DE GRUYTER OPEN

© **2017** ILEX PUBLISHING HOUSE, Bucharest, Roumania
http://www.jrdiabet.ro
Rom J Diabetes Nutr Metab Dis. **24**(2):111-118
doi: 10.1515/rjdnmd-2017-0015

PREVALENCE AND FITNESS OF DIABETICS IN HISAR, HARYANA, INDIA

Jaspreet Kaur ✉***, Manoj Malik, Parul Sharma, Sumedha Sangwan, Kulandaivelan S***

Department of Physiotherapy, Guru Jambheshwar University of Science & Technology, Hisar

received: March 07, 2017 *accepted*: June 03, 2017

available online: June 15, 2017

Abstract

Background and Aims: *Diabetes mellitus is a metabolic disorder which is increasing in older adults. The increasing proportion of elderly persons is contributing to an increase in the prevalence of diabetes. The aim of this study is to analyse the prevalence of Diabetes among active young and middle age subjects and active old age subjects in Hisar district, India.* ***Material and Methods:*** *A total of 400 subjects were screened from Hisar district, India who were physically active then they were allocated groups based on age group A (ranging between 25-50 years) and group B (ranging between 51-75years). A Glucometer device was used to check sugar level and 6 Minute Walk Test (MWT) was used to check fitness level because a higher value obtained in 6MWT is associated with an improved fitness level.* ***Result and conclusion****: Among the 400 participants studied, 43.5% participants were pre diabetics 32.5% were diabetic and 24% were non diabetic. Therefore, this study found that almost three fourth of the total population in all age spectrums had abnormal glucose metabolism in the form of either diabetes or Pre Diabetes. The prevalence of Diabetes was more in the older patient group. The differences between the two groups for 6MWT was found to be significant.*

key words: *Prevalence, Diabetes Mellitus, Pre-diabetic, Non-diabetic, active old age subjects*

Background and Aims

Diabetes Mellitus (DM), is a metabolic disorder which has become a serious health issue worldwide. It is most prevalent among individuals aged 65 and above also in racial and ethnic minorities. It is characterised by high blood sugar level- polyuria, polydipsia and polyphagia [1,2].

WHO predicts the DM will become one of the leading cause of death by the 2030 in the world. In year 2000 it was estimated that approximately 3% of adults will have DM, the figures seeming to be doubled by the year 2030 and also it will become the leading cause of death [3]. In India number of adults with age more than 65 years is increasing [2,4]. As population in India is increasing at a high rate this makes this country to be one with the most populous diabetic population in the world [4].

415 million people have been estimated to have diabetes in year 2015. Among which 78.3 million belong to South East Asia. Indian Diabetic Federation research also estimated that every 1 in 11 adults had diabetes, this figure is likely to be 1 in 10 in year 2040. Among these, 415 million population 3/4th of people with

✉ Hisar, Haryana, 125001. Tel - 01662-263517, 9466092657.
corresponding author e-mail: Jaspreet_malik16@yahoo.co.in

diabetes live in low and middle income countries [5].

According to Indian Council of Medical Research (ICMR) in the 1970, the rate of prevalence in urban areas was 2.3%, but it had increased by the year 2000. In rural areas frequency of being prone to diabetes had increased from 1% to 4-10%. According to the study carried out in 2010 at different cities like Chennai, Pondicherry and Goa the 43%, 31.2% and 10.3% of the population were at high risk of diabetes respectively [6,7].

According to the most recent surveillance data, the prevalence is the highest in Meghalaya to be 45% while the lowest rate of prevalence in Punjab at 9.8% whereas pre diabetes is highest in Chandigarh (14.6%) and lowest in Mizoram (5.8%) [8].

There are two types of diabetes – type 1 diabetes also called insulin dependent diabetes mellitus is caused due to dysfunction or absence of B- cells in islets of Langerhans in pancreas while type 2 diabetes also called non- insulin dependent diabetes mellitus is caused by absence or reduced number of insulin receptors in the cells of the body. Type 2 diabetes is the most leading form of diabetes which comprises at least 90% of all cases of diabetes mellitus [9].

As the duration of disease advances the diabetic control in individuals worsens. Future Indian populations have been found to suffer from complications such as cardiovascular, renal issues, retinopathy and foot ulcers which is the result of poor glycaemic control [10].

