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Vascular and Pathological Complications in Diagnosed Type 2 Diabetes Mellitus in ENT Patients

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Abstract

Background and Objectives

India is claimed to be the diabetes capital of the world. Many studies had proven that persistent hyperglycemia and associated metabolic syndrome features like hypertension, dyslipidemia and obesity contribute to the development of vascular complications.

The present study aims to study the prevalence and clinical profile of microvascular and macrovascular complications in newly diagnosed type 2 diabetes mellitus patients.

Methods: The study is a clinical, prospective and observational study of 100 newly detected type 2 diabetics attending medicine department outpatient/ inpatient, hospital, dehradun, form the subject for the study August 2018 to July 2020 (24 months) who matched the inclusion criteria**.**

Results: In this, 62 were males and 38 were females and the mean age was 54.05±13.24 years. 44% were detected when they presented with multiple complications due to diabetes. Common complications which they presented were coronary artery disease (15%), infection (12%), stroke (6%), ulcers (4%), neuropathy (4%) and diabetic ketoacidosis (1%). The prevalence of macrovascular complications CAD, CVD and PAD was 26.0%, 8.0% and 11.0% respectively and microvascular complications retinopathy, nephropathy and neuropathy was 20.0%, 34.0% and 16.0% respectively.High incidence of complications especially microvascular and CAD occur with HbA1c of range >6.5. The correlation coefficient of FBS and PPBS in relation to HbA1c was 0.56 and 0.57 respectively.

Conclusion: Smoking, increased BMI and waist circumference is associated with increased prevalence of diabetes. There is high prevalence of coronary artery disease, retinopathy and nephropathy at diagnosis.HbA1c levels predict the prevalence of complications.

Keywords: Type 2 Diabetes mellitus, microvascular, macrovascular, HbA1c, CAD

INTRODUCTION

Diabetes mellitus is a common and a serious disease with chronic complications and constitutes a substantial burden for both patient and health care system. In 2011, the global prevalence of diabetes was estimated at 366 million this figure is predicted to

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reach 552 million by 2030 as a consequence of longer life expectancy, sedentary life style and changing dietary patterns.The prevalence of diabetes for all age-groups worldwide was estimated to be 2.8% in 2000 and 4.4% in 2030.[1, 2]

The onset of type 2 diabetes is often silent and insidious. Pathogenic processes causing type 2 diabetes range from autoimmune destruction of cells of pancreas with consequent insulin deficiency to abnormalities that result in resistance to insulin action. The asymptomatic phase of hyperglycemia accounts for the relatively high prevalence of complications at initial presentation.[3]

This study aims in assessing the prevalence and to study the clinical profile of macrovascular and microvascular complications in newly diagnosed type 2 diabetes mellitus patients. This will highlight the need for screening for complications at initial presentation irrespective of the presence or absence of symptoms of the complications. Early detection and intervention will reduce the morbidity and mortality due to the complications.

Materials and Method

Source of Data

Newly detected patients with type 2 diabetes mellitus attending department of medicine(outpatient/ inpatient), form the subjects.

Design of the Study

Cross-sectional descriptive study

Duration of Study

August 2018 to July 2020 (24 months).

Inclusion Criteria

Newly diagnosed type 2 diabetes mellitus adult patients greater than 20 years of age were included for the study.

(Laboratory diagnosis of diabetes mellitus was confirmed by latest criteria laid by the American Diabetic Association. Blood glucose levels were checked on two separate occasions before the diagnosis of diabetes mellitus was made.)

2. Any other severe illness
3. Patients already diagnosed of diabetes mellitus and on treatment
4. Refusal to be a part of the study
5. Pregnancy

Sample Size

Hundred cases of newly diagnosed type 2 diabetes mellitus were included in this study.

Method of Collection of Data

Patients newly detected of type 2 diabetes mellitus attending medicine department outpatient/ inpatient, SGRRIMSHS hospital, dehradun were included for the study.

