

Detailed Review of Type-2 Diabetes Mellitus (T2DM) and Its Prevalence

¹Mohammed Mustafa Abdulkadhm

ABSTRACT--*Diabetes Mellitus is considered as a group of common disorders that shares the phenotype of hyperglycemia. The world is facing various challenges in diabetes management, such as a rising proportion in various countries. As fast as the socioeconomic changes occurring in the rural as well as areas, the prevalence of type-2 diabetes are found to increase several fold which is thereby responsible for early morbidity and mortality in the population. The difference in Urban-Rural prevalence of type-2 diabetes is leading to urbanization and transformation in life style due to Western Culture adoption is spreading widely. In this paper we have presented the detailed review of type-2 diabetes prevalence in urban and rural areas. The screening and awareness events for the general population have to be organized by the Government to achieve prevention and better cure of type-2 diabetes.*

KEYWORDS-- *Diabetes, Type-2 Diabetes mellitus, Prevalence of type-2 diabetes, Rural areas and Urban areas.*

I. INTRODUCTION

Prevalence of Type 2 Diabetes Mellitus (T2DM) is rising much more rapidly than Type 1 Diabetes Mellitus presumably because of rising incidence of obesity and reduced physical activity. The incidence of Type 2 DM is rising sharply in India and International Diabetes Federation (IDF) has projected an estimate of at least 70 million individuals having Diabetes Mellitus by 2025. The rising incidence is presumably due to increasing incidence of obesity and decreasing level of physical activity and transition from rural to urban setup and changing dietary habits.

Diabetes is a chronic condition that influences 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 assessed that there were 108 million individuals living with diabetes and that number expanded 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

¹Al- Manara College for Medical Sciences, Misan Province, Iraq, mohammedmustafa@uomanara.edu.iq

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]. 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 diagnosis and screening of associated risk factors that reduces the morbidity and mortality of diabetic patients.

II. EPEDEMIOLOGY

This study of disease transmission helps in the investigation of DM has given significant data on a few parts of this ailment, for example, its common history, commonness, frequency, grimness and mortality in diverse populaces around the globe. Identification of the reason for the infection and the conceivable preventive estimates that could be found to capture or defer the beginning of this ailment which has arrived at plague extents in both the created and the creating countries.

Tragically, the improvement in results for singular patients with diabetes has not brought about comparative enhancements from the public wellbeing point of view. The overall predominance of diabetes has continued extending in a more significant manner. In the beginning of year 2011, an expected 366 million people had T2DM contributing 90% of the cases. The amount of people with T2DM was increased in many countries with 80 percent of people with diabetes are living in low and middle salary countries. Despite the way that T2DM is commonly examined in adults, it's recurrence has particularly extended in the pediatric age groups. T2DM now addresses 8-45 % of every new instance of diabetes revealed among kids and adolescent. The prevalence of T2DM in the pediatric population is higher among young women than young men; likewise it is higher among women than men. The interim of start of T2DM is 12-16yrs; this period concurs with pubescence, when a physiologic state of insulin resistance creates. During this period, T2DM develops just if insufficient beta-cell work is related with other hazard factors.

Directly the same number of as half of individuals with diabetes is undiscovered. Since restorative mediation can lessen complexities of the illness, there is a need to distinguish diabetes right off the bat in its course. The danger of creating Type 2 diabetes increments with age, stoutness, and lack of physical action. It's rate is growing rapidly, and by 2030 this number is assessed to about around 552 millions. DM can happen all over the world, but it is progressively normal (especially type 2) in the more shaped countries, where the vast majority of patients are developed somewhere in the range of 45-64yrs.

III. DIAGNOSYS

Diabetes is analyzed dependent on plasma glucose criterion, either the fasting plasma glucose (FPG) or the 2-hour plasma glucose (2-h PG) esteem after a 75g oral glucose resistance test (OGTT) 4.6. As of late, an International Expert Committee, which contained individuals delegated by the American Diabetic Association

(ADA), the European Association for the Study of Diabetes (EASD), and the IDF, included the A1C (limit > 6.5%) as a third choice to analyze diabetes. The WHO, ADA and IDF were suggested a FPG value > 7.0mmol/L (126mg/dL); a 2-h post-load glucose fixation > 11.1mmol/L (200mg/dL) during an OGTT; or symptoms of diabetes and an easygoing (i.e., paying little respect to the hour of the previous dinner) plasma glucose focus > 11.1 mmol/L (200 mg/dL). In the event that any of these criterion is met, affirmation by continue testing on an ensuing day is important to build up the analysis note that continue testing isn't required for patients who have unequivocal hyperglycemia, that is more than 11.1mmol/L (200mg/dL) with symptoms steady with hyperglycemia (Table 1)

Table 1: Criterion for the diagnosis of diabetes

HbA1c \geq 6.5% (48 mmol/mol)
or
FPG \geq 7.0 mmol/L (126 mg/dL)
or
2-h Plasma glucose \geq 11.1 mmol/L (200 mg/dL) during an OGTT
or
Symptoms of hyperglycemia and casual plasma glucose \geq 11.1 mmol/L (200 mg/dL)

