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Prevalence of Type 2 Diabetes Mellitus and Risk Factors Among Senior Citizens Attending NIUM Hospital Bengaluru

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ABSTRACT

The study was designed with the objective to find the prevalence of type 2 diabetes mellitus and risk factors among senior citizens. This hospital based, cross sectional study was conducted among 250 elderly aged 60 years and above, including senior citizens of either sex, newly diagnosed and known cases of type 2 diabetes mellitus attending community medicine and geriatric OPDs of NIUM hospital, Bengaluru during stipulated period of study. Prevalence of type 2 diabetes mellitus and risk factors were assessed. Survey data has been processed and analyzed by using the Statistical Package for Social Sciences (SPSS) 16.0 for windows. The prevalence of type 2 diabetes mellitus was found 45.6% as a whole. The highest and lowest prevalence of type 2 diabetes mellitus found among 60-65 years and above 75 years, respectively. Prevalence among Males was 30% and Females was 15.6%. Mean ± SD of FBS and PPBS of type 2 DM were observed as 162.27 $\pm$ 75.18 and 257.11 $\pm$ 91.95, respectively. Higher prevalence of type 2 DM patients were found among BMI above 25 kg/m^2. 38.8% of prevalence of type 2 diabetes mellitus was observed among central obese senior citizens. 26% of higher prevalence of type 2 diabetes mellitus was observed among patients had positive family history of type 2 diabetes mellitus. Results confirmed an increased prevalence of type 2 diabetes mellitus among senior citizens. Higher prevalence of type 2 DM was exhibited among senior citizens those were having obesity, overweight, hypertension and family history of type 2 diabetes mellitus. Newly screened cases of type 2 diabetes mellitus showed paramount importance of extension of screening programme in elderly.

Keywords: Senior citizen, Diabetes mellitus, Risk factors, Prevalence.

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INTRODUCTION

The global increase in the prevalence of diabetes is due to population growth, ageing, urbanization, an increase of obesity and physical inactivity[1,2,3]. The number of cases of diabetes worldwide in the year 2000 among adults (more than 20 years) was estimated to be 171 million and will rise to 366 million by 2030[3,4,5,6,7]. The International Diabetes Federation (IDF) estimates the total number of people in India with diabetes to be around 50.8 million in 2010, rising to 87.0 million by 2030[2,6]. According to the 2011 census, percentage of Indians above the age of 60 years is 8.3% as compared to 6.9% in 2001 census. In terms of numbers, according to the provisional data of census 2011, this comes to an estimated 99.87 million[8]. The number of older adults with diabetes is rapidly increasing worldwide due to increased life span and a high prevalence of diabetes in the elderly[5, 9]. The prevalence of diabetes increases with age, and is highest in those older than 60 years. The rate of metabolism slows down with advancing age due to a decrease in lean body mass and increasing sedentary lifestyle, resulting in a reduced daily energy requirement[10,11]. Ageing is a natural process. Discoveries in medical science and improved social conditions during the last few decades have increased the life span of human beings. Mechanisms for ageing are multifactorial, despite the biological controversy, form a physiologic stand point human ageing is characterized by progressive constriction of the homeostatic reserve of every organ system. This decline referred to, as homeostenosis is gradual and progressive and is influenced by diet, environment, and personal habits as well as by genetic factors[12]. As per the WHO**,** diabetes mellitus is a heterogeneous metabolic disorder characterized by common features of chronic hyperglycaemia with disturbance of carbohydrate, fat, and protein metabolism[13]. Type 2 diabetes is a heterogenous disorder with a more complex etiology. Factors that associated with aetiopathogenesis of type 2 diabetes mellitus are genetic factors, certain environmental factors such as obesity, hypertension, and level of physical activity and Insulin resistance[13,14]. One of the most prominent metabolic features of type 2 DM is the lack of responsiveness of peripheral tissues to insulin, especially of skeletal muscle and liver. Obesity, in particular, is strongly associated with insulin resistance and hence type 2 DM[13,15,16,17]. Underlying pathophysiologic mechanisms include an increase in insulin resistance related to weight gain and physical inactivity that is central to the pathophysiology of type 2 diabetes and the metabolic syndrome[10] Overweight, unhealthy diet, physical inactivity, high blood pressure, impaired glucose tolerance (IGT), and poor nutrition during pregnancy are modifiable risk factors of type 2 diabetes mellitus. Family history of diabetes, increasing age, ethnicity, history

