

Chapter 40

Type 2 Diabetes in India: Challenges and Possible Solutions

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ABSTRACT

India has huge health care burden of managing more than 61 million diabetic persons, which is bound to increase further due to rapid urbanization and lifestyle changes occurring in the country. India faces several challenges in diabetes management, including a rising prevalence in urban and rural areas, lack of disease awareness among the public, limited health care facilities, high cost of treatment, suboptimal glycemic control and rising prevalence of diabetic complications. Several barriers related to patients, society and health care system exist, which need to be addressed by the government and health care providers. India has to take drastic and urgent steps to develop an integrated national system for early detection and prevention of the disease. National capacity for management of the disease has to be enhanced by training large number of medical and paramedical personnel and by creating a network of governmental and nongovernmental units working towards the goal of better management of noncommunicable diseases.

INTRODUCTION

Prevalence of type 2 diabetes mellitus (T2DM) is increasing globally and has reached epidemic proportions in many countries. The recent estimates by the International Diabetes Federation (IDF) showed that the number of adults affected by the disease in 2011 was 366 million which was projected to increase to 552 million by 2030.¹ Nearly 80% of the affected people live in middle- and low-income countries. Type 2 diabetes mellitus, which constitutes more than 95% of all the diabetic populations, has an insidious onset with a long, latent, asymptomatic phase. The prediabetic stages also carry high risk for cardiovascular diseases (CVDs) and clustering of the cardiovascular risk factors or the metabolic syndrome.^{2,3}

Among the top 10 countries/territories with the largest number of diabetic adults, five are in Asia.¹ China tops the list with 90.0 million followed by India which has 61.3 million persons affected by diabetes. The numbers are estimated to rise to 129.7 million and 101.2 million, respectively by 2030. These estimates are likely to be underestimations as the prevalence data are mostly available for urban areas and reports from rural areas are scanty. India is largely a rural nation and the recent available reports indicate rising prevalence of the disease in the rural areas also.⁴⁻⁶ With the rapid socioeconomic changes occurring in the rural areas, the prevalence of diabetes and other noncommunicable diseases (NCDs) are bound to increase several fold. These diseases contribute largely to early morbidity and mortality among the population.

India, like many other developing countries, face a double threat from the persisting challenge from a variety of communicable diseases and also from the recent occurrence of lifestyle-related NCDs.

SCENARIO IN INDIA

In another 20 years, nearly one-fifth of the world's diabetic population will be in India.

India faces several major challenges in the management and prevention of T2DM as listed in **Table 1**.

Rising Prevalence of Diabetes

During the period 1971–2000, studies from different parts of India reported a 10-fold increase in the incidence of diabetes in urban India (from 1.2% in 1971 to 12.1% in 2000).⁵⁻⁷

In 2003–2005, a national survey was conducted in persons of age greater than or equal to 15 years, in which self-reported prevalence of diabetes was 7.3% in the urban areas and 3.2% in periurban slum areas. The prevalence in rural areas was significantly lower (3.1%).⁸ Urban areas have witnessed a three- to fourfold increase in diabetes prevalence in many regions of India.

The prevalence of diabetes is reaching a pandemic proportion which is mostly attributed to rapid lifestyle transitions and by a narrowing in the urban-rural divide in living conditions. Although there are disparities in the sample selection and screening criteria, the prevalence estimates are escalating both in the urban and rural regions of India. A recent study in Kerala showed that the rural population has a higher prevalence of diabetes than the urban population.⁹ In fact, the urbanization rate in Kerala is so rapid that the whole of Kerala is almost urbanized. Presently, India is largely

TABLE 1 | Main challenges posed by type 2 diabetes mellitus (T2DM) in India

- Rising prevalence in urban and rural areas
- High prevalence of prediabetes
- Genetic and environmental risk factors
- Rising prevalence among young people
- Delayed diagnosis
- Low disease awareness among the public
- Limited health care facilities
- High cost of disease management
- Suboptimal diabetes control
- Rising rate of diabetes complications

a rural nation, but by 2030, urbanization is expected to reach nearly 50% in the country.

