Evaluation of Chronic Complications among Patients with Diabetes: A Prospective Survey Based Observational Study

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Abstract

Background: Chronic complications or long-term side effects of diabetes mellitus include macrovascular complications, which affect larger blood vessels supplying the heart, brain, and extremities, and microvascular complications, which affect smaller blood vessels such as retinopathy, nephropathy, and neuropathy. In the present paper we will objectively asses the rates of different complications among diabetic patients. **Methods:** A prospective survey based questionnaire observational study was conducted in GMC Jammu. Purposive sampling was used to choose 100 participants with diabetes mellitus for the research. Information on present health status, clinical aspects and associated complications was collected from respondents. Patients, who presented to the medical outpatient department between November 1, 2019, and October 31, 2020, with a diagnosis of diabetes mellitus, were selected for the study based on the laid down inclusion and exclusion criteria. **Results**: In the present study majority of patients presented with peripheral neuropathy, ischemic heart disease, cerebrovascular disease and peripheral vascular disease **Conclusion:** The present study demonstrated that chronic DM is associated with multitude of complications. An increase in the prevalence of diabetes risk related factors will only make the issue worse. In order to lessen the burden of diabetes, populationbased initiatives that target the modifiable diabetes risk factors, particularly obesity and physical inactivity, are required.

Keywords: Diabetes, complications, retinopathy, peripheral neuropathy, ischemic heart disease, cerebrovascular disease

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Introduction

Diabetes is the most prevalent metabolic condition worldwide. India is known as the "Diabetic Capital of the World" due to the rising prevalence of the disease.[1] Diabetes mellitus is a condition marked by glycaemic abnormalities brought on by deficiencies in insulin secretion, action, or both.[2] Insulin resistance is the commonest term given to this condition. Poor insulin action secretion results in anomalies of protein, fat, and carbohydrate metabolism in the target tissues.[3]Consequently, glucose starts to build up in the blood. Inflammation, autoimmune disease, and metabolic stress are influenced by genetic and environmental risk factors. Chronically high blood sugar levels contribute to both microvascular and macrovascular problems; regardless of the aetiology of diabetes mellitus.[4]This will raise the morbidity and mortality risk for diabetics. About 5–10% of people with diabetes have type 1 diabetes mellitus (T1DM), which essentially is result of death of pancreatic beta-cells.[5] T1DM patients often have a lower age range and are completely insulin deficient, necessitating the use of exogenous insulin.[6] A large number of T1DM patients are extremely vulnerable to diabetic ketoacidosis (DKA), diabetic coma, and/or even mortality.[7] Type 2 diabetes mellitus (T2DM) affects 90–95 percent of DM patients.[5] This kind of DM develops over time as a result of the progressive decrease of insulin production, which may be somewhat correlated with obesity, deteriorating pancreatic beta-cell function, and eventual hyperglycemia. Microvascular complications, which affect smaller blood vessels,

like retinopathy, nephropathy, and neuropathy, and macrovascular complications, which affect larger blood vessels supplying the heart, brain, and extremities, are examples of chronic complications or the long-term side effects of diabetes mellitus. In the present paper we will objectively asses the rates of different complications among diabetic patients.

Material and methods

A prospective survey based questionnaire observational study was conducted in GMC Jammu. Purposive sampling was used to choose 100 participants with diabetes mellitus for the research. Information on present health status, clinical aspects and associated complications was collected from respondents. Patients, who presented to the medical outpatient department between November 1, 2019, and October 31, 2020, with a diagnosis of diabetes mellitus, were selected for the study based on the laid down inclusion and exclusion criteria

.Inclusion criteria:

- Who were known diabetic.
- Subjects who were cooperative and willing to participate in the study.
- Who attended the outpatient department of GMC Jammu

Exclusion criteria:

- Who were not known case of diabetes mellitus
- Paediatric patients
- Who were not willing to give the consent

Methods of data collection: A total of 100 subjects were to be interviewed and their details were to be noted in a specially designed data collection form. The data collection form contained information about socio demographic characteristics, questionnaire about patient awareness on illness, risk factor, complications, self-care practices, lifestyle modifications and management. The awareness was assessed by giving scores based on the answers given by the participants during questionnaire.

Following investigations were performed: Blood sugar fasting, blood sugar random, HbA1C levels, lipid profile, renal function tests, liver function test, and fundus examination, urine routine and 24-hour urinary protein/urine for micro-albuminuria

Results

In this section, the results of the study will be presented:

We observed that the mean value of FBS (mg/dl) of studied subjects was 239.11 ± 75.82(Range:

132-456) with median (IQR) of 217.5(188.5-276).

