



A STUDY OF ORTHOSTATIC HYPERTENSION AND ORTHOSTATIC HYPOTENSION IN PATIENTS OF TYPE 2 DIABETES MELLITUS IN A TERTIARY CARE HOSPITAL

General Medicine

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ABSTRACT

Background- Diabetes Mellitus is regarded as the most common endocrine disorder of the world. The present study was conducted to determine the prevalence of orthostatic hypertension and orthostatic hypotension in patients of type 2 diabetes mellitus.

Materials & Methods- The present study comprised of a total of 200 individuals of both genders. 100 patients were of type 2 Diabetes Mellitus with HbA1c \geq 6.5% not on antihypertensive drugs and 100 persons were selected as age-sex matched controls (non diabetic individuals). Routine investigations such as Hb, TLC, DLC, Blood urea, Serum creatinine, lipid profile and specific investigations such as FBS, RBS and ECG was performed.

Results- The mean age \pm SD in type 2 diabetes mellitus was 51.5 ± 11.2 years, in type 2 diabetes mellitus with orthostatic hypotension (OH) was 54.71 ± 8.31 years, type 2 diabetes mellitus with orthostatic hypertension (OHT) was 58.35 ± 11.6 years and in control was 54.61 ± 9.39 years. BMI, TG, HRV resting, standing, FBS, RBS, HbA1c and duration showed significant difference between all groups ($P < 0.05$). The prevalence of orthostatic hypotension (OH) in patients of type 2 diabetes mellitus was 45% and in control group was 2%. The prevalence of orthostatic hypertension (OHT) in cases was 8% and in control group was nil. The difference was highly significant ($P < 0.05$).

Conclusion- Increased prevalence of orthostatic hypotension and hypertension was seen in patients suffering from type 2 DM. Cardiac autonomic neuropathy was present in patients with long history of diabetes mellitus. Triglycerides show a positive association with orthostatic hypertension in patients with DM.

KEYWORDS

Diabetes mellitus, orthostatic hypotension, orthostatic hypertension, autonomic neuropathy

INTRODUCTION

Diabetes Mellitus is regarded as the most common endocrine disorder of the world. India is considered as the capital of diabetic patient load. "Asian Indian Phenotype" which include increased insulin resistance, greater abdominal adiposity which makes them prone for DM but the main cause of high prevalence of diabetes in India is dietary pattern change and reduced physical activity.¹

Diabetes related complications can be divided into vascular and non vascular complications.² The vascular complications divided into macrovascular (coronary heart disease, peripheral arterial disease, cerebrovascular disease) and microvascular (retinopathy, nephropathy, neuropathies such as sensory, motor & autonomic neuropathy). Individuals with long standing diabetes mellitus may develop autonomic neuropathy. Autonomic neuropathies affecting the cardiovascular system can cause orthostatic hypotension and orthostatic hypertension. Cardiac autonomic neuropathy (CAN) is a serious complication in diabetic patients.³ It has a strong influence on various cardiac disorders including myocardial ischemia and infarction, hypertension, orthostatic hypotension, heart failure, and arrhythmias.

In patients with type 2 DM, an increased prevalence of orthostatic hypertension and hypotension has been described. Orthostatic hypertension is defined as an increase >20 mm Hg in systolic and/or 10 mm Hg in diastolic blood pressure (DBP) after standing up.⁴ The likely mechanisms of orthostatic hypertension include excessive venous pooling. The present study was conducted to determine the prevalence of orthostatic hypertension and orthostatic hypotension in patients of type 2 diabetes mellitus.

Materials & Methods

The present case control observational study was conducted in the Department of Medicine, Guru Nanak Dev Hospital attached to Govt. Medical College, Amritsar. It comprised of a total of 200 individuals of both genders. 100 patients were of type 2 Diabetes Mellitus with HbA1c \geq 6.5% not on antihypertensive drugs and 100 persons were selected as age-sex matched controls (non diabetic individuals). The following inclusion and exclusion criteria was used-

Inclusion criteria

1. Age more than 18 years.
2. Patients of Type 2 Diabetes mellitus with HbA1c \geq 6.5%.
3. 100 healthy volunteers.

Exclusion criteria

1. Patients reporting the chronic use of diuretics, beta blockers or alpha blockers.
2. Terminal chronic renal disease undergoing hemodialysis.
3. Patients not willing to give informed consent.

Method

All the patients of Type 2 Diabetes Mellitus with HbA1c levels \geq 6.5% were included in the study. On admission detailed history and clinical examination of the patients was done. Routine investigations such as Hb, TLC, DLC, Blood urea, Serum creatinine, lipid profile and specific investigations such as FBS, RBS and ECG was performed.

In all subjects, blood pressure was measured manually with auscultatory method using mercury based sphygmomanometer. Results were described as mean \pm SD. P value less than 0.05 was considered significant.

Results

The mean age \pm S.D in DM was 51.5 ± 11.2 years, in DM with OH was 54.71 ± 8.31 years, DM with OHT was 58.35 ± 11.6 years and in control was 54.61 ± 9.39 years. Statistically there was non-significant difference ($P > 0.05$).

