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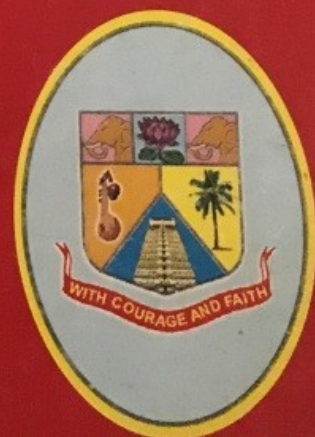
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THE ECONOMIC BURDEN OF DIABETES AND ITS IMPLICATIONS IN INDIA

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ABSTRACT

The largest increases in the diabetic population in developing countries are projected to be in the most economically productive age groups. By the year 2030, over 85% of the world's diabetic patients will be in developing countries. A healthy diet, regular exercise maintaining ideal body weight and physical activity can reduce the risk of developing complications of diabetes such as heart disease, stroke, kidney failure, blindness, and leg ulcers.

Introduction

Health is the major component of human resources, which contributes to economic development and permits people to lead economically and socially satisfying lives. The reduction of sickness increase work productivity and life expectancy to promote economic development. World Health Organization (WHO) in 1948, Health was defined as being "a state of complete physical, mental, and social well-being and not merely the absence of disease or infirmity". Better health is central to human happiness and well-being. It also makes an important contribution to economic progress, as healthy populations live longer, are more productive and save more.

Diabetes has become a major and growing public health problem world wide. It touches every walk of life. Diabetes is amongst a five leading causes of death by disease in most countries (Zimmet, 1997). Diabetes mellitus is defined by the American Diabetes Association expert committee in their 1997 recommendations as "a group of metabolic diseases characterized by hyperglycemia resulting from defects in insulin secretion, insulin action or both. The chronic hyperglycemia is associated with long-term damage, dysfunction and failure of various organs, especially the eyes, kidney, nerves, heart and blood vessels". Thus, diabetes covers a wide range of heterogeneous diseases (Mohan. et al,2004). The World Health Organization study group classification (WHO,1985) includes a number of clinical classes, the two major being insulin-dependent diabetes mellitus (IDDM) or type I diabetes and non-insulin dependent diabetes mellitus (NIDDM) or type II diabetes, as well as malnutrition related diabetes, impaired glucose tolerance (IGT) and gestational diabetes mellitus (GDM).

Diabetes is a major cause of blindness, kidney failure, amputation and cardio-vascular disease, and its complications results in major reduction in both

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length and quality of life. In addition, the burden on individuals and on society extends past human capital (Engelgau et al, 2003). In developing countries, the majority of people with diabetes are in the 45 to 64 year age range. In contrast, the majority of people with diabetes in developed countries are >64 years of age. By 2030, it is estimated that the number of people with diabetes >64 years of age will be >82 million in developing countries and >48 million in developed countries (Wild et al, 2004). The largest increases in the diabetic population in developing countries are projected to be in the most economically productive age groups (Mohan. et al, 2004). By the year 2030, over 85% of the World's diabetic patients will be in developing countries (Mehta, 2009).

Global Epidemiology of Diabetes Mellitus

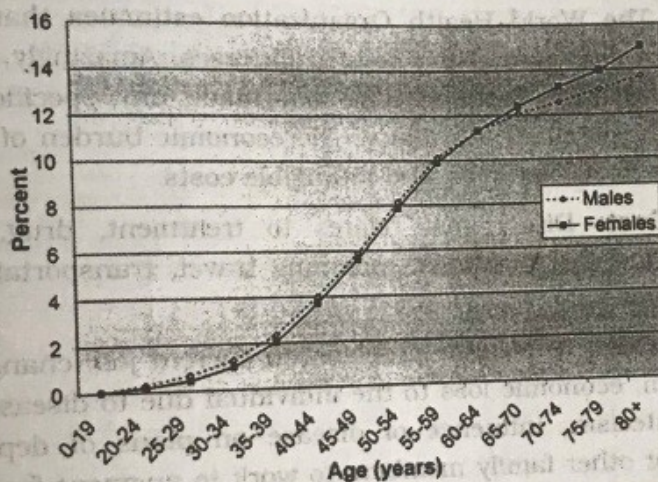
Diabetes represents a spectrum of metabolic disorders, which has become a major health challenge worldwide. Due to aging, accelerated population growth, urbanization and high prevalence of obesity and inactive lifestyle, the number of people with diabetes is increasing globally at a rapid speed. As estimated, 30 million people world-wide had diabetes in 1985. A decade later, the global burden of diabetes was estimated to be 135 million. In 2000, there were 177 million people with diabetes worldwide and by 2030, the projected estimate of diabetes will increase to 370 million (WHO, 2003). The International Diabetes Federation recently published findings revealing that in 2007, the country having the largest number of people with diabetes is India (40.9 million), followed by China (39.8 million); the United States (19.2 million), Russia (9.6 million) and Germany (7.4 million).