of gestational diabetes, polycystic ovarian syndrome are unmodifiable risk factors of type 2 diabetes[3,7,16,18,19,20]. Reducing body weight by eating few calories, taking regular exercise and increased physical activity can lead to improved glycaemia, decreasing insulin resistance, and reduced cardiovascular risk factors[10], [21].

MATERIALS AND METHOD

After Institutional ethical clearance, this hospital based cross sectional study was carried out at community Medicine and geriatric OPDs of NIUM hospital, Bengaluru, over a period of one year from January 2014 - January 2015. 250 patients as per recommendation of Institutional Ethical Committee were enrolled including known cases of type 2 diabetes mellitus as well as newly diagnosed cases of type 2 diabetes mellitus. Newly diagnosed cases of type 2 diabetes mellitus were studied as special populace as they had other risk factors of type 2 diabetes mellitus or either they had some other chief complaints for which they had come to the hospital. Patients aged 60 years and above were included. 60 years age is one of the unmodifiable risk factors of type 2 diabetes mellitus. Therefore, they had been screened for type 2 diabetes mellitus. Patients were informed complete details about the nature of the study, investigations etc. Patients those who agreed to participate in the study were also requested to sign the informed consent form. The patients were inquired about their name, age, sex, marital status, address, religion, occupation and presenting chief complaint. Each enrolled senior citizen was inquired about family history of Type 2 diabetes mellitus and history of type 2 diabetes mellitus. Investigations (FBS and PPBS) were done at the laboratory of hospital of the National Institute of Unani Medicine. The participants of the study were requested to fast for 8-10 hours before the sample collection. About 5 ml of whole blood was collected in plain dry vaccutioner tube via vena puncture with the help of a disposable syringe in between 9.00 am and 10.00 am. The patients were instructed to have breakfast and to come again after 2 hours for postprandial sample collection. Glucose-detected by enzymatic reaction (glucose oxidase and peroxidase = GOD- POD) method. (Method of Trinder (1969) Aspen Diagnostics). As per 2006 WHO diagnostic criteria of diabetes, FBG and PPBS were consider below 126mg/dl and 200mg/dl, respectively as normoglycaemic. No history of type 2 diabetes mellitus but sugar level above as per criteria was considered as new cases of type 2 diabetes mellitus. Known cases of type 2 diabetes mellitus, if they were on antidiabetic treatment or history of type 2 diabetes mellitus. Anthropometric variables measured were height, weight, BMI, waist circumference (WC), hip circumference (HC), and waist to hip ratio (WHR).

The BMI was calculated on the basis of BMI = weight in Kg / height in m^2.

Overweight was defined as BMI of 25.0-29.9 Kg/m^2 and obesity was defined as BMI ≥30.0 $Kg/m.^2$

The waist-to-hip ratio was calculated on the basis of Waist-to-hip ratio = Waist circumference / hip circumference

(WHR <0.9 in men and <0.85 in women were considered normal, while WHR ≥0.9 in men and ≥0.85 in women were considered high and indicative of central obesity)

Brachial blood pressure measurement was taken with a standard mercury sphygmomanometer in sitting position, where patients arm was fully bared and supported at the level of the heart. Patients were asked to sit for at least five minutes in quiet place before beginning blood pressure measurement. Patients were categorized hypertensive and normotensive. Hypertensive, if they were on antihypertensive treatment or history of hypertension or they had a systolic blood pressure ≥140 mm Hg and diastolic blood pressure ≥ 90 mm Hg. Systolic pressure was recorded at the first appearance of korotkoff's sounds, and diastolic pressure was measured at the disappearance of korotkoff's sounds.