Long-term complications of Diabetes develop gradually which may be disabling or even life threatening. Possible complications include nephropathy, retinopathy, neuropathy and foot ulcers [11].

Rapid rates of urbanization, modernisation, readily availability of fast foods, reduced physical activities and sedentary lifestyle are the possible factors that accelerate the rates of prevalence of diabetes [12].

The prevalence of diabetes is lower in rural areas of India as the number of patients with diabetes remains undiagnosed. This is largely due to lack of availability of screening facilities at public health centre (PHC) level. Therefore there is an urgent need to improve the infrastructure in Primary health centres so that exact figure can be calculated [13].

Thus to prevent aggravated complications, control of Diabetes is must and the management of Diabetes should therefore be an objective. To avoid the growth of aggravation of diabetes, a change in lifestyle is must. Further a balanced and nutritious diet, modified sleep patterns should be part of daily routine.

According to recent studies exercises also improves the quality of life of patient suffering from diabetes mellitus which in turn leads to the reduction of complications of diabetes [14].

The aim of the current study is to find out the prevalence of Diabetes among two groups; group a (age ranging between 25-50 years) and group B (age ranging between 51-75 years) in Hisar district and to find out the functional exercise level for daily physical activities by 6-Minute Walk Test.

Materials and Methods

This cross-sectional study was conducted during the month of March and April, 2016. Purposive sampling was done over 400 active subjects from different areas of Hisar district. People aged between 25-75 years were included for blood sugar measurement screening. Two groups i.e. group a (age ranging between 25-50 years) and group B (age ranging between 51-73 years) were considered as a parameter. Blood sugar level was measured using a Glucometer device (ACCU-Check Active) [15]. Relevant diagnosis was abstracted from the subjects

without knowing any previous medical history of the individuals. A standardised chart was used to further classify the subjects in the form of Pre-Diabetes (100-125mg/dl), Diabetes (≥126mg/dl) and Non Diabetes. [According to American Diabetes Association, 2011]

A six minute walk test was used to check the general fitness level of the people [16]. In this Survey those males and females were included who were having a fine active lifestyle such as morning walk, some physical activities, exercises etc. Fasting blood sugar was measured so we excluded those individuals who had taken some meal before test.

No ethical issues were involved in the study as no intervention was carried out; however, verbal consent was obtained to proceed with the survey.

400 active subjects were taken in the study who met the inclusion criteria. Subjects were asked to provide information about their demographic details, their sugar level was measured by using a glucometer device and further a six minute walk test was used to check their fitness level.

6 MINUTE WALK TEST

The walking course was of 30 m in length. A 100-ft hallway was there and the length of corridor was marked every 3m. The turnaround points were marked with cone. A starting line, which marks the beginning and end of each 60 m lap was marked on the floor using colour tape as shown in Figure 1.

The Six Minute Walk Test measures the distance that an individual can walk on a flat, hard surface quickly in 6 minutes duration. It evaluates the global and integrated responses of all the systems involved during exercise.

6MWT assesses the submaximal level of functional capacity. As most of the activities of daily living are performed at submaximal levels of exertion, the 6 MWT may better reflect functional exercise level for daily physical activities.

The mean 6MWT values are 593m for healthy subjects. The ranges vary according to age and health of an individual [17].