Table - 1: The Top 10 Countries with Diabetes Prevalence

Rank	2000		2030	
	Country	People with diabetes (millions)	Country	People with Diabetes (millions)
1	India	31.7	India	79.4
2	China	20.8	China	42.3
3	U.S.	17.7	U.S.	30.3
4	Indonesia	8.4	Indonesia	21.3
5	Japan	6.8	Pakistan	13.9
6	Pakistan	5.2	Brazil	11.3
7	Russian Federation	4.6	Bangladesh	11.1
8	Brazil	4.6	Japan	8.9
9	Italy	4.3	Philippines	7.8
10	Bangladesh	3.2	Egypt	6.7

Source: Wild, Sarah et al., 2004, Diabetes Care

Sex Ratio of Diabetes: The ratio of the number of adult male and female people with diabetes in 1995 in the world as a whole is more for women than men with diabetes (73 vs. 62 million). The female excess is pronounced in the developed countries (31 vs. 20 million), but in the developing countries, there are equal numbers of men and women with diabetes (42 million in each case). There is a moderate female excess in China (9 vs. 7 million). There is a male excess in India (11 vs. 8 million). By the year 2025, the worldwide female/male excess is estimated to be reduced (to 159 vs. 141 million) (King, et al, 1998).



Global Diabetes Prevalence Rate (%) by Age and Sex (2000)
 Source: Wild, Sarah et al., 2004, *Diabetes Care*

Diabetes in India

Diabetes has emerged as a major healthcare problem in India. India is 'Diabetic Capital of the World'. According to Diabetes Atlas published by the International Diabetes Federation (IDF), it has been estimated there were 40 million persons with diabetes in India in 2007 and this number is predicted to rise almost 70 million people by 2025. It is estimated that every fifth person with diabetes will be an Indian. Due to these sheer numbers, the economic burden due to diabetes in India is amongst the highest in the world. The increased number of diabetics in India is likely to be due to a significant increase in the incidence of diabetes, caused by unprecedented rates of urbanization, which results in environmental and life style changes (Ramachandran, 2009). The prevalence of diabetes is 4 - 6 times higher in the urban population as compared to rural areas (Ramachandran, 2002). The prevalence of diabetes is 16.6% in Hyderabad, followed by Chennai with 13.5%, Bangalore with 12.4%, Delhi with 11.6%, and Mumbai with 9.3%. If you compared with North India, the incidence is more in the South.

Economic Cost of Diabetes

Diabetes is a disease which needs more expense, both for the patient and the health care provider. The complications of diabetes and the resulting hospitalizations involve major costs. In most developed countries, health care is streamlined, health insurance is available, and resources for health care are better than in developing countries. In developing countries governmental organizations manage primary care, and some inadequacies in health care systems exist. It is estimated that diabetes accounts for 5% to 10% of national health budgets. The World Health Organization estimates that 4% to 5% of expense on health goes to diabetes-related illnesses. Amazingly, it is estimated that 25% of the World's Nations have not made any specific provision for diabetes care in National Health Plans. The economic burden of an illness like Diabetes includes direct, indirect, and intangible costs.

i) Direct Cost: Direct cost relates to treatment, drug, consultation, laboratory tests and investigations, including travel, transportation and other miscellaneous costs.

ii) Indirect Cost: It includes problems in current job, change in ability to work, absenteeism, economic loss to the individual due to disease related work change or absenteeism, influence of disease on plans of dependent family members, need for other family members to work to augment family income, or change career objectives.

iii) Intangible Cost: It includes pain, anxiety, depression, and loss of enjoyment.

Diabetes costs in the low-income group of patients constitute 25% of their annual income. Expenses increase with the duration of diabetes. In a developing country, the direct cost of diabetes healthcare is very high for many people. A person with diabetes faces higher costs than those of a healthy individual because of more frequent medical visits, the need to purchase supplies/medication and the greater likelihood of being admitted to hospital. So, a person with diabetes incurs medical costs that are 2 to 5 times higher than those of a person without diabetes (Barcelo et al, 2003).

India will spend an amount between \$3.3 billion and \$5.3 billion by 2025 as treatment costs for diabetes, 40% more than what it does at present. WHO has estimated that in the next 10 years, India will face a decrease of \$330 billion in economic growth due to diabetes. In India, the poorest people with diabetes spend an average of 34 % of their total income on private care. According to Janathan Brown, Chairperson of IDF Task Force on Health Economics, says

that the investment in diabetes care and prevention has been found to be lowest in countries where it is needed the most.

