

Prevalence Of Type-2 Diabetes Mellitus: A Systematic Review

Kamlesh Kumari^{1,2}, Harmanjot Kaur¹

¹**Department of Zoology, Desh Bhagat University, Mandi Gobindgarh, Punjab, India**

²**Government Shivalik College, Naya Nangal, Punjab, India**

ABSTRACT

India faces various challenges in diabetes management, such as a rising prevalence in urban and rural areas. As fast socioeconomic changes occurring in the rural as well as areas, the prevalence of type-2 diabetes are found to rise several fold which is responsible greatly to early morbidity and mortality in the population. The difference in Urban-Rural prevalence of type-2 diabetes is narrowing as urbanization and transformation in life style due to Western Culture adoption is spreading widely. The present review is an attempt to focus on the elevated level of type-2 diabetes prevalence in urban and rural areas. More and more studies are needed to find out the prevalence of diabetes in Indian population. Therefore screening and awareness programs among general population as well as diabetic patients has been done by the Government to achieve prevention and better control of type-2 diabetes and its complications.

KEYWORDS: Type-2 diabetes mellitus, Global Prevalence, National Prevalence, Rural areas, urban areas.

INTRODUCTION

Diabetes is a chronic condition that affects the body's ability to produce insulin hormone is impaired, which resulting to an abnormal metabolism of fats, proteins, carbohydrates and a high level of glucose in the blood (Kanaya *et al.* 2010). Sustained high sugar level in the blood cause severe vascular damage, affecting the heart, kidney, nerves and eyes resulting to various complications, reducing quality of life and increasing mortality (WHO, Global health risk 2009). The prevalence of Type-2 diabetes is rising globally and reached epidemic proportion both in developed and developing countries. In 1980, the World Health Organization (WHO) estimated that there were 108 million people living with diabetes and that number increased quadrupled in 2014 estimates (Castetbon *et al.* 2016). Nearly 80% of the affected people live in middle and low income countries. India has the largest number of diabetics in the world with home to 72 million people and takes the second place after china. With the industrialization and growing urbanization there has also an elevation in the prevalence of Type -2 diabetes. It is found that transformation in life style due to western culture adoption, behavioral pattern, environmental factors like, physical inactivity, obesity, diet and aging, population leads to health change over pattern which responsible for developing diabetes.

According to World Health Organization 69.2 million (8.7%) of the world wide population remain undiagnosed for type-2 diabetes (WHO Diabetes Fact Sheet 2016). The Majority of patients with type-2 diabetes are at the pre-diabetic stage for many years, that is a intermittent stage which increase the possibility of converting undiagnosed diabetes to diagnosed diabetes. This stage is referred to as abnormal glucose regulation (AGR) [Meme *et al.* 2015]. Indians are also believed to have a high ethnic and genetic susceptibility for the diabetes and also have lower threshold limit for the environmental risk factors. It is a matter of high concern that Indian develops type-2 diabetes at a very early age than the western population [Ramachandran *et al.* 2010]. There is a growing need for the early identification and screening of associated risk factors to reduce the morbidity and mortality associated with diabetes.

PREVELANCE OF TYPE-2 DIABETES MELLITUS

Global Prevalence

The predominance of type 2 diabetes become epidemic all over the world due to rapid urbanization, population growth, aging, increased obesity and physical inactivity. International Diabetes Federation (IDF) assessed that the global prevalence to be 366 million in 2011 (IDF Diabetes Atlas. 5th ed. 2011), 382 million in 2013 (IDF Diabetes Atlas. 6th ed. 2013), wide 415 million in 2015 (IDF Diabetes Atlas.

7th ed. 2015), and 425 million in 2017 equalling to 8.8 per cent of the world wide population with an equal rate in both male and female (IDF Diabetes Atlas. 8th ed. 2017). For 2045 this number is supposed to increase up to 642 million and its prevalence rate will increase by 48 per cent between 2017 and 2045. There is a large difference in the rural and urban prevalence, with 146 million people suffering from diabetes living in rural areas in 2017 and this number is supposed to increase by 156 million until 2045. In urban areas 279 million people with diabetes in 2017 and this number would be increase to 473 million up to 2045. World Health Organization (WHO) estimates that 1.5 million death in 2012 and 1.6 million in 2016, due to type 2 diabetes and make it the seventh leading cause of death all over the world (Global Reports on Diabetes 2016). The International Diabetes Federation (IDF) predicted that 4.0 million deaths worldwide occur in 2017 from diabetes. The dramatic rise in prevalence of type 2 diabetes however seen in low and middle income countries where more than 80 per cent of deaths occur.

