

# Economic Burden of Diabetes In India: A Review

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## Abstract

Diabetes imposes a significant impact on health systems and societies. Both direct and indirect expenditures contribute to the cost of diabetes mellitus. The direct cost of diabetes is based on a variety of expenses linked to treatment, delivery of therapy, laboratory testing, and investigations, as well as travel, lodging, and other incidentals. For indirect expenses, information about present employment, illness-related job changes, issues at existing employment, changes in ability to do work, and absenteeism. Diabetes has multiple financial ramifications for society, including direct expenses for those with the disease, their families, and the health care industry, indirect expenses for society and the government that affect productivity, and intangible expenses that have a negative impact on quality of life. Very little is known about the financial toll diabetes has on the developing world, a detailed review of which is the aim of this article.

**Keywords:** Diabetes mellitus, health economics, direct cost, indirect cost, cost of illness.

## INTRODUCTION

Diabetes Mellitus is one of the most prevalent persistent non-communicable diseases. In 1995, there were 4% of people in the world who had diabetes; by 2025, that number is projected to rise to 5.4 percent [1]. One of the main causes of the sharp increase in healthcare costs over the past ten years in emerging nations is the rising prevalence of chronic diseases. According to estimates, chronic non-communicable diseases account for about 54 percent of fatalities in developing nations and are expected to increase by 65 percent by 2030. At the moment, this non-communicable disease affects more than 180 million people globally. Around 400 million individuals worldwide are predicted to have diabetes by the year 2030. More than 80% of the 3 million deaths a year that are linked to diabetes take place in underdeveloped nations. The three Asian nations with the highest diabetes prevalence rates are India, China, and Indonesia. From 61 million in 2000 to 163 million in 2030, the combined number of diabetics in these three nations is projected to more than double. Over a ten-year period, India and China experience cumulative GDP losses of 16.7% and 13.8% and, respectively. Researchers face a difficult task when attempting to determine the disease's indirect and direct expenses because individuals

with diabetes frequently experience additional co-morbidities and consequences. Assessing the existing strategy in controlling this chronic disease, health policy makers in underdeveloped nations face considerable obstacles due to the significant economic burden of diabetes.

Serious efforts should be made to focus on and scale up initiatives on prevention and health promotion of diabetes in order to get a more economical solution to this condition with large and escalating financial damage.

Due to its multi-organ involvement and chronic nature, diabetes mellitus is an expensive condition for both the patient and the healthcare provider, necessitating numerous visits and admissions to hospitals. High rates of complications and prevalence have a significant detrimental impact on the economies.

## DIABETES MELLITUS AND COSTS INVOLVED

Diabetes management expenses fall into two categories: indirect and direct, or intangible, expenditures.

**Direct cost:** This sums together both hospital and non-medical expenses, costs for medical services like consultations, lab fees, and the daily management of diabetes are all considered direct costs. These costs include the availability of items like syringes, insulin, oral hypoglycemic medications, blood-testing equipment, and other items that are referred to as pharmacy costs. Patients may be admitted to hospitals and have a variety of procedures or surgeries as a result of coexisting complications, greatly raising the direct expenditures. Direct non-medical costs include transportation expenses. Primary care visits and hospital outpatient episodes are relatively inexpensive, however lengthy hospital inpatient stays for the treatment of problems are quite expensive [2].

**Indirect cost:** The loss of productivity brought on by illness, absenteeism, disability, early retirement, and patient premature mortality are examples of indirect costs.

Diabetes mellitus places a significant financial strain on society as a result of these costs, which is very concerning. Numerous studies have attempted to determine the economic impact of diabetes mellitus, but each of them has limitations since the methods employed were not standardized, the data were not properly documented, there was insufficient follow-up, etc.

## **BURDEN OF DIABETES IN INDIA**

Diabetes is a serious healthcare concern in India for a number of reasons. The rapid increase in DM is caused by a variety of reasons. In addition to lifestyle modifications, urbanization, globalization, and ethnicity, they are a result of genetic susceptibility. These factors make India one of the nations with the greatest diabetes-related economic costs in the world. The various vascular consequences of diabetes, which raise morbidity and death, are actually what carry the most of the disease's burden [3].

