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Research Article

Study of Lifestyle related risk Factors of Type 2 Diabetes Mellitus in Amravati City

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Abstract: DM is the most common endocrine disorder characterized by high blood glucose levels resulting from defects in insulin secretion, insulin action or both. The prevalence of Type 2 diabetes (T2DM) is currently estimated to be 6.4% worldwide. The objective of present work is to determine the role of life style in relation to T2DM in adults and to find out body mass index and lipid profile status of patients and its association with disease. This retrospective case control study was conducted on 100 subjects (50 Type II diabetes as Cases and 50 without diabetes as a Control). The subjects were enrolled from Outpatient clinic from the Department of Medicine during May and June 2013. A highly significant association was observed between cases and controls with regard to family history of T2DM. 86% of cases group have BMI levels > 25 kg/m2 and statistically showed its relation with T2DM; Seventy percent of case group consumed alcohol for more than 5 years. Assessment of self-reported physical activity showed that 32% of cases and 66% of control group subjects were involved in regular exercise. Type 2 diabetes is more common among those who have a family history of diabetes, overweight, unhealthy dietary patterns, lack of physical activity and high lipid profile.
Keywords: Type II Diabetes Mellitus, Body Mass Index, Family history of Diabetes, lipid profile, Blood sugar, Recommended Dietary Allowance

INTRODUCTION

DM is the most common endocrine disorder characterized by high blood glucose levels resulting from defects in insulin secretion, insulin action or both[1]. The prevalence of Type 2 diabetes (T2DM) is currently estimated to be 6.4% worldwide[2] and is increasing in all populations and all age groups throughout the world. DM is one of the major non-communicable diseases in India with a variable prevalence of 2.1% to 12.1% [3]·This rapid increase in prevalence over the last two decades suggests that populations undergoing rapid lifestyle changes and rapid nutrition transition[4]. Since 1921 primary prevention of T2DM has been implicated as an important way to tackle T2DM[5]. The diabetes pandemic is an outstanding example: the estimated number of diabetic patients worldwide was 171 million in 2000, which is expected to increase to 366 million by 2030, and the percentage of diabetics living in developing countries is projected to increase from 74% in 2000 to 81% in 2030 [6]. Type 2 diabetes mellitus (T2DM) is defined as a combination of insulin resistance (reduced ability of insulin to stimulate utilization of glucose in the body), and reduced secretion of insulin. Insulin resistance is believed to be associated with decreased physical activity and obesity. Family history of diabetes, obesity, and hypertension increases the risk of diabetes. Diabetes is also found to be more common among certain ethnic groups. Pre-diabetes is a condition characterized by abnormal blood glucose levels that are below the 'cut-off' point for diabetes [7]. Persons with pre diabetes are at a higher risk of developing diabetes, but its onset can be delayed or prevented by diet control, reducing body weight, and increasing physical activity. Unhealthy dietary patterns and lack of exercise are therefore, the most important factors responsible for the increasing incidence of diabetes worldwide[8]. The emphasis is on improving dietary pattern, lifestyle and early diagnosis of DM through biochemical markers so that complications can be prevented. Indeed there is now overwhelming evidence to conclude that lifestyle modification can prevent or delay the onset of T2DM [9].

Hyperglycaemia, the characteristic sign of diabetes mellitus, can occur in different clinical situations. The national diabetic data group and WHO have issued diagnostic criteria for diabetes mellitus[11].

WHO Criteria for diagnosis of DM

1. Symptoms of diabetes plus random blood glucose concentration > 11.1 mmol/L (200 mg/dl) or

2. Fasting plasma glucose ≥ 7.0 mmol/L (126 mg/dl)
3. Two hour plasma glucose ≥ 11.1mmol/L (200 mg/dl) during an oral glucose tolerance test

Objectives:

1. To determine the role of life style in relation to T2DM.
2. To find out body mass index and lipid profile status of patients and its association with disease.

MATERIALS & METHODS

Study Design

This retrospective case control study conducted in conducted on 100 subjects (50 Type II diabetes as Cases and 50 without diabetes as a Control's). The subjects were enrolled from Outpatient clinic from the Department of Medicine, Dr. P. D. M. Medical College & Hospital, Amravati, who were visited the OPD during May and June 2013. A pretested structured interviewer administered questionnaire was used for data collection. The questionnaire contained data pertaining to life style and socio demographic characteristics and various other risk factors associated with the occurrence of DM.

(i) Inclusion Criteria (for cases)

The patients will be selected based on the following criteria:

a. The patients newly diagnosed as T2DM according to standard WHO criteria [10] will be enrolled within two to three months of diagnosis.

(ii) Exclusion Criteria

a. Patients with uncontrolled DM and other complications such as diabetics neuropathy, diabetics retinopathy, diabetics nephropathy and having cardio-vascular diseases.
b. Patients having tuberculosis, arthritis, cancer and malaria
c. Patients associated with secondary pancreatic disorders like drug-induced and viral infections.
d. Females having history of gestational diabetes mellitus.
e. Those who did not give consent.

