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Research Article

THE “DIABETIC CAPITAL” OF THE WORLD: CUMULATIVE BURDEN OF DIABETES IN INDIA

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ABSTRACT

The burden of diabetes is escalating every single day and it causes enormous mortalities across globe. India is currently on its path to become the diabetes capital of the world by making a significant contribution to the worldwide prevalence. Compared to rural areas, diabetes is more common in urban areas. Nowadays, type 2 diabetes is becoming increasingly more prevalent among youths and women. Type 2 diabetes is predominantly impacted by modifiable risk factors. People just become aware of the disease once they start experiencing its symptoms. There is an imperative need to make policies which focus on awareness, early screening and prevention strategies among people at grass root level. A literature search was carried out using pertinent databases such as IDF Atlas reports, PubMed, Springer, Elsevier, BMJ and other relevant original and meta-analysis studies searched up to October 2023. This review recapitulates the contemporary scenario of cumulative burden of diabetes in India, which is regarded as the world's diabetic capital.

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INTRODUCTION

Diabetes Mellitus

Diabetes, commonly known as diabetes mellitus, is a persistent disorder that ascends when blood glucose levels are elevated. Either the body is unable to synthesize enough insulin, or it is unable to adequately use the insulin that is produced. The pancreas releases insulin, a hormone that is necessary. It enables blood glucose to circulate to the body's cells, where it can either be stored or transformed into energy. Furthermore, insulin is required for the cellular breakdown of fat and protein. Hyperglycaemia, the clinical marker of diabetes, is caused by high blood glucose levels (hyperglycaemia) due to either a shortage of insulin or an inability of cells to respond to it.¹

Type 1 diabetes mellitus

Insulin-dependent diabetes mellitus (IDDM), often referred to as juvenile-onset diabetes, is an instance of diabetes that typically affects individuals beneath 30 years of age, however it can strike any individual at any age.² The immune system of the body targets the pancreatic beta-cells that produce insulin, which results in type 1 diabetes. The body thus makes either inadequate or insufficient insulin. Type 1 diabetes may impact any individual at any stage of life, although it often affects children and young people. Hence, it is one of the most prevalent chronic diseases in children. In certain countries,

children who are obese, or overweight are more likely to develop type 2 diabetes.¹

Type 2 diabetes mellitus

Previously known as non-insulin-dependent diabetes mellitus (NIIDDM) or maturity onset diabetes, type 2 diabetes is a type of diabetes that typically affects people over the age of thirty. It is now also commonly diagnosed in children and young adults.² With over 90% of cases of diabetes globally, type 2 diabetes is the most prevalent kind of the disease. Insulin resistance, a disease in which the body's cells are unable to adequately respond to insulin, is the primary cause of hyperglycaemia in type 2 diabetes. Insulin resistance takes place when the hormone is no longer as effective, which eventually leads to an increase in the synthesis of insulin. Over time, insufficient insulin production may arise from the pancreatic beta cells' inability to meet the body's demands. It can be efficiently controlled with medication when needed in addition to healthy lifestyle adoption, education, and support. There is evidence that type 2 diabetes may be prevented, and more and more research are showing that certain individuals may be able to reverse their type 2 diabetes.¹

Prevalence of diabetes across globe

According to the World Health Organization (WHO), diabetes has been identified as a major cause of premature death and morbidity across the world, and it is estimated to rank seventh

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among the leading causes of human mortality until 2030. Currently diabetes affected 537 million people globally. Type 2 diabetes accounts for most incidents of diabetes albeit being much preventable. According to estimates of International Diabetes Federation (IDF), 8.4% of adults aged 18 to 99 experienced diabetes in the year 2017, and that percentage was predicted to rise to 9.9% by 2045.¹

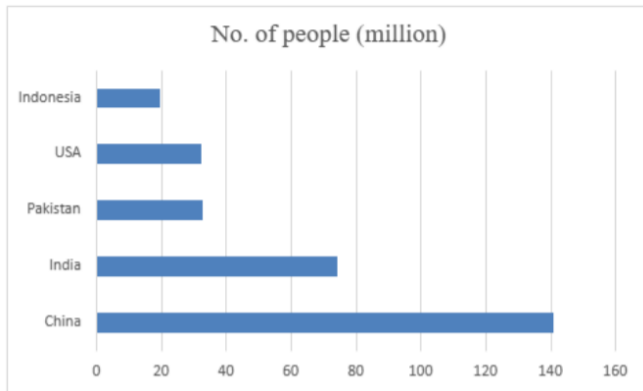


Figure 1 Top 5 countries for number of people with diabetes of age group 20-79 years.