Approximately 50% of diabetics are known to go undetected, and as a result, some of them may already be displaying micro- and macro vascular issues at the time of diagnosis [4].

Despite the fact that there has been sporadic research on the prevalence of diabetes for a long time, reliable epidemiologic data for India weren't made available until the 1970s. Due to the differences in sample sizes and methods between published research, any comparison of prevalence rates is strictly meaningless. In metropolitan regions, the frequency was 2.3% in 1970, according to a report by the Indian Council of Medical Research (ICMR), but by the 2000s, it had risen to 12–19%. [5]. As a result, prevalence rates in rural regions have climbed from about 1% to 4% - 10% and further even 13.2 %, according to a study.

Thus, it is clear that diabetes prevalence rates are rapidly increasing in both urban and rural India, where there has been a roughly 2:1 to 3:1 urban/rural divide over the preceding two to three decades.

Hyperglycemia is a hallmark of the group of metabolic illnesses known as diabetes mellitus (DM). The chronic complications of diabetes, which include neuropathy, retinopathy, and nephropathy (micro vascular) and cerebrovascular disease, ischemic heart disease and peripheral vascular disease (macro vascular), which are linked to abnormalities in fat, carbohydrate and protein metabolism, cause organ and tissue damage in about one-third to one-half of people with diabetes [5,6].

## **PROBLEMS ASSOCIATED WITH DIABETES MANAGEMENT AND HEALTHCARE IN INDIA**

A number of problems, including a decline in public comprehension of diabetes and its consequences and a dearth of medical personnel, monitoring technology, and even drugs, particularly in remote areas, make handling diabetes and its complications a difficult obstacle in India. All of these problems considerably enhance the burden of diabetes by causing delayed presentation and missing diagnoses. Diabetes is recognized in India Diabetes ignorance can make it difficult for patients to control their condition. The degree of diabetes knowledge among patients and medical professionals has been examined in a number of research.

According to CURES, only 22.2 % of people and 41% of people with diabetes believed that diabetes could be prevented. Nearly 25 percent of the population did not know what diabetes was [7]. Although only 42.6% of respondents, primarily postgraduates, doctors, and attorneys, realized that diabetes may be avoided, the study also found that awareness levels rose with education.

While 23 percent of study participants knew that diabetes can cause foot problems and just 5.8% knew it might cause a heart attack, only 11.9% of participants in the study identified obesity and physical inactivity as risk factors for diabetes [7]. Diabetes risk factors were substantially less well-known. Another population-based study found that just 41% of adult Indians over 20 claimed they were aware at risk of developing the disease, and that 92.3 percent of diabetic patients went to their general practitioner for care rather than a diabetologist [8]. Raising diabetes consciousness among the general public and diabetic patient populations is therefore urgently necessary. This is crucial since improving diabetes control is closely tied to increased patient self-management skills.

## DIAGNOSIS AND MANAGEMENT ACCESS

Two of the most crucial elements of diabetes care and management are prompt diagnosis and adequate treatment; in their absence, complications and morbidity linked to diabetes can significantly rise. In India, Type 2 diabetes is usually discovered incidentally after an abnormal blood or urine glucose test, as a result of comorbid conditions, or by chance. More than half of those who have diabetes are undiagnosed as a result [9]. A multicountry study in Asia called Diab-Care Asia found that diabetes was discovered in Indian people at a later stage, with a mean age of 43.6 years, and that 50% of them had poor diabetes control as measured by HbA1c and that 54% had late severe complications [10]. In a related study, it was discovered that only a tiny proportion of patients received prescriptions for diagnostic testing for problems, with lipid tests accounting for 4.2%, kidney function tests for 5.6%, and ocular exams for 17.6% of cases. General practitioners made the diagnosis of diabetes in almost 70% of patients [11]. Another important element is the availability and accessibility of diabetes treatments. According to a figure based on sales of antidiabetic pharmaceutical medications, only 10–12% of diabetics in India received modern pharmacological care [12]. The percentage of glibenclamide that was available in public health facilities in the states of Karnataka and West Bengal, respectively, ranged from 100 to 3.8 percent [13].