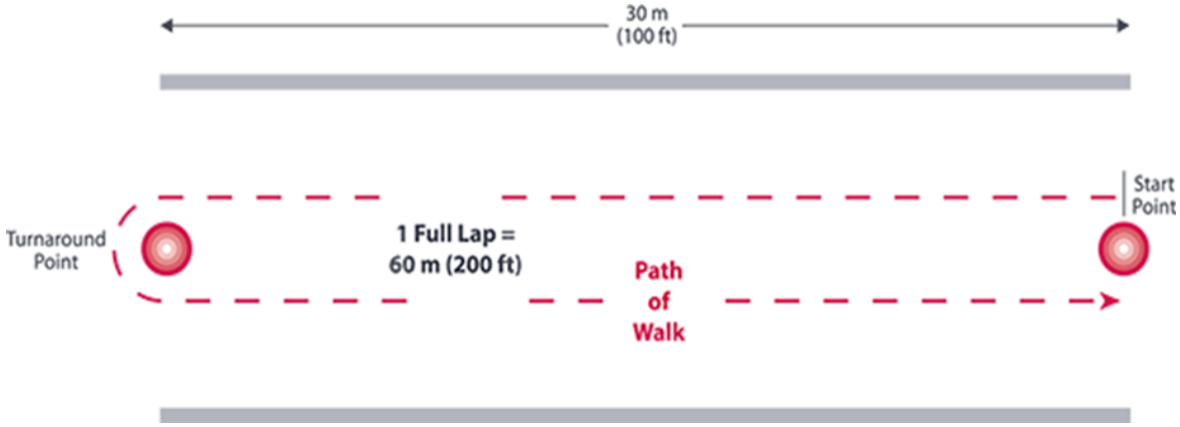

Figure 1. *6 minutes walk test diagram*

Statistical Analyses

Data analysis was done using STATA version 9, statistical formulas for mean value and standard deviation were calculated. Continuous variables were expressed as mean ± SD and categorical variables were expressed as number (%). Dataset comprised of total number of active individuals screened for Blood sugar level and the 6-MWT in terms of their age.

Results

Total 400 individuals (99 females, 301 males) were screened, out of which 173 were in the group A of 25-50 years and 227 were in the group B of 51-75 years.

Out of 400 subjects 43.5% (n=174) individuals were Pre Diabetics, 32.5% (n=130) were Diabetics, and 24% (n=96) were Non Diabetics as shown in Figure 2.

Prevalence for group A (25-50 years) individuals was 36.41% (n=63) were Pre Diabetics, 27.17% (n=47) were Diabetics and 36.41% (n=63) were Non Diabetics (Figure 3).

Prevalence for the group B (51-75 years) individuals was 48.89% (n=111) were Pre diabetics, 36.56% (n=83) were Diabetics and 14.53% (n=33) were Non Diabetics (Figure 4).

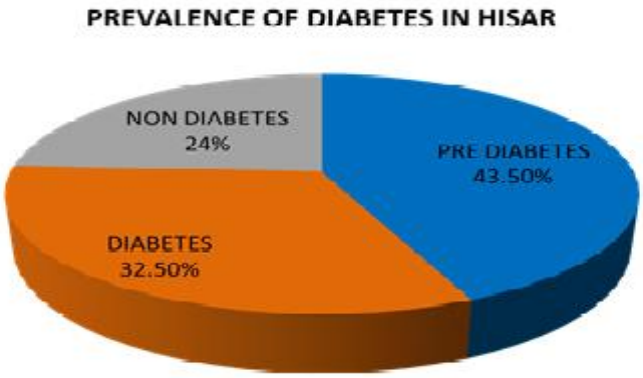

Figure 2. *Prevalence of diabetes in the whole study group*

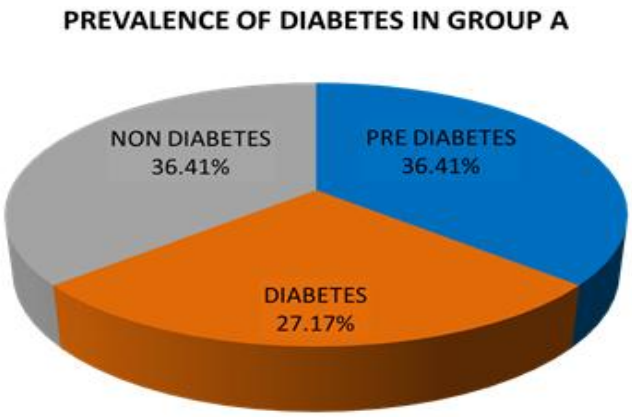

Figure 3. *Prevalence of diabetes in Group A*

The Mean 6-MWT was 577.862 +83.3857 ranging from 340m-765m in group A whereas the Mean 6-MWT was 517.474 $^{+}$105.855 ranging from 200m-730m in group B (51-75 years) (Figure 5). P value is less than 0.0001 and this difference is considered to be extremely statistically significant (Table 1). The results concluded that the overall prevalence of Pre-Diabetics individuals were higher with 43.50% and only 24% of population were non diabetics. Group B was more affected with Diabetes. Age plays a significant role in the increased prevalence of diabetes, reaching 36.56% for the group B aged 51-75 years in the current study.