History

- Demographic characteristics such as age and sex were recorded.
- Family history of diabetes was recorded.
- Symptoms suggestive of diabetes or of related complications were noted.
- Past history of hypertension and complications of diabetes was documented. Any previous treatment for these complications taken was recorded.
- Smoking or alcohol history was noted.
- Nutritional history was taken.

Examination

- On general physical examination, the level of consciousness of the patient, vital parameters such as pulse, blood pressure (in sitting and standing position) temperature and respiratory rate was recorded.
- Anthropometric measurements:
  1. Weight (In Kilograms) And Height (In Centimetres) Was Recorded.
  2. The Body Mass Index Was Determined By Dividing The Weight (In Kilograms) By Height (In Metres^2).
  3. Measurement of waist circumference (cm) - It is measured just above the uppermost lateral border of the right iliac crest, a horizontal mark is drawn, and then crossed with a vertical mark on the midaxillary line. The measuring tape was placed in a horizontal plane around the

abdomen at the level of this marked point on the right side of the trunk.

- Presence of skin infections, gangrene and ulcers was noted.
- Systemic examination was carried out in all patients.
- Presence of sensory neuropathy was defined by symptoms of tingling and numbness over the extremities (bilaterally symmetrical) with or without impaired touch, vibration sense or joint position sense. Presence of motor neuropathy was noted. Autonomic dysfunction in the form of resting tachycardia, orthostatic hypotension, gastroparesis/ diarrhoea or abnormal sweating was noted. 10gm monofilament was used to note any reduced sensation due to neuropathy.
- Dilated pupil fundoscopy was carried out in all patients in conjunction with ophthalmologist and retinopathy was defined and graded as non proliferative diabetic retinopathy and proliferative retinopathy. Proliferative retinopathy was described by the presence of any retinal or optic disc neovascularisation, or the presence of preretinal or vitreous haemorrhage, whereas the presence of microaneurysms, exudates (lipid exudates or ‗cotton-wool spots') and/ or retinal haemorrhages only was defined as non-proliferative retinopathy.

Laboratory Investigations

- Fasting and postprandial blood sugars (venous blood samples drawn) on two separate occasions using glucose oxidase-peroxidase method.
- Renal function tests included blood urea, serum creatinine and urine analysis.
- Urine was analysed for glucose, ketone bodies and protein.
- Microalbminuria was estimated by nephelometry. Microalbuminuria is defined as a mean urine albumin concentration more than or equal to 25mg/ml by nephelometry on three consecutive days.
- Presence of diabetic ketoacidosis was confirmed by high blood sugars, ketonuria, and metabolic acidosis on arterial blood gas analysis.
- Fasting lipid profile included serum cholesterol, serum triglycerides, serum high density lipoprotein, and serum low density lipoprotein. Patient was termed to have dyslipidemia if LDL was more than 100mg/ dl, serum cholesterol>200 mg/dl, serum HDL<40 or serum triglycerides >150mg/dl.
- A 12- Lead electrocardiogram and 2D echocardiography to note the presence of ischemia or infarction.
- Carotid doppler was done to note for presence of stenosis.
- Ankle- brachial index was determined using arterial doppler.

Results

In this present study, 62 % and 38% comprised of males and females respectively and male: female ratio was 1.6:1.

Patients age class were classified based on the mean and SD , as per the result the mean age of the patient was 54.05±13.24 .Age group between 30-40 years mean age was

16 (36.68±3.53years ,p=0.002); 41-51yrs 31(45.61±3.20 ,CI 5%,45.61-46.50,P=0.523); 52-62 years 28(57.28±2.44, CI 95% 56.47-58.08,p=0.880); 63-71 15(67.47±3.24, CI 95%

67.73-69.06,p=0.788) and >72 years the mean age was 10(78.90±6.52, CI 95% 74.4183.38,p=0.698) .The age group between 30-40 years were statistically significant and less prone to express diabetics and its complications.

The mean age of diabetics in this study was 54.05±13.24 years. The youngest was 30 years and oldest was 95 years. The maximum incidence of diabetics was seen in 52-62 years and more chances of developing diabetes in older age group (52-62 years) and incidence were statistically significant p<0.05.

