Review Article

www.ijrap.net

GLOBAL STATISTICAL ANALYSIS OF DIABETES MELLITUS WITH STRESS ON PREVALENCE IN ASIA AND SPECIFICALLY INDIA: A CRITICAL AND CLINICAL OVERVIEW

Vijaya Lakshmi P, Sudheerbabu I.

Sir C.R. Reddy College of Pharmaceutical Sciences, Eluru, Andhra Pradesh, India

Received on: 29/12/17 Accepted on: 12/02/18

*Corresponding author

E-mail: sravya1996penmetsa@gmail.com

DOI: 10.7897/2277-4343.09363

ABSTRACT

Diabetes mellitus is a chronic metabolic non-communicable disease which has been raising rapidly in middle and low-income countries. The number of people with diabetes has increased from 108 million in 1980 to 422 million in 2014 and it has been rising rapidly, resulting in various complications like blindness, kidney failure, heart attacks, stroke and lower limb amputation. Almost half of diabetics are from China, India and USA. In 2015, an estimated 1.6 million deaths were by diabetes alone and another 2.2 million deaths were by high blood glucose levels. Almost half of the deaths attributable to high blood glucose occur before the age of 70 years, placing diabetes the seventh leading cause of death. In India 8.7% of people are diabetic and 10.3% are showing prediabetic symptoms which implies that this population is on verge to develop diabetes in near future. Diabetes can be treated and its consequences can be avoided or delayed with diet, physical activity, medication, regular screening and treating complications.

Keywords: Prediabetes, Impaired glucose tolerance, Prevalence, Staple food, Epidemiology.

INTRODUCTION

Diabetes is a most common non-communicable disease globally, in which the blood glucose levels are increases abnormally. With type1, in which the body does not make enough insulin & type 2, (more prevalent) in which the body, do not use insulin well. The presence of high blood sugar than normal, but not enough to the body is called as diabetes and prediabetes. Having prediabetes may put the person at greater risk of type2 diabetes, heart disease and stroke¹.

Type 1 and type 2 diabetes were identified as separate conditions for the first time by the Indian physicians Sushruta & Charaka in 400-500 BCE as type1 associated with youth and type 2 with obesity. The first known symptoms of diabetes were identified in 1552BCE, i.e. frequent urination and also ants are attracted to the urine of people who had this disease. In the 1700s and 1800s, Physicians began to realize that the dietary changes could help manage diabetes².

Over time, high blood sugar can seriously compromise every major organ system in the body causing heart attacks, nerve damage, kidney failure, impotence, blindness, foot infections that may also lead to amputations³.

Worldwide the estimated number of adults with diabetes in the year 1980 was 108 million & in 2000 was 171 million & in 2007 was found to be 246 million of these 80% are from developing countries, the largest numbers on the Indian subcontinent and Asia of which 85-95% are type 2 diabetes. It is estimated that

nearly 380million adults worldwide will have diabetes by 2025. The number of diabetes has gone up from 108 million in1980 to 422 million in 2014. Due to various factors, the prevalence of diabetes is more in men than in women, but there are more women suffering with diabetes than men.

EPIDEMIOLOGY OF DIABETES ACROSS THE WORLD

Based on the available statistical data of 2014, from world health organisation, 422 million adults are living with diabetes mellitus. Previous 2013 estimates from International Diabetes Federation put the number at 381 million people having diabetes of which 80-85% is type 2 diabetes. Almost half of the people with diabetes belong to China, India and USA. The WHO estimates, diabetes has resulted in 1.5 million deaths in 2012, making it the 7th leading cause of death.

Diabetes in North America

Canada

About 2.4 million Canadians have been diagnosed with diabetes in 2009. The count has increased by 70% over a decade from 1999 to 2009. The highest prevalence was among the 35-40 years age group, due to increased rates of overweight and obesity. The Public Health Agency of Canada estimates if this trend continues, the number of Canadians living with diabetes will reach up to 307 million by 2019⁴.