Table 1: Distribution of HbA1c (%) of study subjects

HbA1c(%)	Frequency	Percentage
Good control	16	16.00%
Poor control	84	84.00%
Mean ± SD	8.35 ± 1.3	
Median(IQR)	8(7.475-8.9)	
Range	6.5-12.8	

In present study, glycemic control of 84.00% of patients was poor and 16% of patients had good HbA1c. Mean value of HbA1c (%) of study subjects was 8.35 ± 1.3 with median (IQR) of 8 with a range of 7.475-8.9.

Table 2:-Distribution of body mass index (kg/m^2) of study subjects.

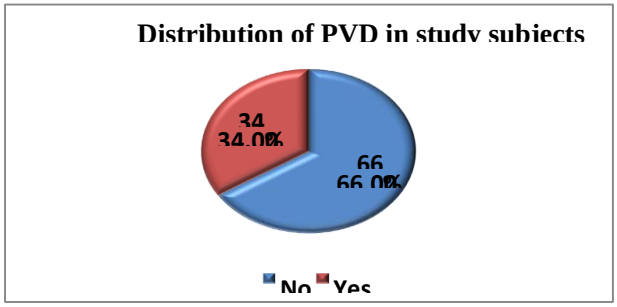
Body mass index(kg/m^2)	Frequency	Percentage
18.5-22.9{Normal BMI}	3	3.00%
23-24.99{Overweight}	13	13.00%
25-29.99{Pre obese}	66	66.00%
>=30{Obese}	18	18.00%
Mean ± SD	27.72 ± 2.73	
Median(IQR)	28(26.5-29.5)	
Range	19.1-33	

In present study, in majority (66.00%) of patients, body mass index (kg/m^2) was 25-29.99{pre obese} followed by >=30{obese} (18.00%) and 23-24.99{overweight} (13.00%). Body mass index (kg/m^2) was 18.5-22.9{normal BMI} of only 3 out of 100 patients (3%). Mean value of body mass index (kg/m^2) of study subjects was 27.72 ± 2.73 with median (IQR) of 28(26.5-29.5) with a range of 19.1-33. In present study, in 31.00% of patients, micro-albuminuria was nil, 1+ each followed by 2+ (25.00%). Micro-albuminuria was 3+ in only 13 out of 100 patients (13.00%).

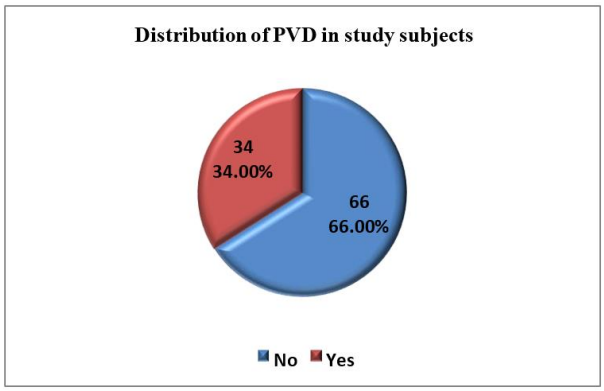
Table 3:-Distribution of retinopathy in study subjects.

Retinopathy	Frequency	Percentage
No	18	18.00%
Yes	82	82.00%
Total	100	100.00%

In present study, in majority (82.00%) of patients, retinopathy was present. Retinopathy was absent in only 18 out of 100 patients (18.00%).



In present study, in majority (66.00%) of patients, PVD was absent. PVD was present in only 34 out of 100 patients (34.00%) as assessed clinically.



In present study, in majority (79.00%) of patients, IHD was absent. IHD was present in only 21 out of 100 patients (21.00%).

Table 4:-Distribution of cerebrovascular disease in study subjects

Cerebro vascular disease	Frequency	Percentage
No	89	89.00%
Yes	11	11.00%
Total	100	100.00%

In present study, in majority (89.00%) of patients, cerebrovascular disease was absent.

Cerebrovascular disease was present in only 11 out of 100 patients (11.00%).

Table 5:-Distribution of peripheral neuropathy in study subjects.

Peripheral neuropathy	Frequency	Percentage
No	76	76.00%
Yes	24	24.00%
Total	100	100.00%

In present study, in majority (76.00%) of patients, peripheral neuropathy was absent. Peripheral neuropathy was present in only 24 out of 100 patients (24.00%) as assessed clinically.