Statistical Methods

Quantitative analysis was used by two steps; mainly univariate, and bivariate level by employing parametric and non-parametric statistical methods to analyze the data on prevalence of type 2 diabetes mellitus among senior citizens.

$$\text{Prevalence} = \frac{(new+old)cases\ of\ type\ 2DM}{studied\ population} \times 100$$

Mean and standard deviation has been used to interpret the sample statistics. The descriptive statistics provides the foundation for the quantitative analysis.

Data was analyzed by using software and manual methods for data analysis. Survey data has been processed and analyzed by using the Statistical Package for Social Sciences (SPSS) 16.0 for windows. Graphs and tables were reproduced by using MS excel. Findings from the analysis were presented by using one way, two way tables, and graphs.

RESULTS AND DISCUSSION

Among the study population 99 were found to be known cases of type 2 diabetes mellitus and 15 were newly detected with type 2 diabetes mellitus during the trail. 136 elderly were normoglycaemics. The prevalence of type 2 diabetes mellitus was found to be 45.6 %.as a whole. The prevalence of type 2 DM among the age groups of the senior citizens were 60-65 years 23.2%, 66 -70 years 15.6 % , 71 -75 years 3.6 % and above 75 years 3.2%. The present study

showed the highest prevalence among 60-65 years age group and the lowest prevalence among age above 75 years (Table No 1). Our results related with the prevalence of type 2 DM among age distribution are in accordance with the findings of Ramachandran A *et al* in 2012, in the Asian Indian population, prevalence of type 2 DM peaks at 60-69 years. Steyn NP *et al* in 2004 found a decrease in prevalence of type 2 DM among oldest age group (75+) because of higher mortality rates in those with the disease.[1,22]. The prevalence of type 2 DM according to BMI of the senior citizens were normal (19-25Kg/m^2), overweight (25-29.9 Kg/m^2) and obesity (above 30 Kg/m^2) 18%, 17.2% and 9.2, respectively (Table 2).The present study result showed higher prevalence of type 2 DM patients were found among BMI above 25 kg/m^2. Waist circumference is more sensitive for the prediction of risk as well as co-morbidities of cardiovascular disease and diabetes mellitus, according to waist to hip ratio 38.8% of prevalence of type 2 DM was observed among central obese senior citizens and 6.8% prevalence of type 2 DM was observed among senior citizens were having normal waist to hip ratio. (Table 3). Subramani R *et al* in 2014 reported significant association between BMI and type 2 diabetes mellitus. Several studies supported that early identification of high BMI, would give opportunity for primary prevention and early diagnosis of diabetes. Also it would suggest that, Indians, especially, have to maintain low BMI to prevent diabetes mellitus[23]. In this study prevalence of type 2 DM 26.4% among hypertensive patients and prevalence of type 2 DM 19.2% among normotensive patients (Table 4). Diabetes and high blood pressure are closely related diseases. They occur together so frequently that they are officially considered "co-morbidities". Our results also demonstrated a close relation between type 2 DM and hypertension. The study conducted in 2009 by Fatima Bello-Sani *et al* reported higher prevalence of hypertension found among type 2 diabetes mellitus. Autonomic function is also influenced by glycaemia and exerts a crucial role in the control of blood pressure and cardiac function. The disruption of this physiological mechanism influences deeply on cardiovascular mortality in diabetes[24]. In this study Prevalence of type 2 DM was observed 26% among patients who had positive family history of type 2 DM and Prevalence of type 2 DM was observed 19.6% among patients who had no family history of type 2 DM (Table No. 5). A previous study conducted by Vijayakumar G *et al* in 2008 also concluded the same results with regard to family history of type 2 DM.[6]. Reason for the pattern also accorded with the statement mentioned that, genetic component has stronger basis for type 2 DM than type 1 DM. A person with single parent having type 2 DM is at an increased risk of getting diabetes, but if both parents have type 2 DM the risk in the offspring rises to 40 %.[13]

Table 1: Distribution of type 2 diabetes mellitus among senior citizens according to their age and glycaemic status (n=250)