Table - 2: Economic Cost of Diabetes in India

US\$bn, unless stated	2004	2005	2006	2007
Nominal GDP at market prices	693	806	910	1,080
GDP per capita (US\$)	621	710	790	925
Nominal GDP	3,390	3,815	4,287	4,753
Population (million)	1,116	1,134	1,151	1,168
Population age 20-79 years (million)	617	631	645	660
Prevalence of diabetes (million)	37	38	40	41
Prevalence rate (%)	6.0	6.0	6.1	6.2
Total Cost of Diabetes	18.2	20.0	21.1	23.0
National Health care expenditure	34.1	39.8	46.7	56.9
As % of GDP at market prices	2.6	2.5	2.3	2.1
Cost per patient (US\$)	494	523	535	563
Healthcare Costs	2.1	2.3	2.3	2.6
Hospitalization	0.21	0.22	0.23	0.25
Ambulatory care	1.68	1.80	1.86	2.04
Treatment	0.23	0.24	0.25	0.27
% of Total Health care expenditure	6.2	5.7	5.0	4.5
Productivity Loss (Base year 2004)	16.1	17.7	18.8	20.4
As % of GDP at market prices	2.3	2.2	2.1	1.9
Per capita loss in lifetime earnings (US\$)	8,643	9,513	10,111	10,980

Source : Report from Economist Intelligence Unit, 2007.

Table - 2 shows the economic cost of diabetes in India during the year 2004 to 2007. The statistical informations have shown that Government of India has spent just \$56.9 per year per person for diabetes in 2007. In 2007 the total cost of diabetes is \$23.8bn. The health care cost is \$2.7bn. The productivity loss due to diabetes is \$20.4bn. When compared with previous years all the costs are increasing in 2007.

Risk Factors of Diabetes

The important risk factors for the high prevalence of diabetes includes: i) Age, ii) Family history, iii) Central Obesity, iv) Physical Inactivity and Sedentary Living, v) Insulin Resistance, vi) Life style changes due to urbanization, vii) Stress.

i) Age: Indians are prone to diabetes at a very young age, at least 10 to 15 years earlier than the western population. The national urban survey in India showed that more than 50% of diabetic patients had onset at less than 50 years of age (Ramachandran et al, 2002). An early occurrence of diabetes gives ample time for development of the chronic complications of diabetes. The incidence of diabetes increases with age. In India, the life span has increased; hence more number of people with diabetes is being detected.

ii) Family History: The prevalence of diabetes increases with a family history of diabetes. The risk of a child developing diabetes with a parental history increases above 50 per cent. A high incidence of diabetes is seen among the first degree relatives. Indians have a high genetic risk for diabetes as observed in Asian Indians who have migrated to other countries. They have been found to have a higher rate of diabetes as compared to the local population.

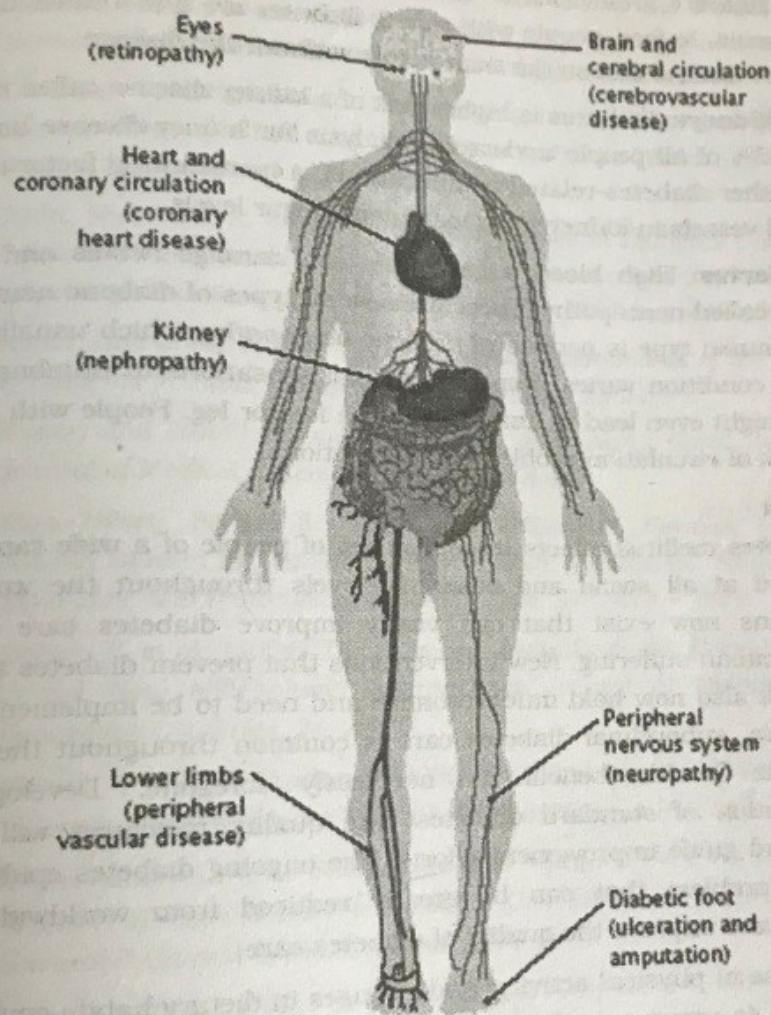
iii) Central Obesity: The association of obesity with Type II Diabetes is well known. Even with an acceptable body weight range, weight gain could increase the risk of diabetes. An excess of body fat specially concentrated within the abdomen has an increased risk of diabetes.