Genetic Susceptibility and Low Threshold for Environmental Risk Factors

Indians have a high ethnic and genetic susceptibility for the disease, and also have lower threshold limits for the environmental risk factors.¹⁰ It is a matter of major concern that Indians develop T2DM at a younger age than the western populations.¹⁰ They also develop diabetes with minor weight gain.

Both the thrifty genotype and thrifty phenotype hypotheses appear to have etiological roles in the development of diabetes in Asian populations. While the thrifty genotype hypothesis points to a mismatch between the ancestral genes and modern environment, the thrifty phenotype hypothesis postulates a mismatch between intrauterine and adult life environments.¹¹ The combination of gestational diabetes, in utero nutritional imbalance, childhood obesity and overnutrition in adulthood will continue to fuel the epidemic in Asian countries undergoing rapid nutritional transitions.

High Prevalence of Prediabetes

Prevalence of prediabetes constituting impaired fasting glucose (IFG) and impaired glucose tolerance (IGT) is also high in all parts

of India. As per the current estimates by the IDF, India has nearly 3.0% of adults with prediabetes.¹ The Indian Diabetes Prevention Programme-1 (IDPP-1) a 3 year prospective study in IGT subjects in India showed a very high conversion rate to diabetes (18% per year).¹² Recent epidemiological studies in Chennai have indicated a rapid conversion of IGT to diabetes, resulting in increased prevalence of diabetes with a concomitant reduction in the number of IGT subjects.^{13,14}

Rising Prevalence Among Youth

It has been noted that the age at diagnosis has decreased considerably among the Indian patients.¹³ Type 2 diabetes mellitus among adolescents and youth has become increasingly common.¹⁰ The development of the disease at a young age predisposes the patients to develop the chronic long-term complications at a relatively young age and severe morbidity and early mortality occur in the most productive years of life.

In Chennai, we had noted that the prevalence of diabetes in persons below 44 years of age had increased from 25% of the total prevalence in 2000 to 34.7% in 2006.¹³ The corresponding increase in the rural population was higher as shown in **Figure 1**. Indians and many other Asian populations have the “metabolically obese” phenotype characterized by higher abdominal obesity despite normal body mass index (BMI), low muscle mass, higher percentage of body