Despite insulin therapy being one of the most dependable and effective treatment options, the IMPROVE Control India study discovered barriers to its use [14]. For the majority of patients, insulin was not administered until it was absolutely necessary or until their HbA1c levels had climbed to roughly 9 percent. The management of diabetes has been plagued by a variety of other problems, including uneven monitoring of diabetes status and variations in laboratory practices [14]. The unpredictability of the supply of diabetes drugs and the absence of price regulation in the private sector are two problems that contribute to low medication compliance.

## FINANCIAL CONSTRAINTS

For the treatment of diabetes-related issues, including hospitalization expenditures, lab test fees, and medicines, healthcare costs are frequently required. Studies conducted in India found that the total annual cost of treating diabetes in 2010 ranged from INR 1230 billion (about \$25.5 billion) to INR 1837.3 billion (roughly \$38.0 billion) [14,15]. A recent study found that the cost of treating diabetes for a patient with foot ulcers will be more than four times higher (INR 19,020) as compared to a diabetic patient without foot ulcers (INR 4493) [16]. The existence of complications also raises the price of therapy. The patient is responsible for covering the astronomical costs and financial losses resulting from missed workdays or lost business chances.

In India, there is often no major or reliable social security system, therefore the patient must rely on family assistance. This suggests that if the family's main provider became ill, it would have a big impact on the whole family. Children's schooling may be cut short with long-term financial consequences for the family, and other non-working family members may be obliged to start working, typically early and for less money [17]. According to the Tharkar et al. study, more than 60% of the low income earners (poor people) had to borrow money or mortgage their home to the banks, whereas roughly 70-80% of the high income earners spent the majority of their personal funds on therapy [15].

Therefore, the financial burden that persons with diabetes and their families experience is influenced by both an individual's financial situation and the nation's social insurance policy. People suffering diabetes and their families typically pretty much pay the whole costs of healthcare in the world's least developed nations. People with little financial means in India continue to devote a considerable portion of their income to managing their diabetes [18]. India's population face a heavy financial burden due to the country's poor economic conditions compared to wealthier nations. The prevalence of associated complications also increases their financial impact. People with diabetes are spending more money both in rural and urban

settings, according to a study from south India [18].

According to estimates, the total annual cost of treating diabetic people in India will be \$420. If per capita spending stayed the same through 2025, the estimated total cost of treating the condition would be \$30 billion [19]. In the vast majority of developing countries, the idea of healthcare insurance coverage is still generally underutilized. In a research using data from 35 low- and middle-income countries, including Kenya, Vietnam, Bangladesh, Mali, Ethiopia, Pakistan, and India, demonstrated that health and medical insurance had no effect on reducing the medical expenditures of diabetes patients [20].

Only 6.4 percent of urban low-income people received medical reimbursement, compared to 21.3 percent of people in the high-income category, according to studies done in India [18]. This shows that, especially in metropolitan settings, health insurance and Mediclaim coverage are specifically used by the high-socioeconomic (high income) group. In developing and underdeveloped countries, just 5% of the GDP is allocated to healthcare, leaving a chronic deficit of funding [21]. Public healthcare received only 0.9 percent of GDP, whereas 4 percent of all healthcare spending went to the private sector. To make the best use of resources allotted for the treatment and prevention of diabetes, a systematic approach based on cost-effectiveness analysis is required. [17].

## ETHNIC BOUNDARIES

Effective diabetes management may be challenging due to sociocultural obstacles as well as economical restrictions. Young people in certain developing countries who have got recently diagnosed with diabetes occasionally conceal their illness and most likely do not take the necessary treatment, due to perceived stigma associated with the disease when finding partners, the high cost incurred, and the possibility of being rejected for certain jobs, insurance, or mortgage products. [22]. Diabetes management becomes difficult under these circumstances, and clinicians may find it difficult to provide these patients the best counsel.