Due to Diabetes, at least 548 billion dollar was spent on health in 2013 and 673 billion dollars in 2015 which accounted for 11 per cent and 12 per cent of universal health spending for the year (IDF Diabetes Atlas. 7th ed. 2015). In 2017 worldwide health care spending reached 727 billion and this expenditure would be increase to 776 billion by 2045 (IDF Diabetes Atlas. 8th ed. 2017 and Cho *et al.* 2018). These estimates confirm the increase rate in developed as well as developing countries, as these countries follow the culture of urbanization and life style changes, including sedentary behaviour, physical inactivity and increased intake of foods that are high energy dense but poor in nutrients. As in urban and rural areas of low and middle-income countries, the epidemiology suggest that diabetes is an alarming health problem and recognized as a public health priority among rural and urban population all over the world.

National Prevalence

India Currently accounts for 49 per cent of the world's diabetes burden, with an estimated 72 million cases in 2017, a figure that is expected to nearly double to 134 million by 2025. About 1.1 per cent million people die from diabetes related disease in India every year. Increasing incidence of diabetes mellitus due to modern life style and change life style and change diet with balance tilted towards refined foods especially sugar and fat. The increase in prevalence occurs in both urban and rural areas showing a faster hike. Recently, however, acceleration has been observed in rural areas, which may represent the adoption of an unhealthy life style in the rural population (Table 1). In rural areas the prevalence of type-2 diabetes is lower, and prevalence varies by region. In studies conducted in west Bengal and Jharkhand, prevalence in rural areas was 2.95% and 3.0% (Bariket *et al.* 2016; Anjana *et al.* 2011). This contrasts with the extremely high prevalence of 19.8% and 16.6% reported from a rural hilly areas in Arunachal Pradesh and Manipur (Zaman *et al.* 2014; Shah *et al.* 2013). A trend of increasing prevalence in rural areas is noticeable with several studies done in different regions. Rural areas in economically under developed states have lower prevalence rate as reported in the ICMR-INDIA B study. In rural areas in the economically better areas of Chandigarh, Tamil Nadu and Maharashtra the rate of type-2 diabetes was 8.3%, 7.8% and 6.5%. On the other hand, in the economically less advantaged state of Jharkhand the prevalence was only 3.0% (Anjana *et al.* 2011).

Table 1: Studies showing Prevalence of Diabetes in India (Urban and Rural area)

Year	Author	Place	Urban Prevalence (%)	Rural Prevalence (%)
2011	Nayak <i>et al</i>	Gujarat	13.8	-----
2011	Vaz <i>et al</i>	Goa	-----	10.3
2011	ICMR INDIAB (Anjana <i>et al</i>)	Chandigarh	13.6	8.3
2011	ICMR INDIAB (Anjana <i>et al</i>)	Tamil Nadu	13.7	7.8

2011	ICMR INDIAB (Anjana <i>et al</i>)	Maharashtra	10.9	6.5
2011	ICMR INDIAB (Anjana <i>et al</i>)	Jharkhand	13.5	3.0
2012	Prasad <i>et al</i>	Orissa	15.7	-----
2012	Rajput <i>et al</i>	Haryana		13.3
2012	Singh <i>et al</i>	Delhi	18.0	-----
2013	Shah <i>et al</i>	Manipur	-----	16.6
2013	Kumar <i>et al</i>	West Bengal	15.0	-----
2014	Walia <i>et al</i>	Chandigarh	16.4	-----
2014	Zamanet <i>al</i>	Arunachal Pradesh	-----	19.8
2014	Shrivastava <i>et al</i>	Pondicherry	-----	8.03
2015	Desappa <i>et al</i>	Banglore	12.33	-----
2016	Goswami <i>et al</i>	South Delhi	24.0	-----
2016	Singh <i>et al</i>	Amritsar	23.2	-----
2016	Barik <i>et al</i>	West Bengal	3.34	2.95
2016	Little <i>et al</i>	Tamil Nadu	-----	10.8
2016	Nirmala <i>et al</i>	Andhra Pradesh	15.1	-----
2017	Tripathy <i>et al</i>	Punjab	9.4	7.6
2017	P.S <i>et al</i>	Uttar Pradesh	-----	8.3
2017	Deepthi <i>et al</i>	Karnataka	-----	10.5
2018	Kapil <i>et al</i>	Uttarakhand	-----	14.6
2018	Poornima <i>et al</i>	Karnataka	-----	9.5