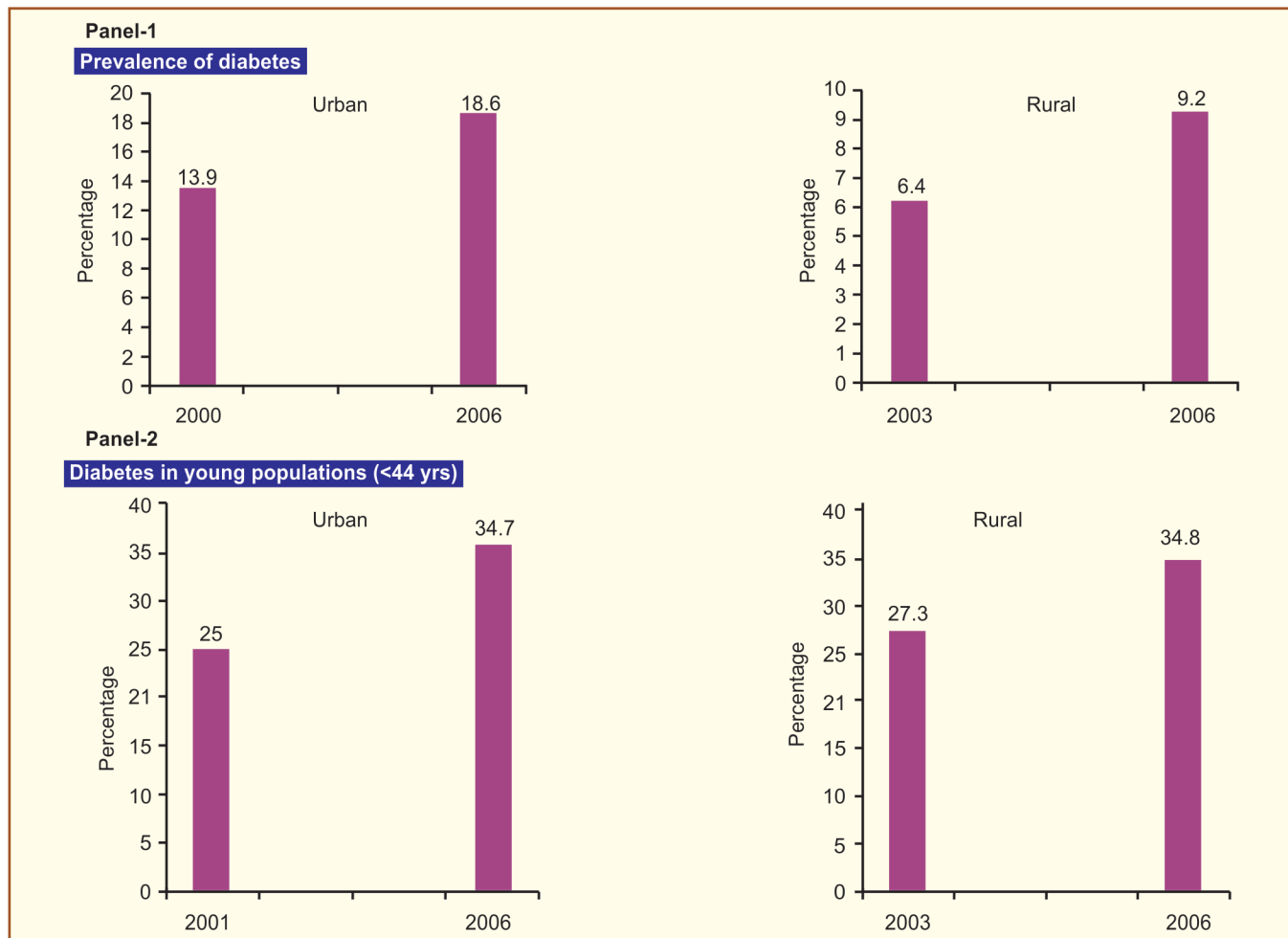


Figure 1: The corresponding increase in the rural population
 Panel-1: Changing trend in the prevalence of diabetes in the urban and rural populations in Tamil Nadu
 Panel-2: Increasing prevalence of diabetes in the young in urban and rural populations

fat and increased levels of insulin resistance, which makes them highly susceptible to diabetes.¹⁰ A study in Chennai had shown high prevalence of insulin resistance and cardiometabolic abnormalities among healthy adolescents, the rate of which significantly increased in overweight and obese children (up to 85%).¹⁵ Moreover, the cardiovascular factors tended to cluster. Similar data have been reported by Misra and coworkers in northern India.¹⁶

Childhood Obesity

There is a global increase in the prevalence of obesity in children and adolescents. This is closely linked to lifestyle factors such as unhealthy eating habits and decreased physical activity, both of which are widely occurring in developing countries with urbanization. Insulin resistance occurs in early ages and it is an independent risk factor for CVD and also a root cause for diabetes.

Type 2 diabetes mellitus in children is becoming common in many countries, especially among the Asian-Indian population. In India, the age at onset of T2DM is generally low and this form of diabetes in children is being detected more frequently now.¹⁰

DELAYED DIAGNOSIS OF DIABETES

Due to the asymptomatic nature of disease and also due to the low disease awareness among the population, diagnosis of the disease is delayed by several years. As a result, many subjects already have vascular complications at the time of diagnosis of diabetes.

Population screening is not practical in India which has a large population. However, it is recommended that opportunistic screening should be done by the health care providers, in the government and nongovernment sectors, for nondiabetic subjects reporting for medical checkup. Simple, noninvasive diabetes risk score is also available for identifying people with high-risk of diabetes.¹⁷ The risk score can be used even in nonclinical setting and it is a very cost-effective method of identifying a people who should be screened using oral glucose tolerance test (OGTT).