Age	Known cases of type 2 DM (%)	New cases of type 2 DM (%)	Total cases of type 2 DM (%)	Normoglycaemics (%)	Prevalence of type 2 DM in different age groups
60-65	48 (48.5)	10 (66.6)	58 (50.9)	76 (55.9)	23.2
66-70	36 (36.3)	3 (20)	39 (34.2)	35 (25.7)	15.6
71-75	8 (8.1)	1 (6.7)	9 (7.9)	15 (11.0)	3.6
Above 75	7 (7.1)	1 (6.7)	8 (7.0)	10 (7.4)	3.2
Total	99 (100)	15 (100)	114 (100)	136 (100)	45.6

The prevalence of type 2 diabetes mellitus was found to be 45.6 % (250). 99 were found to be known cases of type 2 diabetes mellitus and 15 were newly detected with type 2 diabetes mellitus. 136 elderly were normoglycaemics. The highest prevalence was observed among 60-65 years age group and the lowest prevalence among age above 75 years.

Table 2: Distribution of senior citizens according to BMI and glycaemic status (n=250)

Senior citizens	BMI (Body Mass Index) Kg/m^2			
	Normal (19-25) (%)	Overweight (25-29.9) (%)	Obese (above 30) (%)	BMI (Less than 19) (%)
Known cases of type 2 DM	41	38	18	2
New cases of type 2 DM	4	5	5	1
Total type 2 DM	45	43	23	3
Prevalence of type 2 DM	18	17.2	9.2	1.2
Normoglycaemics	56	47	21	12
Prevalence of Normoglycaemics	22.4	18.8	8.2	4.8

The prevalence of type 2 DM according to BMI of the senior citizens were observed nomal, overweight and obesity 18%, 17.2% and 9.2, respectively. Higher prevalence of type 2 DM patients were found among BMI above 25 kg/m^2 (17.2+9.2).

Table 3 Distribution of senior citizens according to Waist to Hip ratio (W/H) and glycaemic status (n=250)

Senior citizens	Waist to Hip Ratio	
	Normal (%)	Central obese (%)
Known cases of type 2 DM	14	85
New cases of type 2 DM	3	12
Prevalence of Type 2 DM	6.8	38.8
Normoglycaemics	37	99
Prevalence of normoglycaemics	14.8	39.6

38.8% of prevalence of Type 2 DM was observed among central obese and 6.8% prevalence of type 2 DM was observed among senior citizens were having normal waist to hip ratio.

Table 4 Distribution of type 2 DM according to their hypertensive status of senior citizens (n=114)

Type 2 DM	No of Hypertensive	Prevalence of type 2 DM	No of Normotensives	prevalence of type 2 DM
Known cases of type 2 DM	59	23.6	40	16.0
New cases of type 2 DM	7	2.8	8	3.2
Total	66	26.4	48	19.2

26.4% of type 2 DM found to be hypertensive and type 2 DM 19.2% found normotensive.

Table 5: Distribution of type 2 DM among senior citizens according to family history of type 2 DM (n=114)

Type 2 DM	Number positive family history of type 2 DM	Prevalence of type 2 DM	Number of no family history of type 2DM	Prevalence of type 2 DM
Known cases of type 2 DM	56	22.4	43	17.2
New cases of type 2 DM	9	3.6	6	2.4
Total	65	26	49	19.6

26% of patients who had positive family history of type 2 DM and 19.6% of patients who had no family history of type 2 DM.

CONCLUSION

Results confirmed an increased prevalence of type 2 diabetes mellitus among senior citizens. Higher prevalence of type 2 DM was exhibited among senior citizens those were having obesity, overweight, hypertension and family history of type 2 diabetes mellitus. Newly screened cases of type 2 diabetes mellitus showed paramount importance of extension of screening programme in elderly. Ageing is one of the immutable risk factors of type 2 diabetes mellitus. Ageing will become a major challenge in the future when vast resources will need to be directed towards the support, clinical gerontology or geriatrics and treatment of old.

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