It is evident from table that the prevalence of type-2 diabetes is raising in urban areas. The prevalence study from West Bengal in Urban areas has been reported lowest prevalence as 3.34 per cent (Barik *et al.* 2016), this contrast with extremely high prevalence of 23.2 per cent and 24.0 per cent reported from a urban areas in Amritsar and Delhi (Singh *et al.* 2016; Goswami *et al.* 2016). Studies have shown that the prevalence of type-2 diabetes had risen to 24.0 percent in the same urban areas which had a prevalence of 18.0 percent four years earlier (Goswami *et al.* 2016; Singh *et al.* 2012). Another study in Urban areas of Chandigarh also shows the rising trend of type-2 diabetes 13.6 per cent to 16.4 per cent three year later (Anjana *et al.* 2011; Walia *et al.* 2014).

The overall prevalence of diabetes is higher in urban areas as compare to the rural areas. However higher prevalence has been noticed in economically developed states. There is a trend of rising prevalence is also notice in rural areas. This trend is worrying because 70% of the India's population remains in rural areas (Chandramouli *et al.* 2011). Even a small increase in the rural prevalence of type-2 diabetes will translate into several millions of individuals requiring chronic health care.

CONCLUSION

The high incidence of type 2 diabetes has had significant social, financial & developmental implications, particularly in low and middle income countries. Type 2 diabetes is highly prevalent in rural and urban population and create significant burden on health care on both family and the community. Accurate estimates of the current and future burden of diabetes are essential to the allocation of society to cope with this rising trend of type-2 diabetes. There is an urgent need for government to implement policies and awareness programs to reduce the growing speed in rural and urban areas.

