

## Diabetes Research, Prevalence, and Intervention in India

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### ABSTRACT

The chronic burden of diabetes on the health of individuals has extensive economic and public health impact on the well-being of any nation. Strategies in place to curtail the growing epidemic challenges mediate their interventions through the informative and preventive programs in place. Research being done to overcome these challenges gives hope towards what one can do at an individual level. The journey towards prevention is a long road once the limitations of the healthcare industry are realized.

**Keywords:** diabetes, diabetes prevalence, public health interventions, diabetes research, diabetes in India

### INTRODUCTION

Diabetes is a global public health problem whose burden is evident in developing countries such as India (Kaveeshwar and Cornwall, 2014). According to the World Health Organisation (WHO), 422 million adults had diabetes in 2014 (Kakkar, 2016). The global prevalence of diabetes is estimated to be 366 million by 2030 (Wild et al., 2004); the overall global prevalence decreasing, with India having the largest number of diagnosed individuals (Katikireddi et al., 2011). Prevalence is defined as the total number of individuals in a population who have a disease or health condition at a specific period of time, usually expressed as a percentage of the population (Harvard School of Public Health, n.d.). More than 62 million people in India are currently affected by the disease (Joshi and Parikh, 2007; Kumar et al., 2013). The rapid rise of the Indian middle class, coupled with sedentary lifestyles and a shift in dietary patterns, fuels the existing burden of this disease (Hu, 2011).

A considerable reduction in the incidence of type 2 diabetes can result from changes in lifestyle (Wing et al., 2013), or by using metformin (Diabetes Prevention Program Research Group, 2002). On the other hand, with the adoption of western dietary habits amongst the comparatively affluent urban (Ramachandran et al., 2008) populations in India (Ramachandran et al., 2001), and with increased intake of complex carbohydrates, animal lipid (Arora et al., 2014) and reduced consumption of fibre, there's a likelihood of predisposition to diabetes (due to a high level of impaired glucose tolerance) (Abate and Chandalia, 2003). However, diabetes is not just affecting the higher socio-economic strata; even the less economically advantaged sections of society are being affected by it, owing to rapid penetration of fast food amongst all levels of society in India (Verma et al., 2012). Going by the health impact pyramid (Frieden, 2010), chronic conditions like diabetes, when diagnosed, need constant adherence when it comes to medications, and predicting compliance can be difficult (Sbarbaro, 1979; Haynes et al., 1996). Limited access to medications and treatment results in more complications from diabetes in people who have a lower socio-economic standing (Ramachandran, 2002).

Studies which suggested that smoking may have an increased risk of causing diabetes (Will et al., 2001) were later confirmed as having a true association with active smoking (Willi et al., 2007). An intervention towards cessation of smoking as a modifiable risk factor towards the risk of developing diabetes showed that initially quitting smoking resulted in weight gain (which is detrimental), but that the overall health benefits far outweigh

the weight gain in terms of reduced risk of atherosclerosis (Bush et al., 2016) and ischemic heart disease in the long run (Wannamethee et al., 2001). The Framingham Study, a 20-year prospective cohort study looking at the evidence of prior diabetes and cardiovascular events, confirms the association of heart disease and diabetes (Kannel and McGee, 1979). Therefore, timely intervention is of great clinical relevance, lest diabetes causes other harms to the body (Tschoepe and Roesen, 1998). It is therefore important to know how interventions work and how effective they are.

The risk of obesity is linked to chronic heart disease and diabetes in a country like India, even though when compared to the global population, Indians tend to have a lower rate of obesity and overweight (Kaveeshwar and Cornwall, 2014). This brings to attention the fact that, on a comparative basis, the Indian population is more prone to develop diabetes, even with a lower body mass index (Misra and Khurana, 2011).

## STRATEGIES

One of the major strategies in controlling diabetes is in maintaining effective glucose levels. The most recent criteria to be followed for diagnosing diabetes mellitus are as follows (American Diabetes Association, 2018):

- Fasting plasma glucose  $\geq 126$  mg/dl
- 2-hour post-load glucose  $\geq 200$  mg/dl
- HbA1c  $\geq 6.5\%$
- Random plasma glucose concentration  $\geq 200$  mg/dl

An effective strategy lies in primary prevention through healthy lifestyle management and reducing risk through proper drug therapy. These form the cornerstone for managing diabetes in India (Venkataraman, 2009).

## PROGRAMS

The National Programme for Prevention and Control of Diabetes, Cardiovascular Disease and Stroke (NPDCS) (A Manual for Medical Officer, 2009), launched by the Government of India in 2008, plans to implement interventions in health promotion and education for the community; early detection of cases through appropriate screening; improving existing health systems for tackling non-communicable diseases; and improving dialysis facilities (Verma et al., 2012).

