T2DM.

**Table 1: Socio-demographic profile of study participants**

VARIABLES	NUMBER	PERCENTAGE
<b>GENDER</b>		
• FEMALE	72	57.6%
• MALE	53	42.4%
<b>AGE</b>		
• 31 – 40 YEARS	11	8.8%
• 41 – 50 YEARS	26	20.8%
• 51 – 60 YEARS	45	36%
• 60 – 70 YEARS	21	16.8%
• YEARS	22	17.6%

**Dominating Cardiovascular Complication In T2dm**



**Figure 1** Prevalence of cardiovascular complication in T2DM

Out of 125 patients, the most commonly occurring condition was T2DM with HTN, which constituted about 73 (58.4%) of the patients. The second most affected group of patients was those with T2DM and comorbidities, which constituted about 35 (28%) of patients.

**Diagnostic And Medication Cost Of Study Population**

**Table 2: Diagnosis and medication cost of T2DM patients with and without CVS complication**

CONDITION	MEAN DIAGNOSTIC COST	MEAN MEDICATION COST
T2DM+STROKE+HTN	Rs 4814	Rs 2499
T2DM+IHD+HTN+ ATHEROSCLEROSIS	Rs 4500	Rs 1800
T2DM+HTN+MI	Rs 3674	Rs 1887
T2DM+COMORBIDITIES	Rs 3214	Rs 5928
T2DM+HTN	Rs 3073	Rs 3744
T2DM+IHD+HTN	Rs 2942	Rs 3170
T2DM+ANGINA	Rs 2187	Rs 1772
T2DM+HTN+ATHEROSCLEROSIS	Rs 1500	Rs 6750
<b>TOTAL</b>	<b>Rs 3238</b>	<b>Rs 3444</b>

**Diagnosis Cost:** The average diagnostic cost for T2DM with complications was Rs3238. The T2DM patient with stroke and HTN spent an average cost of Rs 4814.

**Medication Cost:** The average medication cost for T2DM with complications was Rs 3444. The T2DM patient with other comorbidities had an average medication cost of 5928.

**Direct Health Care Cost For Study Population**

**Table 3 Mean direct cost of T2DM patients with and with and without CV complication**

CONDITION	AVERAGE MEDICAL COST	AVERAGE NON-MEDICAL COST
T2DM+IHN+HTN+ATHEROSCLEROSIS	Rs 5400	Rs 900
T2DM+HTN+MI	Rs 4617	Rs 479
T2DM+COMORBIDITIES	Rs 4571	Rs 1616
T2DM+STROKE+HTN	Rs 3656	Rs 452
T2DM+HTN	Rs 3409	Rs 1057
T2DM+ANGINA	Rs 3073	Rs 581
T2DM+IHN+HTN	Rs 3056	Rs 794
T2DM+HTN+ATHEROSCELSORSIS	Rs 2650	Rs 650

TOTAL	Rs 3804	Rs 816
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The total average direct medical cost for patients with T2DM was Rs 3804. The direct medical cost was highest in the patients with T2DM+IHD+HTN and Atherosclerosis, i.e. Rs 5400.

The total average direct non-medical cost for patients with T2DM was Rs 816. The direct non-medical cost was highest in the patient with T2DM and other comorbidities, i.e., Rs 1616.

**Total Expenses Spent By The Study Participants**

**Table 4 Mean of total cost (Direct + Indirect) per person**

CONDITION	AVERAGE OF TOTAL COST
T2DM + HTN + ATHEROSCLEROSIS	Rs 26280
T2DM + COMORBIDITIES	Rs 19631
T2DM + HTN + IHD	Rs 12108
T2DM + HTN	Rs 11166
T2DM + HTN + STROKE	Rs 10691
T2DM + MI + HTN	Rs 9917
T2DM + HTN + IHD+ ATHEROSCLEROSIS	Rs 8058
T2DM + ANGINA	Rs 7180
<b>TOTAL</b>	<b>Rs 105031</b>

The total expenditure of a T2DM was found to be Rs 105031. Patients with T2DM + HTN + ATHEROSCLEROSIS spent Rs 26280. A patient with T2DM + COMORBIDITIES had spent Rs 19631. A patient with T2DM+HTN+ IHD had spent Rs 12108.

**Indirect Health Care Cost For The Study Population**

The days lost for the subjects were dependent on the duration of hospital stay and severity of the disease. The cost associated with days lost from work during the days spent in hospital is considered as productivity loss. It is calculated by multiplying the wage/hour by the total hours worked by the number of days lost.

**Table 11 Mean Total Indirect Cost Of Patient**

INCOME OF THE PATIENT	NUMBER	TOTAL MEAN PRODUCTIVITY LOSS OF PATIENT
0	5	0
Up to 5000	30	Rs 2067
5001 – 10000	26	Rs 8269
10001 – 15000	32	Rs 12750
15001 – 20000	26	Rs 18115
>20000	6	Rs 26167
<b>TOTAL</b>	<b>125</b>	<b>Rs 10504</b>

The severity and complications of the disease lead to a greater number of days of stays in hospital, thereby leading to a hike in productivity loss and apparently parallel increase in indirect costs.

**DISCUSSION**

A major comorbidity of diabetes is cardiovascular disease (CVD), which affects about one-third of the population with Diabetes and is one of the major causes of mortality among people with DM. Coronary Heart Disease (CHD) is the most common cause of death among people with T2DM. The complications of cardiovascular (CV) issues associated with T2DM cause a considerable amount of disability, premature mortality, productivity loss and a tremendous increase in the burden on healthcare systems and economies worldwide. In the study population, a total of 125 patients were prescribed for T2DM and other complications. Among the 125 patients, 72 were identified as female and 53 as male patients. Among them, patients aged between 51 – 60 years were highly affected by T2DM. The most commonly occurring scenario of T2DM with a CV complication was T2DM with HTN, constituting about 73 (58.4%) of the patients.

The average diagnostic cost for T2DM with complications was

Rs3238. The T2DM patient with stroke and HTN spent an average cost of Rs 4814. The T2DM patient with IHD and HTN Atherosclerosis had spent an average cost of Rs4500 and a T2DM + HTN+ MI had spent Rs 3674. The average medication cost for T2DM with complications was Rs 3444. The T2DM patient with other comorbidities had an average medication cost of 5928. T2DM with HTN had an average cost of Rs 3744. T2DM patients with IHD and HTN have an average medication cost of Rs 3170.

The total average direct medical cost for patients with T2DM was Rs 3804. The direct medical cost was highest in the patients with T2DM, IHD, HTN and Atherosclerosis, i.e. Rs 5400. The total expenditure of a T2DM patient was found to be Rs 105031. Patients with T2DM + HTN + Atherosclerosis spent Rs 26280. A Patient with T2DM + Comorbidities had spent Rs 19631. A patient with T2DM+HTN+ IHD had spent Rs 12108. 32 patients who had an income range of 10001 – 15000 lost Rs 12750.

## CONCLUSION

The incidence of T2DM was more common in females than in males. The majority of patients were diagnosed with T2DM with HTN. The investigation cost is higher in T2DM + stroke + HTN, but the medication cost is higher in T2DM + comorbidities. The average direct medical cost is higher in T2DM + HTN + IHD + Atherosclerosis, but the average direct non-medical cost is higher in T2DM + comorbidities. The average total cost is higher in T2DM + HTN + Atherosclerosis than in others. The indirect cost of a patient with an income range of 10,000 – 20,000 has been greatly affected due to a greater number of days admitted to the hospital.

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