Figure 1: Graphical representation of age standardised death rates v/s year

Figure 2: Proportional Mortality Percent

Diabetes in United States of America

An estimated 30.3 million people i.e. 9.4% of the US population had diabetes in 2015. This included 30.2 million (12.2%) of total adults aged 18 years or above of which 7.2 million (23.8%) are not aware that they are diabetic.

The percentage of people affected with diabetes increased with age, reaching as high as 25.2% among those aged 65yrs and older. An estimated 33.9% (84.1 million) of US adults aged 18 years or older had prediabetes in 2015. Nearly half of the adults (48.3%) aged 65 years or older had prediabetes. According to 2011-2014 data there are more men (36.6%) than women (29.3%) with prediabetes⁵.

According to the 2016 statistics, it was found that the diabetes prevalence in the country went from 9.2% in 2012 to 9.4% in 2016. With women (10.3%) having higher diabetes rate than men (8.4%). This trend is observed both in urban (10.5% in women and 8.2% in men) and rural areas (9.5% in women and 8.9% in men). Higher diabetes prevalence is observed among men aged 60-69 years old (27.7%) than in women and 70-79 years old (29.8%). The present diabetic population in Mexico is 8.5 million⁶⁷.

Age-Adjusted Prevalence of Diagnosed Diabetes Among US Adults 2015

Figure 3: Age adjusted prevalence of diagnosed diabetes among US adults

Diabetes in Europe

About 60 million people in the European region are diabetics, of which about 10.3% are men and 9.6% are women aged greater than 25 years. Also 3.8 million people in the united kingdom have diabetes mellitus, it was predicted this might increase up to 6.2 million by 2035/2036. Among the European countries, Turkey(14.01%) ranks one in diabetes followed by Portugal (13.09),Bosnia and Herzegovina (12.1), Montenegro (12%),Serbia (11.96%),Germany (11.52%), Macedonia(11.4), Malta (10.69%), Spain (10.58%)⁸.

Turkey

According to Turkish diabetes foundation, 15% of Turkish adults are diabetic and the rate is increasing significantly. In last 10 years it raised from 7.6% to 13.2%. The diabetic males accounting 12.2%, alongside 14.2% of females, leading to a total average 13.2% of diabetics. The diabetic deaths noted in the age group 30-69 are 1030 (in males) and 1210 (in females). In the age group greater than 70 years it raised up to 2280 in males & 3790 in females. Diabetes constitutes a total of 2% of deaths that occur in all age groups⁹.

Proportional mortality (% of total deaths, all ages)*

Figure 4: total % of deaths related to various diseases in 2016

Trends in age-standardized prevalence of diabetes

Figure 5: Graphical representation of prevalence of diabetes in males and females in % population

Portugal

According to the national diabetes observatory of Portugal and WHO, prevalence of diabetes in males -10.7% and females-7.8% in between the age group 20-79 years and a total of 9.2% of population are diabetic. Diabetes constitute of about 5% of total deaths that occur in all age groups. The prevalence of diabetes has been increasing readily in male's from 1980-2014, ranging 3-11% where as in females it is a little lower comparatively i.e. 4-8%¹⁰.

Proportional mortality (% of total deaths, all ages)

Figure 6: Total % of deaths due to various diseases in Portugal in 2016

Trends in age-standardized prevalence of diabetes

Figure 7: Prevalence of diabetes in % population (of males and females) v/s years

Diabetes in South America

The South and Central America are inhabited with a population of 467.6 million and 64% of which are within the age group 20-79 years, the prevalence of diabetes in this region is 8% and increased to 9.4% in 2015 i.e. 29.6million people and is expected to reach 9.8% by 2035. On an average 24% of the adult cases are undiagnosed, but in some countries, it is as high as 50 %¹¹. In 2015, 247500 adults died of diabetes. Over 42.7% of these deaths are in people under the age of 60. And half of the deaths are from Brazil.

Diabetes in Brazil

According to the geographical statistics, there are about 190,755 million inhabitants in Brazil. According to International Diabetes Federation, 11.9 million individuals between the age group 20-79 years are diagnosed as diabetic, Brazil ranked 5th in diabetes in whole world. The cities Ribeirao Preto and Sao Carlos, both in the state of São Paulo and Porto Alegre in the state of Rio Grande, Paraiba do sul showed prevalence rates of 12.1%, 13.5% and 12.4% respectively¹².