Additionally, despite the fact that general practitioners, such as cardiologists, neurologists, and nephrologists, diagnose and treat the bulk of diabetes cases in India, there is a dearth or lack of routine health education and surveillance for these patients. This condition suggests that clinicians must be knowledgeable in diabetes education and prevention, as well as patient monitoring to prevent complications.

## HEALTHCARE SYSTEM DISCREPANCIES IN TERMS OF INCOME

In India, communicable disorders like AIDS and tuberculosis have gotten more medical attention than NCDs like diabetes. As a result, diabetes and cardiovascular problems are treated using far less funding than infectious diseases [22].

The availability of healthcare services in rural and urban areas differs significantly in India as a result of the healthcare system's lack of standardization. Public institutions (where treatments are offered for free or at a reduced cost), commercial institutions (services must be paid for by consumers), and a substantial number of medical professionals all participate in the delivery of healthcare.

Depending on their financial ability, accessibility to the facility, and institutional knowledge, anyone can receive any level of care from any of the accessible medical institutions. Private clinics offer diabetic care to those who can afford it [23]. The resources available, the doctor's knowledge of and enthusiasm for treating diabetes, and the patients' financial resources all have an impact on the cost and quality of care, which nevertheless varies greatly by region. Hospital services are provided by government hospitals, including district hospitals and medical college hospitals. Treatment in government hospitals is either free or inexpensive depending on the patient's income; nevertheless, due to few and limited resources and subpar facilities, government care focuses more on acute pressing ailments than diabetes. As a result, diabetes care is generally of poor quality. In the private sector, where treatment is mostly based on financial means, the situation is radically different.

Private medical patients are required to pay all expenses out of pocket because there are little or no reimbursements available and there is also a lack of infrastructure for chronic treatment. India has seen a rise in high-tech corporate healthcare centers over the past few decades with the intention of providing advanced healthcare, but only to the wealthy. The less fortunate

sections of society today have greater standards for the services that government institutions should offer [23]. It is anticipated that a significant lot of patients will transfer to medical colleges because of the cost, notwithstanding the demand for private healthcare facilities.

Rural primary health centers and sub centers need additional attention because of the lack of amenities that contribute to their under appreciation (lack of staff, equipment, laboratory facilities and essential drugs). For people in lower socioeconomic brackets, certain nonprofit organizations offer free healthcare services, albeit these are infrequently used due to inadequate awareness and professional concerns. As a result, insufficient public sector facilities and financial capacity have an impact on the long-term prognosis for diabetes (in the private sector).

When universally high quality care is available to everyone, the prognosis of a disease is at least not determined by a person's socioeconomic level. The problem is made worse by the general disregard for poverty, ignorance, and illiteracy [17].

Following recommendations from rules India has an issue with poor or insufficient adherence to indicated suggestions, which delays diagnosis and leads to improper blood glucose management, raising the risk of adverse outcomes. The IMPROVE Control India study found that only 79 percent of patients had HbA1c testing recommended, compared to 97 and 96 percent of patients who had fasting and postprandial glucose tests, respectively. This is despite the fact that the majority of doctors felt that HbA1c testing is crucial. Since glycated hemoglobin (HbA1c) standardization in laboratories is regarded as being unreliable, many doctors preferred the fasting and postprandial glucose measurements [14].

According to Tharkar et al, the majority of clinical recommendations for diabetes management, including administering HbA1c tests, encouraging glucose self-monitoring, and providing diabetes education, were not being followed in the majority of public/government health care facilities in India [24]. Even at private institutions, only 31.7% of specialized clinicians suggested HbA1c tests. Government hospitals seldom ever gave such advice; only specialized diabetes facilities offered professional aid and counselling regarding healthy lifestyle, diet adjustment, and physical exercise approaches [24]. Disregarding recommended parameters can lead to poor glycemic control, which can substantially increase the odds of complications and add to the financial strain.

## HEALTH CARE INFRASTRUCTURE

India's healthcare infrastructure development has lagged behind its rapid economic growth and is woefully inadequate to meet the nation's present healthcare requirements. Although India has many competent centers' for healthcare provision, the country's overall weak infrastructure limits its potential to increase healthcare standards. In 2002, India had 15,393 hospitals, with over 2/3 of them being public. Due to years of underfunding, the majority of public health facilities only provide limited service. Except for a few notable exceptions, public health institutions lack medical technology, are ineffectively staffed, managed, and equipped.

