Original article

An Observational Study of Type 2 Diabetes Mellitus Patients from a Small Town of Bihar, India

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ABSTRACT

This study was conducted to describe the profile of patients with type 2 diabetes mellitus from a small town of Bihar, India. This study was conducted over 98 patients of Type 2 Diabetes Mellitus, who were taking treatment from a specialized diabetic hospital of Bihar Sharif, headquarter of Nalanda district of Bihar state, India. The study was conducted during January 2023 to March 2023. The patients were requested to complete a questionnaire including their risk profile (hypertension, obesity, dyslipidaemia, and glycaemic status), sociodemographic factors, general health, symptoms present, family history of diabetes, physical activity, diet control, medications (oral hypoglycemic agents, insulin injections, antihypertensives, etc.) and habits present (tobacco chewing, alcohol consumption and smoking). Blood pressure (BP), body mass index (BMI), fasting blood sugar (FBS) level and lipid profile were also included in the questionnaire. Overall, 98 type 2 diabetes mellitus (T2DM) patients with mean age of 60.23±7.50 years were studied. Out of 98 patients, 43 (43.87%) were male and 55 (56.12%) were female. Most of the T2DM patients (42.86%) were obese, and 70.40% had a positive family history of diabetes. 11.22% of patients had vision impairment. The mean FBS level was 188.11±71.10 mg/dl and good glycemic control (FBS level <100 mg/dl) was achieved only in 12.24% of the T2DM patients. 47.96% of study patients were also suffering from hypertension. This study concluded that many factors like family history of diabetes, obesity, uncontrolled glycaemic status, dyslipidaemia, hypertension and sedentary lifestyle were present among the Type 2 Diabetes Mellitus patients. This study will guide the healthcare professionals to develop a better roadmap for controlling and screening Type 2 Diabetes Mellitus in Bihar, India.

Keywords: *Type 2 diabetes mellitus; Fasting blood sugar; Glycemic control; Hypertension; Body mass index.*

Introduction

Diabetes mellitus is a heterogenous group of disorders characterized by hyperglycemia; that results from defects in insulin secretion, insulin action (sensitivity), or both; is associated with abnormalities in carbohydrate, fat and protein metabolism; and results in chronic complications including microvascular, macrovascular, and neuropathic disorders [1].

Among various types of diabetes mellitus, type 2 diabetes mellitus is the most common. The prevalence of type 2 DM is increasing. Type 2 DM accounts for as much as 90% of all cases of DM. Type 2 Diabetes Mellitus is characterized by insulin resistance and, at least initially, a relative lack of insulin secretion. Most individuals with type 2 diabetes exhibit abdominal obesity which itself causes insulin resistance [2].

Since the beginning is insidious, there is an average delay of 3-5 years in diagnosis. Due to slow onset of symptoms, it takes about 3 – 5 years delay in diagnosis of Type 2 Diabetes Mellitus patients. The moment a new case of Type 2 DM is diagnosed, microvascular, macrovascular and neuropathic complications already get started to develop. This problem is further worsened by untreated Type 2 DM patients either due to lack of knowledge or due to unavailability of proper facility for the treatment of Type 2 DM. Type 2 DM is also associated with fourfold increased risk of cardiovascular events and is a risk factor for doubling the risk of cardiovascular death. Untreated diabetes may result in neuropathy, kidney failure, blindness and amputation [3-5].

Globally diabetes affects 246 million people and is expected to affect 366 million by 2030. At least 7 million new cases are reported annually. India accounts for largest diabetic population with 41 million patients, mounting to 6 percent of the adult population. As a result, diabetes mellitus has become a major health issue in the Indian society. Increasing awareness of risk factors and their prevention should be emphasized in the Indian society [6]. Lifestyle modifications (physical exercise, diet control, etc.) are appropriate measures in the prevention of diabetes. Knowing the profile of diabetic patients will provide a path to prevent and control the spread of diabetes in the Indian context.

This observational study was conducted to know the profile of type 2 diabetic patients from Bihar Sharif, a small town of Bihar, India. This study will also create social awareness regarding the prevention and control of type 2 diabetes mellitus.