iv) Physical Inactivity and Sedentary Living: Physical inactivity and sedentary living is one of the major risk factor for the high prevalence of type II diabetes. The availability of motorized transport and a shift in occupation combined with the plethora of television programmes has reduced the physical activity in all groups of populations.

v) Insulin Resistance: Indians have been found to be more insulin resistant as compared to the western population. They have a higher level of insulin to achieve the same the blood glucose control. A cluster of factors consisting of abnormal fats (Dyslipidemia), high blood pressure, obesity, and abnormal glucose levels known as metabolic syndrome is highly prevalent in Asian Indians.

vi) Urbanization: The developing countries like India are undergoing rapid urbanization. Urbanization is associated with increasing obesity, decreasing physical activity due to changes in lifestyle, diet and a change from manual work to less physical occupations. It leads to increase in the type II diabetes.

vii) Stress: The impact of stress both physical and mental along with lifestyle changes has a strong effect of increasing incidence of type II Diabetes amongst persons in a strong genetic background.



Source: *Diabetes Atlas* second edition, © International Diabetes Federation, 2003

i) Brain: Diabetes can be a devastating illness because it can affect so many body systems, including the brain. These effects can cause short-term problems when blood sugar is not controlled, and there can also be cumulative effects that build up as the disease progresses over the course of several years.

ii) Eyes: Diabetes is the leading cause of blindness among Americans younger than 65. High blood sugar levels can damage blood vessels in the eyes and can lead to the growth of new blood vessels there. These new blood vessels are not as strong and can leak or burst. This condition is called *diabetic retinopathy*.

iii) Heart: Cardiovascular disease is the leading cause of death in people with diabetes. In fact, people with type 2 diabetes are 2 to 4 times more likely to have heart disease and stroke than people without the disease.

iv) Kidneys: Diabetes is higher risk of a kidney disease called *nephropathy*. In fact, 35% of all people undergoing dialysis for kidney disease have diabetes. As with other diabetes-related complications, a contributing factor is damage to tiny blood vessels in kidney from high blood sugar levels.

v) Nerves: High blood sugar levels can damage nerves and result in a condition called neuropathy. There are several types of diabetic neuropathy, but a very common type is *peripheral diabetic neuropathy*, which usually affects the feet. This condition varies from pain to odd sensations to numbness. In some cases, it might even lead to amputation of a foot or leg. People with diabetes are also at risk of circulation problems and infections.

Conclusion

Diabetes mellitus affects large number of people of a wide range of ethnic groups and at all social and economic levels throughout the world. Several interventions now exist that can vastly improve diabetes care and reduce needless human suffering. New interventions that prevent diabetes among those at high risk also now hold much promise and need to be implemented. Despite this promise, suboptimal diabetes care is common throughout the world, and considerable health benefit is needlessly foregone. Development and implementation of standard diabetes care quality measures will help track progress and guide improvement efforts. The ongoing diabetes epidemic is a by worldwide problem that can be greatly reduced from worldwide efforts to collaborate and improve the quality of diabetes care.

Increase in physical activity, and changes in dietary habits could to a great extent, help to prevent or delay, the onset of diabetes and reduce the burden due to its associated complications. A healthy diet is to controlling blood sugar levels and preventing diabetes complications. Regular exercise can help to reduce the risk of developing diabetes. Maintaining ideal body weight and physical activity can also reduce the risk of developing complications of diabetes such as heart disease, stroke, kidney failure, blindness, and leg ulcers.

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