Source: IDF, 2021¹

Prevalence of diabetes in India

A new lifestyle that was inconceivable before is gradually becoming the norm for the young Indian population, which constitutes 65% of the nation. They are quite likely to develop diabetes and its complications, which are becoming more and more common. In addition to impacting people's health, the new, changing way of life is also adding to the fiscal burden on a developing nation like India.³

India accounts for one in seven adults suffering from diabetes all across the globe. When it pertains to the total number of people aged 20 to 79 with diabetes, India is placed first among the top 5 nations.¹ India is the country holds the title of 'Diabetic Capital of the World' as it has maximum rising cases every year compared to other countries. According to IDF, 2013 India ranked second under top ten countries for number of people with type 2 diabetes. 65.1 million people were suffering from type 2 diabetes in the year 2013. Likewise, in the year 2015 also IDF revealed the data and again India hold second position out of 10. In India 69.2 million active cases reported by.⁴Presently, there is no proven method to stop type 2 diabetes. As a result, the focus is only on the factors that have been linked to type 2 diabetes prevention.

In the year 2021, IDF revealed that India ranked second in top ten countries for number of people suffering from type 2 diabetes shown in above **figure 1**: for the number of adults (20-79 years) with undiagnosed of diabetes in the top ten nations or territories in 2021, India was in second place after China, followed by Indonesia and Pakistan. The data reveals that there are 39.4 million (53.1%) of people were present with undiagnosed diabetes in India.¹ By maintaining blood glucose, blood pressure, and cholesterol levels as close to acceptable levels as possible, diabetes complications can be prevented or deferred. Screening programmes can identify various complications in their initial stages, enabling for treatment to avoid them from getting worse. Diabetic consequences and untimely death are caused by inappropriate management of ailment. People with diabetes can live a long, healthy life with appropriate self-management and medical professional help.⁴

In the year 2011, ICMR-INDIAB study which was conducted in both urban and rural extents of selected 15 Indian states. It was conducted into two phases. Phase I was conducted by Anjana et al (2011)⁵ for the estimation of the prevalence of diabetes and prediabetes in 3 states and one union territory of India. Phase II was conducted in the year 2017 in 11 states of India which were not covered in the phase 1. During phase I, Prevalence of both pre-diabetes and diabetes was estimated in three states of India namely Tamil Nadu, Maharashtra, Jharkhand and Chandigarh. Similar study was conducted by ICMR-INDIAB in the year 2017 for 11 states of India.

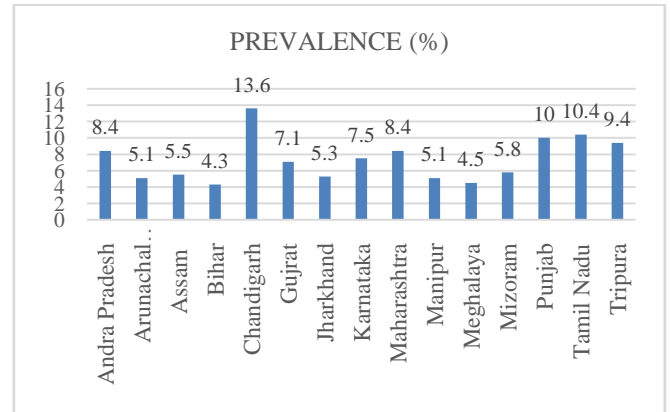


Figure 2 Prevalence of diabetes in 15 states of India

Source: ICMR-INDIAB.⁶

Prevalence of diabetes in all 15 states of India was 7.3%. Andhra Pradesh, Arunachal Pradesh and Assam had prevalence rates of 8.4%, 5.10% and 5.5% respectively. The overall prevalence of diabetes in Bihar was 4.3% but varied in urban (10.5%) to rural (3.5%) settings. ICMR INDIAB estimated highest diabetes prevalence of 13.6% in Chandigarh. Prevalence of diabetes in Gujarat was 7.1% and 5.3% in the Jharkhand state. Prevalence estimated 7.7%, 8.4% and 5.1% in Karnataka, Maharashtra and Manipur respectively. Among other states of India in Meghalaya the lowest prevalence was estimated i.e. 4.5%. Mizoram has prevalence of 5.8%, whereas, Punjab, Tamil Nadu and Tripura had a high prevalence of 10.0%, 10.4% and 9.4% respectively.^{5,6}

The following (Table 1) provides a succinct explanation of several other research that looked at the overall prevalence of type 2 diabetes in different Indian states and cities.