IV. MATERIALS AND METHODS

The present examination was led with spellbinding explanatory and cross-sectional techniques. The measurable populace comprised of diabetics alluded to Diabetes Centers. The specialists analyzed a poll containing statistic inquiries regarding the patient age, sex, level of absence of education and furthermore inquiries concerning patients' sickness data remembering assessment and recorded tests for the patient's document WITH the weight list, pulse, hemoglobin A1c, the kind of treatment (routine, pill or insulin), the reason and sort of difficulty as indicated by patients' documents. Patients with type 1 diabetes and those with deficient information will be barred from the exploration. Conclusion of diabetes depended on the standard FPG level over 126mg/dL; and its difficulty and type were recorded by the clinical and research facility assessment and last finding by doctors.

V. GLOBAL PREVELANCE OF TYPE-2 DIABETES MELLITUS

The predominance of T2DM become epidemic all over the world due to rapid urbanization, population growth, aging, increased obesity and physical inactivity. 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 equaling 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 suppose to be increased 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 suppose to be increased by 156 million until 2045. In urban areas

279 million people with diabetes in 2017 and it 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 7th leading cause of death all over the world (Global Reports on Diabetes 2016). The IDF predicted that 4.0 million deaths worldwide occur in 2017 from diabetes.

Due to Diabetes, at least 548 billion dollar was spent on health in 2013 and 673 billion dollars in 2015 which accounted for 11% and 12% 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 behavior, 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, this 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.

VI. NATIONAL PREVALENCE

India Currently accounts for 49% of the world's diabetes burden, with an estimated 72 million cases in 2017, a figure that is expected to nearly double to 134 millions by 2025. About 1.1% 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 which is shown in Table 2. In rural areas the prevalence of T2DM 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). Higher prevalence of T2DM is 19.8% and 16.6% reported from rural hilly areas in Arunachal Pradesh and Manipur (Zaman *et al.* 2014; Shah *et al.* 2013). Rural areas in economically under developed states have lower prevalence rate as reported by 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%. In the low economical state like Jharkhand, this prevalence is only 3% (Anjana *et al.* 2011).

Table 2: Prevalence of T2DM in India (Urban and Rural area)

Year	Author	Place	Urban Prevalence (%)	Rural Prevalence (%)
2011	Nayak <i>et al</i>	Gujarat	13.8	NA
2011	Vaz <i>et al</i>	Goa	NA	10.3
2011	ICMR INDIA B (Anjana <i>et al</i>)	Chandigarh	13.6	8.3
2011	ICMR INDIA B	Tamilnadu	13.7	7.8
2011	ICMR INDIA B	Maharashtra	10.9	6.5

2011	ICMR INDIA B	Jharkhand	13.5	3.0
2012	Prasad <i>et al</i>	Orissa	15.7	NA
2012	Rajput <i>et al</i>	Haryana	NA	13.3
2012	Singh <i>et al</i>	Delhi	18.0	NA
2013	Shah <i>et al</i>	Manipur	NA	16.6
2013	Kumar <i>et al</i>	Westbengal	15.0	NA
2014	Walia <i>et al</i>	Chandigarh	16.4	NA
2014	Zaman <i>et al</i>	Arunachalpradesh	NA	19.8
2014	Shrivastava <i>et al</i>	Pondicherry	NA	8.03
2015	Desappa <i>et al</i>	Banglore	12.33	NA
2016	Goswami <i>et al</i>	South Delhi	24.0	NA
2016	Singh <i>et al</i>	Amritsar	23.2	NA
2016	Barik <i>et al</i>	West Bengal	3.34	2.95
2016	Little <i>et al</i>	Tamil Nadu	NA	10.8
2016	Nirmala <i>et al</i>	Andhrapradesh	15.1	NA
2017	Tripathy <i>et al</i>	Punjab	9.4	7.6
2017	P.S <i>et al</i>	Uttar Pradesh	NA	8.3
2017	Deepthi <i>et al</i>	Karnataka	NA	10.5
2018	Kapil <i>et al</i>	Uttarakhand	NA	14.6
2018	Poornima <i>et al</i>	Karnataka	NA	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 T2DM had risen to 24.0 percent in the same urban areas that has 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 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).

VII. CONCLUSION

The high incidence of type 2 diabetes has had significant social, financial & developmental implications, particularly in low and middle income countries. T2DM is highly prevalent in rural and urban population and create significant burden on health care on both family and the community. Accurate estimation of the current and future burdens of diabetes is essential to the allocation of society to cope with this rising trend of type-2 diabetes

.There is a critical 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 5906 - 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 LC 01 - 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 ClinPract.**138** 271 - 281.
16. NCD Risk Factor Collaboration (NCD - RisC) Katia; Castetbonet 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 “ Highprevalence of diabetes and Cardiovascular risk factors associated with urbanizationin 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](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](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.**5**383 - 388.