(iii) For Controls

The patients will be selected based on the following criteria:

Those patients who are found non-diabetic on investigation were selected as controls. Controls are selected after pair matching age, sex and place of residence with corresponding cases.

Patients diagnosed to have T2DM whose past records were available were studied for risk factors and another group whose past records were available, who were non-diabetics and of similar age and sex were taken as controls.

II. Tools and Techniques

To gather relevant data various tools and techniques will be employed:

(i) Questionnaire

A suitable questionnaire cum interview schedule will be developed to elicit information on:

a. **General Profile:** To collect information regarding age, sex, family profile, family income, occupation, educational qualification and marital status of the subjects. Information on activity pattern and personal habits (smoking and alcohol consumption) will also be gathered using the questionnaire.
b. **Clinical Profile:** In this part, information will be gathered to find out the duration of disease, family history of disease, type of treatment they are advised and the clinical condition of patients. Blood pressure and pulse rate will be measured.
c. **Dietary Profile:** Dietary information was obtained with diet history, 24-hour dietary recall and food frequency questionnaire methods.

(ii) Anthropometric Measurements

Anthropometric status was be assessed by measuring height, weight and Body Mass Index.

(iii) Biochemical Analysis

The following nutritional parameters were assessed both in control as well as in study subjects:

a. Serum Glucose

b. Lipid Profile

I. Serum Cholesterol
II. Triglycerides

Fasting blood samples would be collected for the biochemical investigations. 10-ml blood was drawn and divided between plain and anticoagulant tubes. Then it will be centrifuged at 1000 rpm for 10 minutes.

Serum Glucose will be determined by glucose oxidase method.

Lipid Profile

I. Serum Cholesterol was estimated.
II. Triglyceride will be measured by the method of Handel and Zilversmit.

After collection of data all subjects were given advice regarding healthy life style habits.

RESULTS

At the end of the assigned data collection period, 50 cases and 50 controls were interviewed. Table number 1, presents the various parameters of study respondents. The mean age in both cases and control was found equal. The mean BMI was higher in cases group 27.25 kg/m2 than control group 24.97 kg/m2. Gender wise distribution of subjects showed that 44% were males and 66% were females. Mean serum cholesterol in case group was (215) as compared to

control group (152). The mean triglyceride in cases group was 154 as compared to control group 137. Mean FBS in cases group was 126 as compared to controls group101.

In Cases group, 58% of patients had a positive family history of T2DM, statistically highly significant association was observed between cases and controls with regard to family history of T2DM (p<0.001). 86% of cases group have BMI levels > 25 kg/m2. 80% lies between 25-29.99 kg/m2 & 6% between 30-34.99 kg/m2. In Control group, 52% of subjects have BMI between 18-24.99 kg/m2; 42% have BMI between 25-29.99 kg/m2. The association was found to be highly significant with regards to BMI and T2DM [P< 0.01]. 56% of cases used to smoke with 38% for less than 5 years and about 18% smoke for more than 5 years. In controls 62% patients were non-smokers. There was no statistically significant association of smoking and T2DM.(p>0.05)

Table-1: Distribution of Various Parameters in Cases & Controls

PARAMETERS		**CASE (Mean ± SD)**	**CONTROL(Mean ± SD)**
Age (Years)		45.5 ± 6.77	45.5 ± 6.83
BMI (Kg/m2)		27.25 ± 1.99	24.97± 1.86
Frequency of food intake		4.08 ± 1.23	2.58 ± 0.86
Calories intake	Male K cal	3367.5 ± 531.87	2659.54 ± 520.91
	Female K Cal	3022.92 ± 722.99	1884.75 ± 523.67
Serum cholesterol		215.38 ± 28.73	152.67 ± 7.49
Serum triglyceride		154.64 ± 16.28	137.36 ± 5.11
FBS		126.58 ± 9.17	101.08 ± 7.62
Post-prandial BS		227.06 ± 13.70	176.12 ±17.29

Seventy percent of case group consumed alcohol for more than 5 years and in control group 42% were consumed alcohol. The association was found to be statistically significant.(p<0.05) Assessment of self-reported physical activity showed that 32% of cases and 66% of control group subjects were involved in regular exercise, whereas 78% of cases and 44 % of controls were involved in sedentary activity. The association between physical activity with regard to diabetes status was found to be statistically highly significant (p<0.01). (Table 2)

Table-2: Distribution of study subjects according to life style.