Duration of smoking was analysed by using univariate analysis, the result showed that individuals with longer duration of smoking were more susceptible for diabetes and its complications . It was expressed that, the mean duration of smoking was 20.20±3.56 years, p=0.02*. We correlated duration

of smoking with respect to the different age group of the patients. Between 1-15 years 10(10.9±1.91years, median 8.0 and p=0.65); 10-21 years 09(19.6±1.26 years, median= 16, p=0.03); 22-26 years 03(24.00±3.38, median =22, p=0.08), and more than 26 years was 14 (28.07±2.76years, median=21, p=0.01).

Total 100 diabetics were considered for the study out of which 36 patients were smokers. The prevalence of diabetes among smokers is statistically significant (p<0.05) and positively correlated with duration and its complications (r=0.64).

Patients presented with symptoms suggestive of different complications of diabetes viz., CAD, CVD, PVD, retinopathy, nephropathy and neuropathy. History from the patients was recorded systematically by using structured questionnaires. The patients presented with complaints correlated with diabetics complications of coronary artery disease, cerebrovascular disease, peripheral artery disease, retinopathy, nephropathy and neuropathy. The result being that 15% of cases expressed coronary artery disease, 7% was cerebrovascular disease, 7% peripheral artery disease, 2% was retinopathy and neuropathy 7% respectively .

Hypertension is considered as the one of the determinants for associated complications of diabetics. BP ranges <120/80 was statistically significant and more associated with diabetics p=0.02, followed by BP ranges between 120/80-140/90, p=0.01, 140/90- 160/110, p=0.03 respectively. BP >160/110 was statistically not significantly associated with diabetics. 46 and 19 cases had prehypertension and hypertension respectively.

Body mass index is a profounded parameter for the onset of diabetes and its complications. In India, 65% of the patients suffered from diabetes with associated risk factors .The present study documented that, BMI was considered as one of predictor's for the diagnosis of diabetics. Elevated BMI is more associated with diabetic complications. Study results showed that cases with BMI <18 was 4, p>0.05, 18.1-24.9 was 24, p<0.05, 25-29.90 50, p<0.05 and more than 30 BMI was 22, p<0.05 .

Distribution of waist circumference presented , males and females expressed the variations of waist circumference; between <80cms was 11% (p=0.88), 8090cms was 34.0% (p=0.01), 91-100cms was 38.0% (p=0.02) and >100cms was 17.0% (p=0.56). The waist circumference class interval between 80-90 and 91-100cms was statistically significant and more prevailing for diabetics complications (p<0.05) . Mean in males was 90.14±9.83 and in females was 87.92±8.86cms.

Total cholesterol was raised in 13 cases and rest were within normal range. Significant p value <0.05 was noted in cases with total cholesterol less than 200. Cholesterol is an important hallmark parameter for development of diabetes and its complications. Elevated serum cholesterol level can cause various manifestations in diabetics. Present study documented between 150-200 mg/dl as 45 cases were seen, p=0.002 and it was expressed in both gender followed by 100-150 (27), p=0.023, <100mg /dl was (15), p=0.01. The elevated serum cholesterol level was not statistically significant (p>0.05) with association of diabetes.

Fundus examination was done for all eligible patients, the study revealed that no changes were seen in 80 cases, NPDR was 19 cases and PDR was seen in only one cases .

Laboratory parameters was analysed by standard laboratory procedure, the present study showed microalbuminuria in 34 cases and it was statistically significant (p<0.050) .

ECG expressed different variants myocardial infarction in (3.0 %) ; left bundle branch block (3.0%); left ventricular hypertrophy (3%); old infarction (7.0%) ; ischemic changes (8.0%) and arrhythmias in (2.0%).

ABI scale was recorded by using standard operating guidelines of diabetics patients, the ABI was expressed the range between <0.70 was 7.0% 0.7-0.90 was 12% and > 0.90 was 81.0% respectively. 19% of cases had limb ischemia, out of which 7% had critical ischemia.