Discussion

In this study, the fasting glucose level among studied subjects ranged from 6.5 to 12.8 with an average value of (239.11±75.82) (mg/dl), and HBA1c level was ranging from 6.5 to 12.8, with an average value of (8.35±1.3) (mg/dl). In a likewise study by Kazeminezhad et al (2018), the mean value of fasting glucose level and blood sugar level was respectively reported as (219.66±24.87) mg/dl and HBA1c 8.17±0.53 mg/dl which is almost comparable with our study.[8] We analyzed BMI among studied patients and found that majority of subjects accounting for (66%) were pre-obese with their BMI falling in the interval of (25-29.99) kg/m^2, followed by (18%) obese patients with their BMI >=30. Only 13% patients were overweight with BMI

(2324.99) kg/m^2. The average BMI of studied subjects was (27.72±2.73) kg/m^2. Ahmed *et al.,* (2019) in a similar kind of study reported that 35.5% were pre-obese, 46.1% were obese and only 14.5% had normal BMI.[9]The differences in both these studies could be contributed to different lifestyles of people. However, in another Bays et al (2007) reported that majority of adults with diabetes mellitus were obese (BMI ≥ 30 kg/m^2).[10] In the present study, micro-albuminuria was present in 69 subjects out of whom 1+ was present in 31 and 2+ in 25 and 3+ in 13 subjects. In rest 31 subjects micro-albuminuria was nil. Different studies have reported different prevalence's of microalbuminuria among diabetic patients. In 2002, Nakhjavani and colleagues observed that diabetic individuals in Tehran had microalbuminuria rates of 20.3 % and macroalbuminuria rates of 10,6 %.[11] Similarly, Zeller *et al.,* (2005) in a likewise study reported that proteinuria was present in total of 31 patients.[12] This difference could be because our study is a tertiary care hospital based study which involved symptomatic and sick subjects. In the present study, 82% patients had retinopathy complication. According to one study, people with T1DM who have persistent hyperglycemia would eventually acquire retinopathy.[13]The same study did highlight a difference between exposure time (at a particular threshold) and hyperglycemia severity, with the former risk factor having a stronger impact on microvascular consequences. Similarly, it has been shown that retinopathy in DM patients was more closely associated to the length of the disease than to the age at which it first manifested itself.[14] Shah *et al.,* (2018) in a similar kind of study reported that 65% patients had developed diabetic retinopathy.[15] The difference could be due to the fact that our study is a tertiary care hospital based study which included symptomatic and sick subjects. In the present study, peripheral vascular disease was present in only 34% of patients. In the rest 66%, PVD was absent. Diabetes mellitus (DM), which increases morbidity and mortality as well as hastens the progression of the illness, is a significant risk factor for peripheral arterial disease (PAD). In the United Kingdom, PVD (defined as ABI less than 0.8) was present in 1.2% of newly diagnosed type II diabetes patients, and it elevated to 12.5% after 18 years of diabetes duration.[16] Some studies reported a prevalence of PVD ranging from 20% to 30%.[17] Soyoye *et al.,* (2016) in a similar study reported the prevalence of peripheral vascular disease as 27% in diabetic subjects which is slightly less compared to our results.[18] The differences are due to the fact that this study was conducted in a tertiary care hospital which included sick and symptomatic subjects. Peripheral vascular disease works through a number of different mechanisms, including atherosclerosis, vascular remodelling, endothelial dysfunction, and thrombosis, all of which contribute to the narrowing of the vascular lumen, thickening of the vascular wall, reduction in nitric oxide (NO) production, and eventual blockage of the vascular system. All of these processes result in a decrease in vascular blood flow, which in turn causes the development of ischemia and PVD in the skeletal muscle.[19] In this study, ischaemic heart disease was found in 21% of subjects. McGurnaghan S *et al.,* (2018) in a study showed that that prevalence of ischaemic heart disease was 35% which was higher than in the non-diabetics.[20]The lower proportion of ischaemic heart disease in our study was because of the fact that only known IHD patients were included in this category and no further investigations were done. In this study, cerebrovascular disease was present in only 11% patients, however, majority didn't have this disease. Kuebler TW *et al.,* (1983) showed in a study that the prevalence of cerebrovascular disease was found in 20% of adult diabetic patients.[21]The lower proportion of cerebrovascular disease in our study was because of the fact that only those patients were included in this group who were already known cases of cerebrovascular disease and no further investigations were done. In this study, only 24% patients had peripheral neuropathy and rest 76% didn't had this component. Jaiswal M *et al.,* (2017) in a study showed that the prevalence of peripheral neuropathy in patients with type 2 diabetes mellitus was 22% which is comparable with our study comparable.[22] Likewise to our study, a good corpus of scholars have linked T2DM syndrome with numerous consequences like; cardiovascular disease (CVD), diabetic retinopathy, neuropathy, and nephropathy. However, compared to non-diabetic patients, persons with previously undiagnosed DM have been demonstrated higher rates of complications.[23, 24]

Conclusion

The present study demonstrated that chronic DM is associated with multitude of complications like; obesity, retinopathy, peripheral neuropathy, ischemic heart disease, cerebrovascular disease and peripheral vascular disease. An increase in the prevalence of diabetes risk factors will only make the issue worse. In order to lessen the burden of diabetes, population-based initiatives that target the modifiable diabetes risk factors, particularly obesity and physical inactivity, are required.

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