Urban rural prevalence

In this regard, the Indian scenario by ICMR-INDIAB also revealing the same picture i.e. urban area has a greater number of diabetes patients than rural areas. This study was conducted in two phases from the year 2011 to 2017 which covered both urban and rural area of 15 states of India. Anjana et al (2017)⁶ determined that urban settings have higher prevalence of diabetes linked to rural in all the 15 states of India. Prevalence of diabetes was estimated urban setting of Andhra Pradesh was 12.6% whereas in rural 6.3%. Urban extents of Arunachal Pradesh have 5.3% and rural have prevalence of 4.9%. Assam had prevalence rates of 12.4% in urban while rural had 4.4%, Whereas Bihar state of India had 10.5% in urban and 3.5% prevalence in rural settings. ICMR INDIAB estimated highest diabetes prevalence in Chandigarh; urban (14.2%) and rural

Table 1 Prevalence of diabetes across India

S.no	State	Site	Age group	Population	Year of study	Overall prevalence (%)	Author
1.	Andhra Pradesh	West Godavari region	40-85	62254	2014	29.9	Affan et al 2016 ^[7]
		Godavari	>30	4535	2005	13.2	Chow et al 2006 ^[8]
2.	Delhi	-	>20	5363	2015	25.2	Deepa et al 2015 ^[9]
		Dilshad Garden	>20	1317	2015-2016	18.3	Madhu et al 2018 ^[10]
3.	Goa	-	>20	1266	2010	10.3	Vaz et al 2011 ^[11]
4.	Gujrat	-	>18	2161	2009-2010	28.9	Joshi et al 2012 ^[12]
5.	Haryana	-	>18	1003	2007-2008	8.1	Arora et al 2010 ^[13]
		Jhajjar and Rohtak	20-75	2606	2012	13.3	Rajput et al 2012 ^[14]
			18-69	2524	2016-2017	15.5	Thakur et al 2019 ^[15]
6.	Jammu	R S Pura Block, Miran Sahib Zone	>30	2085	2013	8.15	Shora et al, 2014 ^[16]
7.	Jammu and Kashmir	Anantnag and Srinagar	>40	3972	2015	6.31	Dar et al, 2015 ^[17]
		Srinagar	>20	1040	2011	6.05	Ahmad et al, 2012 ^[18]
8.	Karnataka	Bangalore	>35	2013	2012-2013	12.33	Dasappa et al 2015 ^[19]
9.	Kerala	Kochi	>18	4507	2015-2016	20	Menon et al, 2016 ^[20]
10.	Madhya Pradesh	Gwalior-Chambal region	20-79	7608	2015-2017	11.4	Subramani et al, 2019 ^[21]
11.	Maharashtra	Mumbai	>40	6569	2011-2014	15.37	Sunita et al, 2017 ^[22]

(8.3%). In Gujarat prevalence was 9.5% in urban and 5.1% in the rural settings. Prevalence estimated in the Jharkhand state in urban and rural settings was 13.5% and 3.0% respectively. In urban Karnataka prevalence was 11.1% and it was 5.6% in the rural part.

The urban Maharashtra had prevalence of 10.9% whereas rural had 6.5%. The prevalence rate in Manipur was 7.1% and 4.4% in urban and rural respectively. Meghalaya had the prevalence of 8.9% in urban whereas 3.5% in rural fragment. Mizoram has prevalence of 7.9% (urban) and 3.6% (rural). Punjab had 12.0% in urban settings while rural had prevalence rate 8.7%. Urban regions of Tamil Nadu state had prevalence of 13.7% and 7.8% in rural. Tripura had a high prevalence of 15.5 (urban) whereas % 7.2 (rural)^{5,6}

From the above figure 2.5; it is clear that urban settings had high prevalence of diabetes then rural. Urban populations considerably have greater rates of obesity due to sedentary lifestyles and have more frequent family histories of diabetes than rural populations, which contributes to the increased prevalence of diabetes in urban settings worldwide.²³

Risk factors for type 2 diabetes

Diabetes is believed to have multiple etiological factors. Modifiable and non-modifiable risk factors are the two categories into which risk factors for type 2 diabetes are divided. Type 2 diabetes is linked to several modifiable risk factors, including an inactive lifestyle or lack of exercise, obesity, a poor diet, stress, depression, and insufficient sleep. Age, race, ethnicity, family history of diabetes, genetic predisposition, and non-modifiable risk factors are all linked to type 2 diabetes.²⁴ Type 2 diabetes is becoming more and more common, and communities that are "westernising" or becoming

more modernised as well as those in developing nations have high prevalence rates.²⁵