REFERENCES

1. Anjana RM, Pradeepa R, Deepa M, Datta M, Sudha V, Unnikrishnan R, Nath LM, Das AK, Madhu SV, Rao PV, Shukla DK, Kaur T, Ali MK and Mohan V. 2011 The Indian Council of Medical Research-India Diabetes (ICMR-INDIAB) Study: Methodological Details. [ICMR-INDIAB] *J Diabetes Sci Technol* 5:906-914.
2. Barik A, Mazumdar S, Chowdhury A and Rai RK. 2016 Physiological and behavioural risk factors of type 2 diabetes mellitus in rural India. *BMJ Open Diabetes Res. Care.* 4 e000255.
3. Chandramouli C. 'Census of India 2011. Rural urban distribution of population (provisional population totals)'. Registrar General & Census Commissioner: New Delhi.
4. Dasappa H, Fathima FN, Prabhakar R and Sarin S. 2015 Prevalence of diabetes and pre-diabetes and assessments of their risk factors in urban slums of Bangalore. *J. Fam Med Primary Care.* 4 399-04.
5. Global Report on Diabetes (http://apps.who.int/iris/bitstream/handle/10665/204871/9789241565257_eng.pdf) World Health Organization. 2016.
6. Goswami AK, Gupta SK, Kalaivani M, Nongkynrih B, Pandav CS. 2016 Burden of hypertension and diabetes among urban population aged >60 years in South Delhi: a community based study. *J. Clin. Diagn. Res.* 10 LC01-5.
7. International Diabetes Federation. IDF Diabetes Atlas. 5th ed. Brussels, Belgium: International Diabetes Federation; 2011.
8. International Diabetes Federation. IDF Diabetes Atlas. 6th ed. Brussels, Belgium: International Diabetes Federation; 2013.
9. International Diabetes Federation. IDF Diabetes Atlas. 7th ed. Brussels, Belgium: International Diabetes Federation; 2015.
10. International Diabetes Federation. IDF Diabetes Atlas. 8th ed. Brussels, Belgium: International Diabetes Federation; 2017.
11. Kanaya AM, Wassel CL and Mathur D. 2010 Prevalence and correlates of diabetes in South Asian Indians in the United States: findings from the metabolic syndrome and atherosclerosis in South Asians living in America study and the multi-ethnic study of atherosclerosis. *Metab Syndr Relat Disord.* 8 157-64.
12. Kapil V, Khandelwal R, Ramakrishnan L, Khenduja P, Gupta A, Pandey RM, Upadhyay AD and Belwal RS. 2018 Prevalence of hypertension, diabetes and associated risk factors among geriatric population living in a high-altitude region of rural Uttarakhand, India. *J. Family Med Prim care.* 1527-1536.
13. Little M, Humphries S, Patel K, Dodd W and Dewey C. 2016 Factors associated with glucose tolerance, pre-diabetes, and type 2 diabetes in a rural community of south India: a cross-sectional study. *Diabetol Metab Syndr.* 8 21.
14. Meme N, Amwayi S, Nganga Z and Buregyeya E. 2015 Prevalence of undiagnosed diabetes and pre-diabetes among hypertensive patients attending Kiambu district hospital, Kenya: A cross sectional study. *Pan Afr Med J.* 22 286.
15. N.H. Cho, J.E. Shaw, S. Karuranga, Y. Huang and J.D. da Rocha Fernandes. 2018 Global estimates of diabetes prevalence for 2017 and projections for 2045. *Diabetes Res Clin Pract.* 138 271-281.
16. NCD Risk Factor Collaboration (NCD-RisC) Katia; Castetbonnet al. 2016 Worldwide trends in diabetes since 1980: a pooled analysis of 751 population-based studies with 4*4 million participants. *The Lancet.* 387 1513-30.
17. Poornima MP and Walvekar PR. 2018 Prevalence of type 2 diabetes mellitus among adults aged between 30 to 60 years residing in rural area: a cross sectional study. *Int J. Comm. Med Public Health.* 5 3639-3642.
18. Ramachandran A, Mary S, Yamuna A, Murugesan N, Snehalatha C. 2010 High prevalence of diabetes and Cardiovascular risk factors associated with urbanization in India. *Diabetes Care.* 31 893-898.
19. Shah A and Afzal M. 2013 Prevalence of diabetes and hypertension and association with various risk factors among different Muslim populations of Manipur, India. *J. Diabetes Metabol. Disord.* 12 52.
20. Singh A, Shenoy S, Sandhu JS. 2016 Prevalence of type 2 diabetes mellitus among urban Sikh population of Amritsar. *Ind. J Community Med.* 41 263-267.
21. Singh AK, Mani K, Krishnan A, Aggarwal P and Gupta SK. 2012 Prevalence, awareness, treatment and control of diabetes among elderly persons in an urban slum of Delhi. *Ind. J. Community Med.* 37 236-239.
22. Tripathy JP, Thakur JS, Jeet G, Chawla S, Jain S, Pal A. 2017 Prevalence and risk factors of diabetes in a large community-based study in North India: Results from a steps survey in Punjab, India. *Biomed Central.* 9 8.
23. Walia R, Bhansali A and Ravi Kiran M, 2014 High prevalence of cardiovascular risk factors in Asian Indians: a community survey-Chandigarh urban diabetes study (CUDS). *Ind. J Med Res.* 139 252-259.
24. World Health Organization. 2009 Global health risk: mortality and burden of disease attributable to selected major risk. A Geneva: Switzerland; <http://www.who.int/healthinfo/global_burden_disease/Global_Health_Risks_report_full.pdf>.

25. World Health Organization. 2016 Diabetes Fact Sheet, <https://www.who.int/news-room/fact-sheets/detail/diabetes>.
26. Zaman, Forhad Akhtar, and Anita Borang. 2014 Prevalence of diabetes mellitus amongst rural hilly population of NorthEastern India and its relationship with associated risk factors and related co-morbidities. *J. Nat. Sci. Biol. Med.* 5383-388.