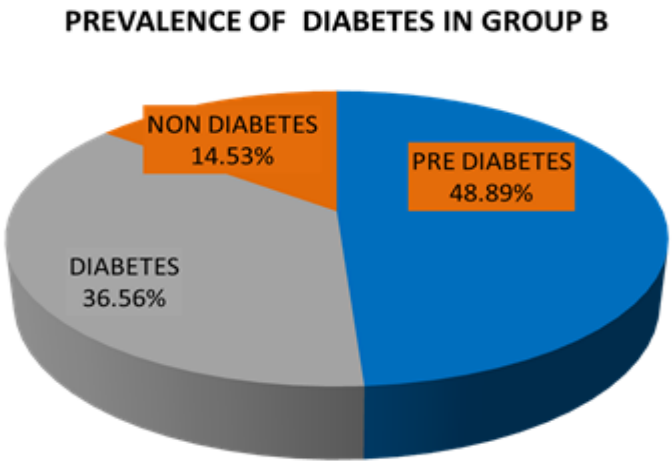

Figure 4

Figure 4. *Prevalence of diabetes in Group B*

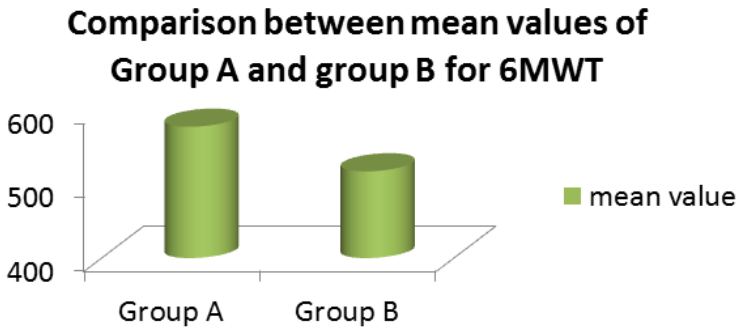

Figure 5

Figure 5. *Comparison between mean values of Group A and Group B for the 6 MWT*

Table 1. Mean values of the 6 MWT for the two age groups

Groups	Age (years) (n=400)	6MWT Range (meters)	Mean Range ±SD	t-value	p-value
A	25-50 (n=173)	340-765	577.862± 83.3857	6.1822	<0.0001
B	51-75 (n=227)	200-730	517.474 ±105.855		

Almost three fourth of the total population in all age spectrums was suffering from abnormal glucose metabolism in the form of either diabetes or Pre Diabetes. More than 50% of

these cases were unaware of their disease and were picked up by screening.

Discussion

To find the prevalence of diabetes mellitus in individuals there are different methods available. The present study aims to find the Diabetes prevalence in district Hisar of Haryana, India. The study winded up with the result that out of total population 43.50% individuals were Pre Diabetics whereas 24% individuals were non diabetics. The older age group was more affected with Diabetes. Age plays a significant role in the increased prevalence of diabetes, reaching 36.56% for group B in the current study. This observation is also supported by many local and international studies that with increasing age, prevalence of diabetes also increases [18].

Another important observation that was noted in this study was the unexpected high prevalence of Pre Diabetics individuals in both groups. The above said observation may be caused by modern lifestyle adaptation, reduction in physical activities and consumption of high calories.

According to National Institute of Diabetes and Digestive and Kidney Disease (NIDDK), Pre Diabetes is a state of high-risk for developing diabetes and associated complications. It is a condition in which blood glucose levels are higher than the normal but not too high for a diagnosis of diabetes. People suffering from pre diabetes are more prone to type 2 diabetes and cardiovascular diseases which may further cause heart attack or heart failure [19].

The U.S. Department of Health and Human Services estimates that at least 86 million U.S. adults ages 20 or older were Pre Diabetic in 2012 [20].

5–10% of people per year with Pre Diabetes progresses to diabetes. Prevalence of Pre Diabetes is increasing worldwide and experts have projected that more than 470 million people will have Pre Diabetes by 2030. The high prevalence of Pre Diabetes is threatening as it implies a large population at risk of developing diabetes in future. For Pre Diabetic individuals, lifestyle modification is the cornerstone of Diabetes prevention, with evidence of a 40–70% relative-risk reduction [21].

Although every year pre diabetes frame moderate part of economic accountability; almost on average 1.8 million new individuals get diagnosed with pre diabetes out of which 0.2% population becomes diabetics yearly [22].