Numerous non-modifiable risk factors at the individual level, such as genetics, age, ethnicity, and family history, have been prospectively linked to type 2 diabetes, but in most of the population, the prevalence has likely been caused by modifiable risk factors such as sedentary lifestyle and/or inactivity, rising rates of overweight and obesity, unhealthy eating patterns (increased consumption of refined grains, fat, sugar, and sweetened beverages and decreased intake of fruits and vegetables), bad drinking and smoking habits, exposure to environmental pollutants, altered intrauterine environment, and mental health (stress/depression).²⁴

In the past, older individuals had a higher prevalence of type 2 diabetes; however, this is no longer the case since teens and young adults are now becoming susceptible. This is because of increased consumption of junk foods and sedentary or inactive lifestyle. Eating junk foods and lower physical activity leads to positive energy balance, which ultimately leads to obesity. Obesity is well known, major contributing factor in the development of type 2 diabetes. There is accumulating suspicion that gender differences play a role in T2DM and its complications. These variances are brought on by hormonal changes, sociocultural practises, alterations in the environment (food, lifestyle, stress, attitudes), and gene-environment interactions.²⁶

Challenges with increasing instances of type 2 diabetes in India

For low- and middle-income nations like India, where the burden of the disease has increased dramatically in recent

decades and will continue to increase over the forthcoming decades, the scenario grows increasingly catastrophic. In the current Indian scenario, youths and adults are becoming more prone towards developing type 2 diabetes. There is a serious reason to be concerned since diabetes and complications associated to it are becoming more common across nation. This may have a significant impact on diabetes-related morbidity and death as well as India's total healthcare expenditure. India is currently facing the several challenges and obstacles that make it difficult to prevent and manage diabetes and its complications, including a lack of a multi-sectoral approach, surveillance data, a lack of awareness of diabetes, its risk factors, and complications, access to health care settings, a lack of affordable medication options, among other things. In order to stop the diabetes pandemic and lower diabetes-related complications in India, better health promotion and primary prevention are required at both the individual and population levels.²⁴

Up to 90% of all cases of diabetes are type 2 cases, and many people are unaware that this kind of diabetes is completely preventable. It might take years for problems to become apparent before a diagnosis is made because early and even intermediate diabetes mellitus is asymptomatic.²⁷ After they started experiencing the symptoms, people used to become conscious and seek medical attention for themselves and get diagnosed with diabetes. This condition cannot be reversed; it can only be managed through certain lifestyle changes. And thereby, early screening serves as the sole method of preventing this catastrophe.

The risk factors are the key area where raising knowledge is necessary to lower the risk of type 2 diabetes among Indians. Policies and programmes must generate awareness regarding the risk factors for diabetes at grass root level. Strategies that may be conducive to lower the encumbrance of the disease-Promotion of health and primary prevention to reduce the exposure to lifestyle risk factors and conducting early detection and necessary treatment to the patients should be given on time. There is a need for a multi-faceted approach to stop the diabetes pandemic and its related problems, it involves early diabetes diagnosis, screening for complications, providing the best treatment possible for people with diabetes at all levels of care, and primary diabetes prevention in people with prediabetes.²⁴

Approaches for combating epidemic of diabetes in India

- A multi - sectorial approach ought to be implemented to effectively execute policies and programmes at the grassroots.
- Through awareness campaigns, informing people about the causes, consequences, and prevention of type 2 diabetes.
- The promotion of primary preventive techniques to reduce the incidence of new cases.
- As they are the future, youths should be the segment that awareness campaigns explicitly target since they are more susceptible.
- Such programmes could also include non-invasive procedure based early screening initiatives.

CONCLUSION

The high and growing incidence of diabetes globally, especially in emerging countries like India, is predominantly due to the increased prevalence of overweight/obesity and unhealthy lifestyles. There is a need of multi-sectoral approach at grass-root level to spread awareness and to educate people specially youths regarding the risk of diabetes. Owing to the asymptomatic nature of early and even intermediate diabetes mellitus, it may take years before problems are diagnosed. The incidence would be significantly reduced by early screening, followed by the implementation of preventative measures, including lifestyle modifications. Early screening decreases the probability of developing type 2 diabetes in an individual.

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