Early diagnosis of diabetes has many clinical advantages, such as early and prompt initiation of treatment and thus avoiding occurrence of vascular complications in many people.¹⁸ Moreover, management of related abnormalities such as dyslipidemia and hypertension can also be started which will help to reduce the risk of vascular complications. Early intervention could also help to preserve the beta cell function. Overall, these benefits will improve personal health, reduce economic and physiological burden at societal level.

AWARENESS ABOUT DIABETES AND OTHER NONCOMMUNICABLE DISEASES AMONG THE PUBLIC

Awareness about NCDs, its causes and long-term morbidity associated with NCDs are not recognized by the public, especially those who have low education levels.^{6,19} At present, government and nongovernment organizations are conducting awareness creation programs through health camps, exhibitions and by using the mass media. However, the awareness level is still low in rural areas.

National Capacity Enhancement to Manage and Prevent the Disease

Wide disparities in socioeconomic level, educational background and nonavailability of diabetes care are some of the major hurdles in the management of diabetes or any other chronic diseases in India. The launch of a national program by the Indian government for prevention and control of diabetes, CVD and stroke, i.e. NPDCS is a major step in strengthening the national capacity for coping with the diabetes epidemic.²⁰ India Diabetes Research Foundation, Chennai has taken a major role by providing training for large number of

medical and paramedical personnel from 10 states in the country by conducting workshops and hands-on training on various aspects of diabetes management. More than 4,000 doctors and 10,000 paramedical persons have been trained in this program. It is hoped that the training will have a cascading impact whereby larger number of persons in the rural areas will be benefited.

LIMITED HEALTH CARE FACILITIES

A mismatch of national health care budget and health care burden, especially due to the epidemic of noncommunicable diseases, poses huge national challenges.

Several barriers exist in achieving the goals of diabetic management. They include patient barriers, social barriers, barriers related to healthy system and also related to medical professionals.²¹ Patient-related barriers are shown in **Table 2**. Societal barriers are shown in **Table 3**. There are specific problems related to medical profession, which are highlighted in **Table 4**. The health care system has to address these barriers, to formulate effective health care strategies.

Although the prevalence of diabetes is lower in low socioeconomic group versus the high-income groups living in urban areas, the former group has higher prevalence of complications.^{6,22} This is because they tend to neglect the management of diabetes due to lack of awareness and also due to economic barriers.

TABLE 2 | Patient-related barriers in diabetes management

- Lack of awareness, poor motivation
- Economic constraints
- Denying risk
- Stress, fear, confusion
- Immediate benefits not seen
- Lack of family and social support
- Lack of trust in health care providers
- Changing behavior and sustaining the changes are difficult

TABLE 3 | Societal barriers related to diabetes management

Urban

- Changing patterns in the lifestyle in families
- Unhealthy eating habits, e.g. fastfoods, etc.
- Frequency of eating out
- Faith in different systems of treatment and frequent changes in treatment

Rural

- High rates of illiteracy
- Poverty and different socioeconomic strata
- Multilingual population
- Cultural, religious and customs
- Superstitions and beliefs
- Faith in alternate systems of treatment
- Hesitancy to go to doctors or hospitals

TABLE 4 | Barriers relating to medical profession

- Medical training focused to acute care
- Treatment of acute diseases more rewarding to doctors
- Most of the clinical workload in developing societies is due to acute illnesses and infection
- Even nurses find acute illness treatment more paying
- Cost of having a team for diabetes management
- Lack of trained paramedicals

The challenges for diabetes care in India and in other Asian countries include improved education to alert the population about the risk factors for diabetes, training of patients to manage their disease more effectively, and development of more structured care delivery and management of cardiometabolic risk factors. It is essential to diagnose the disease early, start an aggressive management of glycemia and associated cardiovascular risk factors. It is also mandatory to individualize glycemic targets, taking into account the comorbid conditions.