Table I Baseline characteristics in different groups

Parameters (Mean \pm SD)	DM	DM & OH	DM & OHT	Control	P value
Weight	74.75 \pm 4.42	74.35 \pm 4.60	73.37 \pm 4.56	73.87 \pm 3.81	<0.5
BMI	25.75 \pm 0.99	25.85 \pm 0.87	25.72 \pm 1.70	23.34 \pm 2.42	<0.05
TG	160.72 \pm 38.4	170.97 \pm 34.2	209.75 \pm 49.7	146.25 \pm 15.4	<0.01
HRV[Resting]	74.02 \pm 8.75	92.77 \pm 18.54	85.25 \pm 15.70	78.96 \pm 12.61	<0.02

HRV[Standing]	80.25± 6.89	92.41± 12.61	89.75± 10.22	83.92± 7.84	<0.05
FBS	173.63± 33.6	187.91± 35.95	192.25± 32.74	94.66± 7.70	<0.01
RBS	262.94± 48.2	290.4± 78.92	259.12± 51.31	137.98± 13.12	<0.01
HBA1C	8.17± 1.09	8.84± 1.31	9.45± 1.49	4.5± 0.64	<0.01
Duration	9.30± 3.91	14.08± 5.48	15.75± 6.22	-	<0.01

Table I shows that body mass index [BMI], triglycerides [TG], heart rate variability [HRV] resting, standing, FBS, RBS, HBA1C and duration showed significant difference between all groups ($P < 0.05$).

Table II Prevalence of Orthostatic hypotension & hypertension in both groups

	Cases	Percentage	Control	Percentage	P value
Orthostatic hypotension	45	45%	2%	2%	0.001
Orthostatic hypertension	8	8%	0	0	0.001

CONTROLS CASES

Table II & figure 1 shows that the prevalence of orthostatic hypotension in cases was 45% and in control group was 2%. The prevalence of orthostatic hypertension in cases was 8% and in control group was nil. The difference was highly significant ($P < 0.05$).

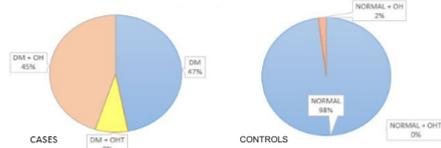


Figure 1. Prevalence of orthostatic hypotension [OH] & orthostatic hypertension [OHT] in cases and controls.

DISCUSSION

In India and worldwide prevalence of diabetes mellitus show the dramatic increase in recent years. Near about 40.9 million patients of diabetes mellitus currently present in India and this number is expected to rise to about 69.9 million by the year 2025. This high burden is likely associated with complications.^{5,6}

In present study 200 cases of both genders were included. 100 patients were of type 2 Diabetes Mellitus with HbA1c $\geq 6.5\%$ not on antihypertensive drugs and 100 cases were selected as age-sex matched controls (non diabetic individuals). We observed that the mean age in males was 54.20 years and in females was 53.15 years. In control it was 54.81 years in males and 53.16 in females. Rehman et al⁷ in their study included a total of 200 subjects with male to female ratio 1:2. Mean age of patients was 48.3 years.

In present study, there was statistically non-significant difference in mean height of males (170.4± 24.8 cm) and females (166.5± 22.7) in cases. In control, it was 168.2± 26.4 cm in males and 167.1± 28.3 cm in females. In DM group, the mean weight was 79.75 kg, in DM with OH was 77.32 kg, in DM & OHT was 73.37 Kg and in control was 68.79 Kg. On comparing mean weight of DM group with control group, a significant difference was observed ($P < 0.05$). The mean BMI in DM group was 27.25, in DM & OH was 25.85, in DM & OHT was 25.72 and in control was 22.77. We observed that there was significantly higher BMI of cases as compared to control group. Birajdar SV et al⁸ found similar results. The diabetic group had higher BMI than healthy subjects. Our results are in agreement with other studies.^{9,10}

In present study we compared triglyceride level in DM and control group. The mean triglyceride level (mg/dl) in DM (160.72± 38.4), in DM & OH (170.97± 34.2), in DM & OHT (209.75± 49.7) and in control (146.25± 15.4) showed significant difference ($P < 0.05$). Yoshinari et al¹¹ found that serum triglyceride levels in diabetic patients with OHT and in those with hypertension were significantly higher than in normotensive diabetic patients without OHT. There was

positive correlation of triglyceride level and orthostatic hypertension ($P = 0.019$) while no correlation was found between triglyceride level with orthostatic hypotension and autonomic neuropathy patients ($P > 0.05$).

We found significant higher heart rate variability in diabetic group as compared to control group. In DM, HRV (beats/min) was 74.02± 8.75, in DM & OH was 92.77± 18.54, in DM & OHT was 85.25± 15.70 and in control was 78.96± 12.61. Standing HRV was 80.25± 6.89, 92.41± 12.61 in DM & OH, 89.75± 10.22 in DM & OHT and 83.92± 7.84 in control group. Sukla et al¹² found that heart rate variation during deep breathing was found to be the most sensitive test to detect parasympathetic autonomic neuropathy while the diastolic blood pressure response to sustained handgrip exercise was the most sensitive method to detect sympathetic neuropathy dysfunction.

Conclusion

Both orthostatic hypotension and hypertension is a complication of long standing diabetes mellitus. Both conditions are more prevalent at old age. Cardiac autonomic neuropathy was present in patients with long history of diabetes mellitus. Triglycerides show a positive association with orthostatic hypertension in patients with DM.

Conflict of interest: As authors and planners we have no potential conflicts of interest, financial or otherwise.

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