In the present survey conducted on individuals of Hisar district, India, it was observed that most of the individuals in group B (51-75 years) were either Diabetics or on the borderline to develop Diabetes. Increase in age is primary cause for type 2 diabetes augmentation. According to survey conducted by National Health and Nutrition Examination Survey 18.5% of population lying between 65-74 years of age are diabetics [23]. Although the consequences of diabetes are many related to health, economy ramification but in older age diabetes remain masqueraded and undertreated.

The three most important risk factors of Diabetes in older adults are sedentary lifestyle, poor dietary habits and changes in the body composition.

Diabetes has delusion that the glucose intolerance is associated with increase in age but different commonality is differently prone to prevalence of diabetes.

In some areas of the world, although the prevalence of diabetes increases with age, it does not exceed 3.5% [24]. This disorder is considered to be of utmost importance. In addition, clinical studies confirm the reduced insulin activity in aged subjects [25,26].

Moreover fatality due to acute diabetic complications like ketoacidosis may increase with age.

The benefits of identification of Pre Diabetes and asymptomatic type 2 diabetes in older adults depend on the pre-planned time duration of the advantage of strategies given and the patient's living probability [27].

In addition to pharmacological treatment overall physical health of individuals suffering from type 2 diabetes mellitus should be focused to improve glycaemic control. Further for improving glycaemic control and life quality walking and sub-maximal graded exercises must be recommended to diabetic patients [28].

The mean 6MWT values are 593m for healthy subjects. The ranges vary according to age and health of an individual's [16]. In the current study the Mean values for 6-MWT was 577.862, SD+-83.3857 ranging from 340m-765m in Group A (25-50 years) and the Mean 6-MWT was 517.474, SD+-105.855 ranging from200m-730m in group B (51-75 years). It indicates that for most of the subjects the results lies around the normal referral range.

According to surveys done from time to time findings show that individuals suffering from Type2 Diabetes had less exercise capacity as compared to non-diabetic individuals when undergone Six Minute Walk test. Moreover patients in the middle age group also have more six minute walk distance when compared with older age group. The exercise capacities of the patients did not however differ based on the durations of their diabetes [17]. T2D patients had lower exercise capacities as assessed by the 6MWT than their non-diabetic counterparts and this was lower in women, older and obese subjects.

Conclusion

This study found that almost three fourth of all the individuals in group A and group B was affected by either diabetes or Pre Diabetes. Out of these subjects almost half of them were not familiar about their diabetes status. Diabetes leads to many complications but effective management of the Diabetes at an early stage reduces occurrence of such types of complications. So change in lifestyle is firmly needed to cope up with diabetes and its health related issues.

Acknowledgment – we are thankful to all the volunteers who participated in this study.

Ethical clearance – all the ethical consideration have been taken care of no long term intervention or drugs have been used in this study only performance on scales and blood glucose have been measured which was comfortable for subjects.

Source of funding: NIL.

Conflict of Interest: NIL.

REFERENCES

1. Mohan H. The endocrine system, *Textbook of pathology*. The Indian J of Pathology & Microbiology (ed), Jaypee Brothers Medical Publishers, New Delhi, pp. 8842-47, 2005.

2. Brown AF, Mangione CM, Saliba D et al. Guidelines for improving the care of the older person with diabetes mellitus, *J Am Geriatric Soc* 51(5 Suppl Guidelines): S265-S280, 2003.

3. Singh AK, Mani K, Krishnan A, Aggarwal P, Gupta SK. Prevalence, awareness, treatment and control of diabetes among elderly persons in an urban slum of Delhi. *Indian J Community Med* 37: 236-9, 2012.

4. Gulabani M, John M, Isaac R. Knowledge of diabetes, its treatment and complications amongst diabetic patients in a tertiary care hospital. *Indian J Community Med* 33: 204-206, 2008.

5. International Diabetes Federation. Diabetes by region. *Diabetes Atlas* 7: 4, 2015.

6. Gupta SK, Singh Z, Purty AJ et al. Diabetes prevalence and its risk factors in rural area of Tamil Nadu. *Indian J Community Med* 35: 396-9, 2010.