According to the WHO-Diabetes country profile 2016, almost 7.4% of males are diabetic and 8.8% of females are diabetic with a total average of 8.1%. Diabetes owns 6% of total deaths of all ages. The prevalence of diabetes in Brazil has been increasing since 1990-2016 lying between 5-10%.

Trends in age-standardized prevalence of diabetes

Figure 8: Prevalence of diabetes in males and females from 1980-2014

Proportional mortality (% of total deaths, all ages)

Figure 9: Representation of total % deaths in pie diagram

Diabetes in Venezuela

In Venezuela, the prevalence of diabetes is 7.7% and prediabetes is 11.2% and it was the 5th leading cause of death in 2012.¹³ According to the WHO-diabetes country profiles 2016, the prevalence of diabetes is 9.1% in males, 8.5% in females and a total average of 8.8% of people suffer with diabetes; the percentage of deaths in all ages due to diabetes is 7% of total deaths. The prevalence of diabetes has been increasing from 5-19% in 1990-2016.

Trends in age-standardized prevalence of diabetes

Figure 10: Graphical representation of prevalence of diabetes in Venezuela from 1980-2014

Proportional mortality (% of total deaths, all ages)

Figure 11: Representation of total deaths due to various diseases in pie chart form

Diabetes in Africa

The number of people with diabetes in Africa remains uncertain, although the estimate of 2000 put the figure at 7.5 million diabetic's adults between 20-79 years of age and now it is much higher.

The number of people living with diabetes has jumped from 4 million in 1980 to 25 million in 2014.

Although, Type 1 diabetes is rare in many areas, but now its prevalence is increased. Impaired glucose tolerance has turned problematic and exceeds 30% in many south African countries¹⁴

¹⁵

Figure 12: Prevalence of diabetes% in 1980 & 2014

Figure 13: Diagnosed diabetes among adults age 20 years and older, by race/ethnicity, 2007-2009

Table 1: The World Health Organisation estimated the following diabetes populations by country for 2000, and 2030

Country	2000	2030
Algeria	426,000	1,203,000
Angola	51,000	140,000
Benin	87,000	266,000
Botswana	25,000	45,000
Burkina Faso	124,000	388,000
Burundi	26,000	72,000
Cameroon	70,000	171,000
Cape Verde	7,000	24,000
CAR	18,000	46,000
Chad	97,000	269,000
Comoros	4,000	15,000
Congo	14,000	39,000
Côte d'Ivoire	264,000	636,000
DR Congo	291,000	910,000
Eq. Guinea	8,000	21,000
Eritrea	65,000	142,000
Ethiopia	796,000	1,820,000
Gabon	8,000	14,000
Gambia	22,000	61,000
Ghana	302,000	851,000
Guinea	34,000	89,000
Guinea-Bissau	17,000	44,000

Country	2000	2030
Kenya	183,000	498,000
Lesotho	31,000	42,000
Liberia	40,000	154,000
Madagascar	100,000	301,000
Malawi	65,000	118,000
Mali	140,000	405,000
Mauritania	34,000	103,000
Mauritius	111,000	233,000
Mozambique	133,000	291,507
Namibia	25,000	60,000
Niger	108,000	382,000
Nigeria	1,707,000	4,835,000
Rwanda	30,000	77,000
Sao Tome	1,000	2,000
Senegal	143,000	421,000
Seychelles	8,000	19,000
Sierra Leone	65,000	178,000
South Africa	814,000	1,286,000
Swaziland	13,000	21,000
Togo	64,000	184,000
Uganda	98,000	328,000
UR Tanzania	201,000	605,000
Zambia	70,000	186,000
Zimbabwe	108,000	265,000
Total	7,020,000 cases	18,234,000 cases

Diabetes in Australia

Around 1.7 million Australians are with diabetes, which include 1.2 million of diagnosed and nearly 500,000 undiagnosed cases. More than 100,000 Australians developed diabetes in the past year. 280 Australians develop diabetes every day and that is one person every five minutes.