Materials and Methods

Study participants

To participate in this study, it was necessary for the patients, to be suffering from Type 2 diabetes mellitus for at least six months and who were under treatment from the specialized diabetic hospital of Bihar Sharif, and willing to participate in this study.

Study setting

This observational study was conducted during January 2023 to March 2023 in a specialized diabetic hospital of Bihar Sharif, headquarter of Nalanda district of Bihar state, India. Bihar Sharif town has an approximate population of four lacs.

Sample size

100 newly diagnosed Type 2 diabetes mellitus patients were included in this questionnaire based observational study. Later on, 2 patients were dropped from this study because they were not available for follow up. So, the final sample size for this study was of 98 patients.

Data collection

98 patients were enrolled for this study after fulfilling the inclusion criteria. Patients were selected on a random basis and informed consent was also taken from the patients. First of all, objectives of this study were explained to the patients. Later on, the patients were interrogated regarding the questions of this questionnaire-based study. Questions related to sex, age, occupation, education, tobacco chewing, alcohol consumption, smoking, physical activity and diet were interviewed from each and every patient. Each and every patient was also interviewed regarding the presence of hypertension and other associated diseases.

Type 2 DM was categorized as acute (if symptoms are present for up to one month), sub-acute (if symptoms are present from one to three months), insidious (if symptoms are present from three to six months) and chronic (if symptoms are present from more than six months). Physical activity was differentiated as sedentary (standing, sitting, and driving for most of the day, light cleaning, cooking, slow walking, light yard work and other major activities that involve sitting), moderate (an occupation that includes lots of walking, lifting or other activities that keep the patient moving for several hours qualified as moderately active), and heavy (a very active lifestyle, heavy manual labour, very active sports played for several hours almost daily, dancer or an athletic person).

Clinical, biochemical and anthropometric, measurements

Anthropometric measurements (like height, weight, body mass index (BMI), etc.) were recorded as per standard protocol. The study patients were also proceeded for various laboratory tests such as blood haemogram, blood glucose and blood lipid levels. After having 12 hours of overnight fasting, blood samples were collected. Total cholesterol (TC), Low-density lipoprotein-cholesterol (LDL-C) and High-density lipoprotein-cholesterol (HDL-C) levels were also measured in the blood sample of each and every patient [7].

The diagnosis of diabetes mellitus was made using the criteria established by the American Diabetes Association [10], i.e. a medical record indicating fasting plasma glucose (FPG) level of ≥126 mg/dl after a minimum 12-hour fasting on more than one occasion, with symptoms of diabetes. Impaired glucose tolerance (IGT) was defined as the fasting plasma glucose (FPG) level of 100 – 125 mg/dl.

Blood pressure was noted after the patients had rested for at least five minutes. Three readings were taken at an interval of thirty minutes and average blood pressure was calculated. According to the Joint National Committee - VII (JNC-VII) criteria, hypertension was diagnosed if the blood pressure was >130/80 mmHg (8-9).

National Cholesterol Education Programme's guidelines were considered for defining dyslipidaemia [11]. Dyslipidaemia was confirmed by presence of one or more than one abnormal serum lipid concentration, such as high LDL-C, low HDL-C and hypercholesterolaemia,.

Indian Council of Medical Research (ICMR)'s guidelines were considered for estimating Body mass index (BMI). A patient was considered to be obese if BMI was ≥30 kg/m^2, overweight if BMI was 25-29.9 kg/m^2, normal if BMI was 18.5 – 24.9 kg/m^2 and underweight if BMI was < 18.5 kg/m^2 [12].

Glycemic status was differentiated into four categories: good control (FBS < 100 mg/dl), sub-optimal control (FBS 100-125 mg/dl), inadequate control (FBS 126-199 mg/dl), uncontrolled (FBS > 200 mg/dl) [13].

Data interpretation

Data were analysed in MS Excel-sheet. Categorical variables were tabulated using frequencies and percentages and quantitative variables were presented using mean and standard deviation.

Approval from ethics committee

Institutional Ethical Committee (IEC) of Nibha Institute of Pharmaceutical Studies (NIPS), Rajgir has approved this study.