Patient education and empowerment are key steps in assuring good glycemic control. However, the facility and adequate manpower for these are not available even in major cities. Priority must be given for creating awareness among the public and for patient education. Patient education programs are generally cheap and cost-effective.

The loss of human resources and economic burden due to diabetes at personal, societal and national levels are huge. National strategies to raise public awareness about the diseases and to improve standard of care and implementation of programs for primary prevention are urgently needed.

Well-targeted basic research is needed to provide insight into feasible strategies for prevention of diabetes and its complications.

COST OF DIABETES MANAGEMENT

Diabetes is a costly disease for the health care sector, at societal and at personal level. Cost of diabetes care is very high. The cost of care increases many folds when complications occur or when admission to hospital, surgery or insulin treatment is needed. A study by the authors has shown that the annual median expenditure by patients on diabetes care is Rs 10,000 in urban and Rs 6,300 in rural areas.²³ Low-income group spends nearly 25–35% of their annual income on diabetes care. Due to the high economic burden on the patients and their families, people tend to neglect health care causing severe morbidities and early mortality. India has no comprehensive diabetes health care program. Patients seek medical care from different health care providers, many of whom lack any yardsticks for quality.

SUBOPTIMAL DIABETES CONTROL AND RISING RATE OF DIABETES COMPLICATIONS

It is well-known that the treatment outcome is far from ideal among diabetes patients even in developed countries.²⁴ Studies in India indicate that clinical outcome is very poor among majority of the patients even in cities where facilities for ideal diabetes treatment are available.^{6,25,26}

Primary Prevention of Diabetes at Community Levels

Unlike many other diseases, treatment exists for diabetes. Better understanding of the pathophysiology of the disease and its complications has helped to develop newer, effective drugs for the treatment. It is also proven that T2DM is preventable and the long-term complications also can be reduced by proper management of diabetes.^{27,28} The major hurdles in achieving these goals are multiple, in low- and middle-income countries such as India. With the guidance from the IDF and the World Health Organization (WHO) and adopting the strategies developed by countries such as Singapore, Korea and Mauritius for reducing the risk factors for NCDs, a comprehensive national policy has to be developed to arrest the onslaught of diabetes in the country.²⁹

Indian primary prevention studies have shown that T2DM can be prevented in persons of high-risk of developing the disease, by consistent lifestyle modification focused on improved physical activity and healthy diet.^{12,30} At present, there is an urgent need to translate the findings of the clinical trials into community

levels programs. Cheaper and widely accessible methods of communication are required for motivating people to adhere to the preventive strategies. Use of information technology and telecommunication via cell phones may prove to be cost-effective communication strategies.

Future Actions

To promote primary prevention of diabetes, there is a need to improve nutrition and enhance physical activity, both of which require major behavioral changes in the community. There are several social, political, economic and administrative hurdles in a large country like India for implementation of national primary prevention programs. Inadequate financial resources and lack of trained personnel pose major hurdles. Several private organizations are implementing programs for awareness creation on NCDs among the public. Primary prevention programs are also being organized with the guidelines from the organizations such as the American Diabetes Association (ADA), IDF, WHO and World Diabetes Foundation (WDF). There is a need to train a large number of grass-root health care workers to communicate with the rural population and the general public at large.

A mismatch of national health care budget and health care burden, especially due to the epidemic of NCDs poses a huge challenge to the country. A large proportion of diabetic patients neglect appropriate management because of the unaffordable cost of the treatment. Availability of treatment including the drugs at an affordable cost will reduce the huge morbidity and early mortality resulting due to diabetic complications.

India has a very large population which is stricken by poverty. Maternal malnutrition is rampant and the adverse effects of malnutrition in utero are evident by the appearance of metabolic disorders at a very young age in these groups.³¹ There is an urgent need for the government to address these issues and provide adequate health care facilities, particularly for the lower economic status of the society. An integrated national system for early detection and prevention of diabetes has to be developed.

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