Type 1 diabetes accounts for 10% of total diabetic population in Australia and type 2 of about 85%. Australia has the 7th highest prevalence and 6th highest incidence of type 1 diabetes in children aged 0-14 years.

Diabetes is more prevalent in South Australia and the northern territory; it was found that 58 people per 1000 were registered as diabetic in South Australia and Northern Territory was close behind with 56 people per 1000. Almost 37% of diabetic people live in Australia^{16 17 18}.

Figure 14: Graphical representation of age standardised deaths from 2000-2012

Figure 15: Percentage of total deaths in Australia in 2016

Diabetes in Asia

There are now 422 million people living with diabetes, according to International Diabetes Federation (IDF). More than half are from Asia and the Western pacific, where 90-95% of cases are classed as Type-2.

Diabetes in china

China is leading the world, with the disease now affecting more than 98.4 % (110 million) people or about 10% of the total world population there is a dramatic increase from about less than 5% in 1980.

Number of people with diabetes

Figure 16: Diabetic population of various countries in millions

Almost one in ten of Chinese adults have diabetes. A 2010 study estimated that more than 92 million Chinese adults have the disease, with another 150 million showing early symptoms. The incidence is rapidly increased to a 30% in 7 years. According to 2016 statistics, one in three of world's adults with diabetes are from china, i.e. almost 10% of all adults in china (110 million people) currently living with diabetes and this number may be increased to 150 million by 2040. India is closely trailing China, with an estimated 65.1 million diabetics, which is more than 7.1% of the adult population. The average age onset is 42.5 years. Nearly 01 million Indians die due to diabetes every year. According to the Indian Heart Association, the diabetics will increase to 109 million by 2035. The high incidence is attributed to a combination of genetic susceptibility, adoption of a high-calorie diet, low activity life style.^{19 20}

Diabetes prevalence in India

India had 69.2 million people living with diabetes (8.7%) as per 2015 data. Of these, it remained undiagnosed in almost 36 million people. Number of diabetes deaths in India between the ages 30-69 is 79,500 in males and 51700 in females. Meghalaya has the lowest prevalence of diabetes prevalence at 4.5%, while Chandigarh has the highest at 13.6% followed by Punjab at 9.8%. Prediabetes prevalence is also high in Chandigarh at 14.6% and the lowest at Mizoram at 5.8%. A large community based study involving over 15,000 adults from 14 states and a union territory in the country has revealed that the average prevalence of diabetes in these states is over 7.3%.

The prevalence varied from 4.3% of Bihar population, to 10.4% in Tamil Nadu, Chandigarh was found to have a prevalence of 13.6%, Punjab (9.8%). This shows that the economically more developed states had a higher prevalence than economically less developed states. The prevalence of diabetes was lower in the northeast states compared with other states.

The prevalence of prediabetes in all 14 states and union territory was found to be 10.3%.it varied from 6% (Mizoram) to 14.7% (Tripura). The prevalence of prediabetes implies the percentage of population prone to develop diabetes in near future.

The undiagnosed diabetes is almost 45%, prevalence was higher in urban areas (11.2%) compared to rural areas (5.2%). The prevalence of diabetes in north east is 5.9% which is lesser than the other states(8.3%).The prevalence of diabetes is higher in the states- Chandigarh, Tamil Nadu and Gujarat which are having high socio-economic status even in the rural areas.

Proportional mortality (% of total deaths, all ages)*

Figure 17: Total deaths % in all ages based on the cause of death

Figure 18: Trends in age standardized prevalence of diabetes

Dietary profile

The staple food consumed by the urban and rural population in all the four regions is shown below:

Figure 19: Staple food of the urban and rural population in all the four regions

Rice is the main staple food in Tamil Nadu and rural Jharkhand. Wheat is main staple for both urban and rural Chandigarh. About half of the population in urban Jharkhand and Urban Maharashtra

consumes wheat as the main staple food. The staple food in rural Maharashtra is varied and comprises of 36.3% wheat, 28% Jowar, 20.6% rice, 13.8% Bajra, 0.9% maize and 0.4% Ragi consumers. The following table shows the major cooking oil of the urban and rural population in all the four regions. In Tamil Nadu, the major oil used for cooking is sunflower oil, followed by palm oil,

groundnut oil and gingerly oil. The major cooking oil in Jharkhand is mustard oil. In Chandigarh, in addition to mustard oil, the next major oil used is soybean oil, in Maharashtra, the major oil used is soybean oil, followed by groundnut and sunflower oil²¹.