## RESOURCES

A valuable resource is the guide for health workers under the NPDCS. Health workers are the people who are in direct contact with the population at risk. This guide deserves applause as it mentions exactly what needs to be done, and what needs to be avoided. Its recommendations for the prevention and control of diabetes hinge on the fact that all diabetic persons, once diagnosed, should get their blood glucose estimation, kidney function test, eye check-up and foot examination regularly in conjunction with proper diet and regular exercise (A Guide for Health Workers, 2009).

## PARALLEL/CONTRAST

The Building Indo-UK Collaboration in Chronic Diseases 2009 workshop held in New Delhi explored some of the challenges faced by both countries, and discussed various ideas for future solutions, as stated below:

- The burden of diabetes in the United Kingdom (UK) presents a conundrum that, due to the slow nature of onset, there are a significant number of hidden cases. These hidden cases tend to have more complications due to lack of proper intervention at the proper time. Complications range from severe retinopathy to major amputations, kidney failure and heart problems such as ischemic heart disease, which includes myocardial infarction (ICMR, 2009).
- By contrast, in India, which has the highest population of diabetic individuals in the world, prevalence continues to increase. One reason is that the primary health care system there has been structured and designed with the main purpose of catering to mostly acute conditions (Venkataraman, 2009). Areas for research therefore include reasons for this increase in prevalence, and differences in phenotype (ICMR, 2009).

## RESEARCH AND ITS SCOPE

Areas of possible research include comparing phenotypic differences between patients of Indian and European descent towards answers in pathogenesis of disease. Research towards finding the basis of gene-environment interactions that has a flow-on effect towards disease causation is another avenue for potential investigation (ICMR, 2009). Recruiting participants for trials is another challenge faced by epidemiologists in a country like India, the reason being the hesitant nature of people when it comes to screening, due to lack of awareness (Ranjani et al., 2015).

Another area for research lies in establishing a positive association between diabetes and cancers, as type 2 diabetes and cancers are 'common diseases' that are 'frequently diagnosed in the same individual.' The risk of developing cancers of the breast, liver, pancreas, rectum and the urinary tract are increased in cases having type 2 diabetes (Adami et al., 1991; Onitilo et al., 2012).

## PREVALENCE AND THE ECONOMIC BURDEN

The prevalence of diabetes in India has far surpassed the capacity to treat, and that has resulted in a large number of cases remaining undiagnosed (Guariguata et al., 2014). The history of diabetes in India dates back to 2500 BC where old Indian texts referred to it as 'Madhumeha.' This gives an insight that this disease was known since then, and that the prevalence may not have been as high as it is now (Anjana et al., 2011). The economic burden of diabetes is tremendous, with the cost for obesity in India being 1.1% of the gross domestic product (Popkin et al., 2001). Its prevalence is linked to the economic burden diabetes imposes on a population, as not only high-income countries are affected, but low-income countries are as well (Seuring et al., 2015).

## CHALLENGES

Elimination of diabetes is perhaps improbable, because it is a chronic disease and there is no one specific cause for it. The genetic basis of this disease is most intriguing as this exerts the most pressure when it comes to the population at risk - the cohort being the South-East Asian population, with India at the forefront. Accepting the challenges of this disease is the humblest thing a country's premier health organisation can do, and it is incumbent on its officials to formulate plans to combat and monitor the progress of disease on a national scale. The intertwining of other chronic conditions affecting the cardiovascular and urinary systems makes diabetes more debilitating if not treated, allowing the disease to progress with pride. The lack of good epidemiological data adds to these challenges in a country like India (Anjana et al., 2011). Another challenge is the inability of the national health system to work in conjunction with other global health organisations (the WHO), and this poses serious drawbacks towards fulfilling its policy-based goals (WHO, 2018).

## TOWARDS PREVENTION AND HOPE

The primary question that one could pose towards prevention would be "Is there a cure for diabetes?" The answer, for now, is a disappointing "no". The reasons all boil down to the fundamental fact that it is a largely multi-factorial disease with a genetic pre-disposition (Wolford et al., 2004). The Diabetes Research Institute Foundation in Florida is doing some exceptional work in cell-based therapy and bioengineering, and the results can have a positive impact on how the disease is dealt with in India (Diabetes Research Institute Foundation, 2016). Knowing that environmental and genetic factors are responsible for type 2 diabetes and firmly controlling for any associated risk factors, would perhaps delay its onset, or not allow it to happen at all. Cessation of smoking, limiting alcohol intake, being physically active, and following a healthy diet all count towards better control. If these are controlled, then the predicted prevalence can be significantly brought down, and the burden of disease reduced. The discovery of insulin (Bliss, 2013) was a major breakthrough in treating diabetes. Such breakthroughs certainly gives hope for a newer protocols that could one day lead to a more definitive cure in the face of this disease, keeping in mind the challenges the disease imposes on the healthcare system (Ramachandran et al., 2014).

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