Results

Initially, 120 diabetic patients were taken randomly in this study. Out of the 120 patients, 100 patients were suffering from Type 2 Diabetes Mellitus. Later on, 2 patients were dropped from this study because they were not available for follow up. So, the final analysis was conducted over 98 Type 2 Diabetes Mellitus patients.

Sociodemographic features

Those patients who had participated in this study, their sociodemographic features have been displayed in Table 1. The type 2 diabetic patients were distributed in four age groups with a mean of 60.23±7.50 years. Out of 98 study patients, 43 (43.87%) were male and 55 (56.12%) were female. All the patients (100%) were married. Patients were of different educational level. 11.22% patients were illiterate, 17.34% patients had gone up to primary school, 21.42% patients had gone up to high school, 28.57% patients had gone up to intermediate college level, 16.32% patients were graduate and remaining 5.10% patients were postgraduate.

Symptoms present

Diabetic symptoms were present in almost all the patients. Out of 98 patients, 56 (57.14%) had polydipsia, 60 (61.22%) had polyuria, 11 (11.22%) patients had vision impairment and 47 (47.95%) had polyphagia.

Habits Present

Out of the 98 patients, 48 (48.97%) had some form of habits. 11 (11.22%) were tobacco chewers, 18 (18.37%) were consuming alcohol and 19 (19.39%) were smokers.

Physical activity

On the basis of physical activity, it was found that most 75.51% patients were having sedentary lifestyle, 19.39% patients were having moderate activity and 5.10% patients were having heavy activity.

Risk profile

Only 12 (12.24%) study patients had good glycaemic control (FBS ≤100 mg/dl). 69 (70.41%) study patients

had positive family history of diabetes. BMI calculations reveal that 15.30% of the study patients had normal weight; 41.83% of the study patients were overweight and 42.85% of the study patients were obese. 47.96% of the study patients were suffering from hypertension. Lipid profile data reveals that 60.20% of the study patients had high total cholesterol values, 58.16% had high LDL cholesterol values and 56.12% had low HDL cholesterol values (Table 3).

Table 1: Sociodemographic features of type 2 diabetes mellitus patients.

Characteristics	No. (n=98)	Percentage (%)
1. Age (years) (mean±SD)	60.23±7.50	
Upto 50	8	8.16
51-59	13	13.26
60-69	47	47.95
≥70	30	30.61
2. Gender		
Male	43	43.88
Female	55	56.12
3. Marital status		
Unmarried	00	0
Married	100	100
4. Education		
Illiterate	11	11.22
Primary school	17	17.34
High school	21	21.42
Inter	28	28.57
Graduate	16	16.32
Postgraduate	5	5.10

Table 2: Symptoms present in type 2 diabetes mellitus patients.

Manifestation of symptoms	No. (n=98)	Percentage (%)
Polyuria	60	61.22
Polydipsia	56	57.14
Polyphagia	47	47.95
Vision impairment	11	11.22
Tingling sensation	25	25.51
Numbness	9	9.18

Table 3: Clinical Parameters and other features of type 2 diabetes mellitus patients.

Characteristics	No. (n=98)	Percentage (%)
1. FBS (mean±SD)	188.11±71.10 mg/dl	
Glycemic status (%)		
<100 mg/dl	12	12.24
101 - 125 mg/dl	15	15.3
126 - 199 mg/dl	33	33.67
≥ 200 mg/dl	38	38.78
2. Family history of diabetes - Present	69	70.41

3. Hypertension – Present	47	47.96
4. Lipid Profile		
i) Total Cholesterol		
< 200 mg/dl	39	39.79
200 – 249 mg/dl	27	27.55
250 – 299 mg/dl	19	19.39
$\geq$ 300 mg/dl	13	13.27
ii) LDL Cholesterol		
< 130 mg/dl	41	41.84
130 – 199 mg/dl	27	27.55
200 – 249 mg/dl	18	18.37
$\geq$ 250 mg/dl	12	12.24
iii) HDL Cholesterol		
> 40 mg/dl	43	43.89
30 – 39 mg/dl	33	33.67
20 – 29 mg/dl	17	17.34
$\leq$ 20 mg/dl	5	5.1
5. BMI category		
Underweight (<18.5 kg/m^2)	0	0
Normal (18.5-24.9 kg/m^2)	15	15.3
Overweight (25.0-29.9 kg/m^2)	41	41.83
Obese ($\geq$30.0 kg/m^2)	42	42.85
6. Physical activity		
Sedentary	74	75.51
Moderate	19	19.39
Heavy	5	5.1
7. Diet control	28	28.57
8. Tobacco chewing - Yes	11	11.22
9. Alcohol drinking - Yes	18	18.37
10. Smoking - Yes	19	19.39