Table 2: Major cooking oil used in the urban and rural population in all four regions

Cooking Oil	TAMIL NADU		JHARKHAND		CHANDIGARH		MAHARASHTRA	
	Urban	Rural	urban	rural	urban	Rural	urban	rural
Mustard Oil	0.3	0.1	90.4	98.7	65.4	81.6	4.1	0.9
Coconut Oil	2.3	3.2	0.2	0	0	0.2	0.6	0.2
Groundnut Oil	21.4	39.7	1.1	0.1	1.2	0.3	29.6	20.2
Sunflower Oil	40.0	15.9	2.3	0.1	4.2	0.5	14.9	5.3
Soya Bean Oil	0.2	0	4.7	0.2	23.2	14.2	45.1	65.0
Palm Oil	29.6	29.7	0.2	0.1	0.4	0.1	3.3	5.6
Gingelly Oil	5.4	11.2	0.3	0	0.1	0	0	0.1
Others	0.9	0	0.8	0.7	5.4	2.9	2.5	2.7

Table 3: Indicating State/UT wise number of new cases of diabetes detected in 2014-15 & 2015-16 (till Oct 2015)²²

Sl. No	States and UT's	Patients diagnosed with diabetes at NCD clinics	
		2014-15	2015-16(till oct,2015)
1	Andhra Pradesh	9,139	35,461
2	Arunachal Pradesh	1,469	2,384
3	Assam	5,052	6899
4	Bihar	9,595	NA
5	Chhattisgarh	11,897	45833
6	Goa	5,692	7,297
7	Gujarat	1,61,578	10,9,340
8	Haryana	27,185	9,205
9	Himachal Pradesh	2,777	3,749
10	Jammu and Kashmir	3,701	1,763
11	Jharkhand	17,240	11,388
12	Karnataka	15,871	8,757
13	Kerala	29,768	13,435
14	Madhya Pradesh	10,165	16,825
15	Maharashtra	53,488	41,608
16	Manipur	NA	NA
17	Meghalaya	190	484
18	Mizoram	2,992	3,859
19	Nagaland	328	375
20	Odisha	17,834	34,721
21	Punjab	32,100	13,766
22	Rajasthan	67,738	31,300
23	Sikkim	937	1,325
24	Tamil Nadu	NA	66,896
25	Telangana	NA	NA
26	Tripura	NA	50
27	Uttar Pradesh	60,459	91,937
28	Uttarakhand	645	291
29	West Bengal	11,908	7,295
30	Andaman & Nicobar	NA	3,245
31	Chandigarh	NA	NA
32	Dadar & N.Haveli	NA	NA
33	Daman & Diu	NA	NA
34	Lakshadweep	NA	NA
35	Delhi	NA	NA
36	Puducherry	NA	4,727
	TOTAL	5,59,718	5,74,215

CONCLUSION

The above data suggests that diabetes is a disorder which occurs due to intake of high calorific diet with low activity (sedentary life style). It was also observed that food habits of different parts

of the world is also a contributing factor for diabetes. It can be controlled only by sticking to good food regimen, by keeping check on junk food and also by regular physical exercise; as this disease may silently cause major harm to the people in coming years, making it deadlier than other prevalent diseases.