Furthermore, not enough public health facilities exist. For instance, India only has around half as many community health centres per million residents as is necessary. Currently, there are no drug testing facilities in minimum eleven Indian states, and more than 50% of the labs lack the necessary personnel or equipment. The majority of public money—around 80%—is provided by the state governments, which are also in charge of funding public health. The federal government contributes an additional 15%, mostly through national health programmes [19]. In order to better satisfy people's healthcare demands, it is critically important to update the current medical infrastructure.

## HEALTH CARE COST DUE TO DIABETES IN INDIA

Diabetes is linked to a number of different problems and raises the risk of all atherosclerotic manifestations [25]. More than 70% of the costs associated with diabetes and 80% to 90% of the indirect costs are attributable to its effects, notably severe vascular disease [26]. Since success in human endeavour depends on good health, it is essential for economic advancement [27]. In addition to the cost of medications, diabetes is a costly burden because it necessitates hospital stays, surgeries, consultations, investigations, and other medical procedures to treat its side effects. Indirect costs from lost productivity, missed time, and travel fees are also a big factor.

India is responsible for 23.5 percent of the disability adjusted life years lost worldwide due to diabetes, despite having only 6.4 percent of the world's average per capita health care spending [28].

A low-income family's income accounts for 20% of the cost of a diabetic person's care, according to studies done in India. The direct costs include those for medical care, prescription medications, consultation fees, lab test charges, complication screening, etc. Production losses brought on by frequent absences from work, incapacitating conditions that impede working, early retirement, and death result in higher indirect and intangible expenses. Admissions to hospitals for the purpose of treating long-term effects, such as heart disease, stroke, renal failure, foot ulcers, etc., account for the majority of diabetes-related spending. There are a few studies in Indian contexts that have systematically emphasized the direct cost associated with the management of diabetes.

Shobhana et al. reported a total annual cost of INR 4510 in a public hospital in Chennai [29], despite the fact that the same author reports an annual cost of INR 15,596 for hospitalized patients and INR 8,578 for patients visiting the clinic in another survey. [30]. Hospitalization costs in 2004 were reported to be INR 5925 by Rao et al in a cross-sectional study [31].

To the best of our knowledge, three study reports from 2005 are available, one of which is a cohort study in Northern India by Gover et al. that reported a total cost of INR4966.2 for diabetes over a 6-month period that included consultations, investigations, nursing, and infrastructure. He further stated that INR 2086.74 in indirect costs, including travel, food, medications, and other expenses, resulted from the loss of wages [32]. The study's limitation was the sample size, which was somewhat tiny. In their cohort study, which was carried out in Delhi, Kumar et al. reported a total direct cost of INR 6212.4, inclusive of testing, medications, monitoring, etc. In a cross-sectional study spanning seven Indian states, Ramachandran et al. estimated an annual direct cost of INR 8,130, which includes medications, diagnostics, hospitalization, surgery, and consultations [34]. Shiv Prakash et al 's regional cohort study indicates a consultation fee of INR 363[35].

For uncomplicated diabetics, the annual cost per patient was INR 10,584 in 2009, INR 19,326 for complicated diabetics who weren't hospitalised, and INR 25,960 for complicated diabetics who were admitted [36]. In 2009, Chennai spent INR 4,493 and 15,280 yearly, with and without difficulties, according to a study by Kumpatla et al. [37]. A Punjab-based study reported a consultation cost of INR 166.85, and a cross-sectional study from Maharashtra reported a consultancy cost of INR 116.85 [38,39].

## CONCLUSION

The financial toll that the illness is having on society highlights the need for programmes that aim to achieve targeted glycemic control, quick and efficient care of complications, operationalize routine and early screening for complications, and lessen the escalating financial burden. The current imperative calls for the capacity-building for the advancement of medical and nursing practitioners in diabetes care as well as the promotion of expanding awareness about prevention and management of diabetes and its associated risk.

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