Discussion

Globally diabetes affects 246 million people and is expected to affect 366 million by 2030. At least 7 million new cases are reported annually. India accounts for largest diabetic population with 41 million patients, mounting to 6 percent of the adult population.

Type 1 diabetes mellitus results from autoimmune destruction of the β cells of the pancreas. Type 1 diabetes mellitus develops in childhood or early adulthood, although some latent forms do occur. Type 1 DM accounts for up to 10% of all cases of DM and is likely initiated by the exposure of a genetically susceptible individual to an environmental agent.

Among various types of diabetes mellitus, type 2 diabetes mellitus is the most common. The prevalence of type 2 DM is increasing. Type 2 DM accounts for as much as 90% of all cases of DM. Type 2 Diabetes Mellitus is characterized by insulin resistance and, at least initially, a relative lack of insulin secretion.

Most individuals with type 2 diabetes exhibit abdominal obesity which itself causes insulin resistance. Multiple risk factors for the development of type 2 DM have been identified, including family history (i.e., parents or siblings with diabetes); obesity (i.e., ≥20% over ideal body weight, or body mass index [BMI] ≥30 kg/m^2); habitual physical inactivity; race or ethnicity; previously identified impaired glucose tolerance or impaired fasting glucose; hypertension (≥140/90 mm Hg in adults); high density lipoprotein (HDL) cholesterol ≤40 mg/dL, low density lipoprotein (LDL) cholesterol ≥130 mg/dL and total cholesterol value ≥200 mg/dL; history of gestational diabetes mellitus or delivery of a baby weighing >9 pounds; history of vascular disease; and polycystic ovary disease.

While the prevalence of type 2 DM increases with age, the disorder is increasingly being recognized in adolescence. Much of the rise in adolescent type 2 DM is related to an increase in adiposity and sedentary lifestyle, in addition to an inheritable predisposition [14-19].

This observational study presented data from 98 patients of Type 2 Diabetes Mellitus, who were taking treatment from a specialized diabetic hospital of Bihar Sharif, which is the headquarter of Nalanda district of Bihar state, India.

The results revealed that many factors like family history of diabetes, obesity, uncontrolled glycaemic status, dyslipidaemia, hypertension and sedentary lifestyle were present among Type 2 Diabetes Mellitus patients.

This study will guide the healthcare professionals to develop a better strategy for controlling Type 2 Diabetes Mellitus in Bihar, India. This study will also create social awareness regarding the prevention and control of type 2 diabetes mellitus.

Conclusion

This observational study, conducted over 98 chronic patients of Type 2 Diabetes Mellitus, has described the various profiles of patients including their risk profile (hypertension, obesity, dyslipidaemia, and glycaemic status), sociodemographic factors, general health, symptoms present, family history of diabetes, physical activity, diet control, medications (oral hypoglycemic agents, insulin injections, antihypertensives, etc.) and habits present (tobacco chewing, alcohol consumption and smoking). Blood pressure (BP), body mass index (BMI), fasting blood sugar (FBS) level and lipid profile were also recorded.

The results revealed that many factors like family history of diabetes, obesity, uncontrolled glycaemic status, dyslipidaemia, hypertension and sedentary lifestyle were present among the Type 2 Diabetes Mellitus patients.

Increasing awareness of risk factors and their prevention should be emphasized in the Indian society. Lifestyle modifications (physical exercise, diet control, etc.) are appropriate measures in the prevention of diabetes.

This study will guide the healthcare professionals to develop a better strategy for controlling Type 2 Diabetes Mellitus in Bihar, India. This study will also create social awareness regarding the prevention and control of type 2 diabetes mellitus.

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Conflict of Interest

The author declares no conflict of interest.

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