REFERENCES

1. World Health Organization(WHO). Global report on Diabetes 2016 [internet]. Available from: [www.who.int > diabetes > global-report](http://www.who.int/diabetes/global-report).
2. Ambady ramchandran and Chamukuttan snehalatha-mCurrent scenario of diabetes in India. <https://www.ncbi.nlm.nih.gov/pubmed/20923516>
3. World Health Organisation(WHO). World Health Day 2016: Beat Diabetes [internet] Available from: [www.searo.WHO.int/india/mediacentre/events/2016/en/](http://www.searo.who.int/india/mediacentre/events/2016/en/)
4. Canada Diabetes Association. Diabetes Canada [internet]. Available from: <http://www.diabetes.ca>
5. Centre for Disease Control and Prevention(CDC). National Diabetes statistics report 2017-10-08. Available from: <https://www.cdc.gov/diabetes/data/statistics/statistics-report.html>
6. Mexican observatory on noncommunicable diseases(OMENT). Latest diabetes statistics in mexico-ENSANUT2016 Available from:-oment.unal.mx/latest-diabetes-statistics-in-mexico-ensanut-2016/lang-en
7. Centre for Disease Control and Prevention(CDC). Maps of trends in diagnosed diabetes and obesity-April 2017 Available from: <http://www.cdc.gov/diabetes/data>
8. Newly Diagnosed with Diabetes-Diabetes in Europe/uk Available form: www.diabetes.co.uk/newly-diagnosed.html/
9. Innovating diabetes Care in turkey- the blueprint for change program Nov 2014 by novonordisk. Available from: <https://www.novonordisk.com>
10. First diabetes prevalence study in Portugal : PREVADIAB study – Gardete-correia¹, Boavida JM, Raposo JF, Mesquita AC, Fona C, Carvalho R, Massano-Cardoso S. Available form: <https://www.ncbi.nlm.nih.gov/pubmed>
11. Atlas diabetes south America. Available from: <https://www.slideshare.net/Pathyluna/atlas-diabetes-south-america>
12. Diabetes care in Brazil -Annals of global health. volume 81, issue 6 nov-dec 2015. Available from: [www.science-direct.com>article>pii](http://www.science-direct.com/article/pii)
13. Diabetes care in Venezuela. nieto.martinez>R, et al. *Ann Glob Health*.2015 Nov-Dec. Available from: <https://www.ncbi.nlm.nih.gov/pubmed/27108145>
14. Atlas-data: World Health Organisation(WHO). Available from: [www.who.int>globalatlas.-](http://www.who.int/globalatlas)
15. American diabetes association. Diabetes in African American community advocacy fact sheet. Available from: [main.diabetes.org>dorg>pdfs>factsheet-advocacy-african-american.pdf](http://main.diabetes.org/dorg/pdfs/factsheet-advocacy-african-american.pdf).
16. Diabetes Australia. Available from <https://www.diabetesaustralia.com.au/diabetesinaustralia>
17. Diabetes: the silent pandemic and its impact on Australia. Available from: <https://statistics.diabetesaustralia.com.au/statistics/filesassets/data.australia>.
18. Diabetes facts-Australian diabetes council. Available from: <https://www.diabetesaustralia.com.au/diabetesfactsaustralia>.
19. World Health Organization(WHO). Rate of diabetes in china “explosive”. Available from: www.wpro.who.int/china/mediacentre/releases/2016/20160406/en/
20. World Health Organisation(WHO). Noncommunicable disease(NCD)country profile. Available from: www.who.int/nmh/publications/ncd-profiles-2014/en/
21. ICMR-India Diabetes (India) study phase-1 final report (2008-2011). Available from: icmr.nic.in/final/indinab/indinab.ntm
22. Cases of Diabetes-Environment Portal. Government of India, Ministry of health and family welfare. Available from: <https://www.indiaenvironmental.org.in/files>.

Cite this article as:

Vijaya Lakshmi P & Sudheerbabu I. Global statistical analysis of diabetes mellitus with stress on prevalence in Asia and specifically India: A critical and clinical overview. *Int. J. Res. Ayurveda Pharm.* 2018;9(3):58-65 <http://dx.doi.org/10.7897/2277-4343.09363>

Source of support: Nil, Conflict of interest: None Declared

Disclaimer: IJRAP is solely owned by Moksha Publishing House - A non-profit publishing house, dedicated to publish quality research, while every effort has been taken to verify the accuracy of the content published in our Journal. IJRAP cannot accept any responsibility or liability for the site content and articles published. The views expressed in articles by our contributing authors are not necessarily those of IJRAP editor or editorial board members.