7. Vaz NC, Ferreira A, Kulkarni M, Vaz FS, Pinto NR. Prevalence of diabetic complications in rural Goa, India. *Indian J Community Med* 36: 283-6, 2011.

8. Kumar D, Mukherjee K. Economic impact of type-2 diabetes mellitus on households in Hisar district of Haryana state, India. *The Health Agenda* 2: 125-129, 2014.

9. Ozougwu J, Obimba KC, Belonwu CD, Unakalamba CB. The pathogenesis and pathophysiology of type 1 and type 2 diabetes mellitus. *J Physiol Pathophysiology* 4: 46-47, 2013.

10. Kaveeshwar SA, Cornwall J et al. The current state of diabetes mellitus in India. *Med J Aus* 7: 45-48, 2014.

11. American Diabetes Association. Diagnosis and Classification of Diabetes Mellitus. *Diabetes Care* 32: 562-67, 2009.

12. Dionyssiotis Y. Analysing the problem of falls among older people. *Int J Gen Med* 5: 805-15, 2015.

13. Madaan H, Aggarwal P, Garg R, Sachdeva A, Kumar S, Nair R. Prevalence of Diabetes Mellitus in Rural population of District Sonipat, India. *Int J Med Sci and Public Health* 3: 261-264, 2014.

14. Kaur J, Singh SK, Singh J. Physiotherapy and rehabilitation in the management of diabetes mellitus. *Indian J Sci Res* 6: 171-181, 2015.

15. Tack C, Pohlmeier H, Behnke T et al. Accuracy evaluation of five blood glucose monitoring systems obtained from the pharmacy. *Diabetes Technol Ther* 14: 330–337, 2012.

16. Rikli R, Jones C. The reliability and validity of a 6-minute walk test as a measure of physical endurance in older adults. *J Aging Phys Act* 6: 363-375, 1998.

17. Chetta A, Zanini A, Pisi G, Aiello M, Tzani P, Neri M, Olivieri D. Reference values for the 6-minute walk test in healthy subjects 20-50 years old. *Respir Med* 100: 1573-1578, 2006.

18. Carlsson S, Midthjell K, Tesfamarian MY, Grill V. Age, overweight and physical inactivity increase the risk of latent autoimmune diabetes in adults: results from the Nord-Trøndelag health study. *Diabetologia* 50: 55–58, 2007.

19. Diabetes Prevention Program. National Institute of Diabetes and Digestive and Kidney Disease, 2017. Accessed at: https://www.niddk.nih.gov/about-niddk/research-areas/diabetes/diabetes-prevention-program-dpp/Pages/default.aspx

20. Centres for Disease Control and Prevention. Estimates of diabetes and its burden in the United States. *National Diabetes Statistics Report 2014.* Accessed at: https://www.cdc.gov/diabetes/pdfs/data/2014-report-estimates-of-diabetes-and-its-burden-in-the-united-states.pdf

21. Tabák A, Herder C, Rathmann W, Brunner E, Kivimäki M. Prediabetes: a high-risk state for diabetes development. *Lancet* 379(9833): 2279–2290, 2012.

22. Centres for Disease Control and Prevention. National diabetes statistics report, 2014. Accessed at: https://www.cdc.gov/diabetes/pubs/statsreport14/national-diabetes-report-web.pdf

23. Harris MI, Flegal KM, Cowie CC et al. Prevalence of diabetes, impaired fasting glucose and impaired glucose tolerance in U.S. adults. The Third National Health and Nutrition Examination Survey. *Diabetes Care* 21: 518-524, 1988.

24. Bierman EL. Atherogenesis in diabetes. *Arterioscler Thromb* 12: 647-56, 1992.

25. Kohrt WM1, Kirwan JP, Staten MA, Bourey RE, King DS, Holloszy JO. Insulin resistance in aging is related to abdominal obesity. *The Diabetes Educator* 42: 273-281, 1993.

26. Meneilly GS, Dawson K, Tessier D. Alterations in glucose metabolism in the elderly patient with diabetes. *Diabetes Care* 16: 1241-1248, 1993.

27. Kirkman M, Jones V B, Clark N et al. Diabetes in older adults. *Diabetes Care* 35: 2650-2664, 2012.

28. A.F Adeniyi, Uloko A.E, Sani-Suleiman I. Exercise capacity in type 2 diabetes patient. *J Biomed Res* 12: 175-79, 2009.