Out of the total 100 diabetics, 28 cases were detected on routine investigations, 28 were incidentally detected when they attended the hospital for other illnesses and rest of the 44 cases presented with multiple complications due to diabetes.

Out of 100 cases, patients presenting with complications suggestive of CAD was (15.0%, p=0.014), CVD was (6.0%, p=0.521) PAD was (6.0%, p=0.448). Symptoms of neuropathy seen in 4.0%, p=0.69; infection in 12.0%, p=0.033 and DKA was seen in only one cases p=0.896. The CAD and infection were positively associated with diabetics and statistically significant (p<0.05).

Of 100 cases, macrovascular complications CAD, CVD and PAD were expressed 26.0%, 8.0% and 11.0% respectively and microvascular complications retinopathy, nephropathy and neuropathy was expressed 20.0%, 34.0% and 16.0% respectively. Higher prevalence and statistical significance ($p<0.05$) of presence of CAD, retinopathy and neuropathy at diagnosis was noted in this study.

The study results determine that CAD is positively associated with smoking ($p=0.002$). The prolonged duration of smoking >20 years emerged to express CAD. Present study has been compared with non smoking and it was found to be statistically non significant with diabetics associated complications ($p<0.05$).

The study results revealed that CAD is positively associated with hypertensive patients ($p=0.004$). More hypertensives express CAD complication than other complications. Present study has been compared with normotensive and it was found to be statistically non significant with diabetics associated complications ($p<0.05$).

HbA1c is an important predictor for development of complications. High incidence of complications especially microvascular occur with HbA1c of range 6.5-7.5 and also >9.5% .In our study, correlation coefficient of FBS and PPBS in relation to HbA1c was 0.56 and 0.57 respectively.

Discussion

This is a study done over a period of 24 months in cases of newly detected type 2 diabetes mellitus attending the inpatient and outpatient department of SGRRIMSHS hospital.

The mean age of the diabetics in our study was 54.05±13.24 years. The maximum incidence of diabetics was seen between 52-62 years.

In our study, 62 were males and 38 females with a male: female ratio of 1.63:1. In western study, ratio is 1.07:1 and in Sri Lankan study it is 1.63:1. This difference noted is probably due to illiteracy and decreased turnover of females to hospital for routine and treatment purposes.

In our study, 36 cases of the 100 were smokers. In the study conducted by Drivsholm et al, 86% of men and 50% women were smokers.

Family history of Diabetes in our study was 2% and in Nambuya AP et al study was 16%. This variation is probably due to high illiteracy and lack of awareness of diabetes among the people.

In our study, correlation coefficient of FBS and PPBS in relation to HbA1c was 0.56 and 0.57 respectively. In DCCT, it was 0.82 and in a study conducted by Nathan et al it was 0.89. The relative contribution of postprandial PG decreased progressively from the lowest to the highest quintile of HbA1c. By contrast, the relative contribution of fasting PG showed a gradual increase with increasing levels of HbA1c.

Conclusion

- Prevalence of diabetes increases with age and preponderance of males in our study.
- Increased BMI and waist circumference is associated with increased prevalence of diabetes.
- Large proportion of population presented because of complications occurring due to diabetes- a silent killer.
- Screening for CAD, retinopathy and nephropathy at diagnosis was statistically significant.
- There is high prevalence which is statistically significant ($p<0.05$) of coronary artery disease (26%), retinopathy (20%) and nephropathy (34%)at diagnosis.
- Prevalence of CVD, PVD and neuropathy is 8%, 11% and 16% which is statistically insignificant.
- HbA1c levels predict the prevalence of complications.
- There is moderate correlation between HbA1c and blood glucose levels.
- Screening with simple tests such as ECG, ECHO, fundoscopy and urine microalbuminuria at diagnosis for all cases of diabetes is essential to identify the complications at an early reversible stage.

Ethical clearance- taken from institutional committee

Source of funding - Self

Conflict of Interest – Nil

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