Life style factors		**Case n= 50**	**Control n =50**	**p**
Family history of DM	YES	29 (58%)	11 (22%)	p<0.01
	NO	21 (42%)	39 (88%)	
BMI (kg/m2)	18 – 24.99	07 (14%)	26 (52%)	P< 0.01
	25 – 29.99	40 (80%)	21 (42%)	
	30 – 34.99	03 (6%)	02 (4%)	
Smoking (in years)	NO	22 (44%)	31 (62%)	P >0.05
	<5	19 (38%)	15 (30%)	
	>5	09 (18%)	04 (8%)	
Alcohol intake in (years)	NO	15 (30%)	29 (58%)	P<0.01
	< 5	22 (44%)	17 (34%)	
	5-10	12 (24%)	04 (8%)	
	> 10	01 (2%)	00	
Physical activity	Sedentary	34 (68%)	22 (44%)	P< 0.015
	Regular exercise	16 (32%)	28 (66%)	

In Cases group, 38% had high food frequency rate more than four times a day. In Control group, 58% had normal food frequency 3 times a day. The food frequency and diabetes difference was found to be statistically significant (p<0.05). (Table 3)

Table-3: Showing food frequency of food intake seen in patients

FOOD FREQUENCY (times/day)	CASE	CONTROL
2	05 (10%)	29 (58%)
3	13 (26%)	16 (32%)
4	13 (26%)	03 (6%)
> 4	19 (38%)	02 (4%)
TOTAL	**50 (100%)**	**50 (100%)**

$\chi^2 = 37.26$; d (f) = 3; P <0.01 SIG

40.90% of males cases were consumed high calories diet than the RDA i.e. > 3600/Kcal/day although they had a sedentary lifestyle; 36.36% patients were between 3001-3600 Kcal; 9.09% patients between 2401-3000 Kcal/day. In Control group, 50% males consumed appropriate i.e. < 2400 Kcal/day; 50% patients were just above the margin line > 2400 Kcal/day. In Cases group, 53.47% of females had high calorie food which may indicate higher chances of T2DM in females, 36.36% females were between the ranges of 2401-3000 Kcal/day. In Control group, 57.14% females were consuming calories < 1800 Kcal per day; rest were above the 1800 Kcal/day. (Table 4)

Table 4: Calories intake in study subjects

CALORIES* (in Kcal/day)	CASE	CONTROL	p
Calories intake in male			
< 2400	01 (4.54%)	11 (50%)	
2401-3000	04 (9.09%)	05 (22.72%)	<0.01
3001-3600	08 (36.36%)	05 (22.72%)	
> 3600	09 (40.90%)	01 (4.54%)	
TOTAL	**22 (100%)**	**22 (100%)**	
Calories intake in female			
< 1800	04 (14.28%)	16 (57.14%)	
1801-2400	01 (3.57%)	08 (36.36%)	**<0.01**
2401-3000	08 (36.36%)	03 (10.71%)	
> 3000	15 (53.57%)	01 (3.57%)	
TOTAL	**28 (100%)**	**28 (100%)**	

*Reference values as per RDA in a Normal Indian adult male & female:
MALE: Light work 2425;Moderate work 2875; Hard work 3800
FEMALE: Light work 1875; Moderate work 2225; Hard work 2925

72% of cases had S. Cholesterol levels > 200 mg% of which 68% where between 201-250mg%; 4% with >250mg% levels. In Controls group, 42% patients had levels less than 150mg% and 52% between 151-200 mg% levels statistically significant association was found between cholesterol and T2DM (p<0.01). In Case group, 54% of patients had S. Triglyceride levels >150 mg% of which 24% where >160 mg%; 30% between 151-160mg%.In Controls group, 82% patients S. Triglyceride levels < 140 mg% and only 18% between 141-150mg%. Statistically highly significant association was found between triglyceride and T2DM (p<0.01 (p<0.01) (Table 5)

Table-5: Distribution of lipid profile levels

Lipid Profile levels	Case n= 50	Control n =50	p
Serum cholesterol(mg%)			
≤150	00	21 (42%)	P <0.01
151 – 200	14 (28%)	26 (52%)	
201 – 250	34 (68%)	03 (6%)	
>250	02 (4%)	00	
Triglyceride (mg%)			
≤140	06 (12%)	41 (82%)	
141 – 150	17 (34%)	09 (18%)	P = 0.001
151 – 160	15 (30%)	00	
> 160	12 (24%)	00	

DISCUSSION

Type 2 diabetes mellitus is one of the most important public health problems in the developing countries. The present study showed that Type 2 diabetes is more common among those who have a family history of diabetes and high BMI. Similarly, unhealthy dietary patterns, lack of physical activity and high lipid profile are also linked with the risk of T2DM.

The results of present study are consistent with those from several other studies [11,12,13] with regard to the association between type 2 diabetes and age, family history of diabetes, BMI,alcohol and serum cholesterol level. Study by Farid M. et al [14] shows that persons not carrying out any form of regular exercise are at a significantly greater risk, even after adjusting for their dietary habits, age, and family history. Study by Swinburm B et al [15] on the role of physical activity: leading a sedentary life increases the risk of diabetes considerably. Studies on the Lifestyle-related risk factors have shown that physical inactivity and unhealthy dietary patterns are quite common among the Indian population.

Excess weight is the most important cause of type 2 diabetes. Being overweight increases the chances of developing type 2 diabetes seven fold. Being obese makes you 20 to 40 times more likely to develop diabetes than someone with a healthy weight[9].

Several studies [16, 17] have shown that healthy lifestyle can significantly reduce the risk of T2DM, and/or delay its onset among genetically susceptible individuals. Furthermore, diabetes is more effectively controlled among patients who have high levels of awareness, and who consciously make choices for a healthy lifestyle. Physical inactivity and obesity are among the most important risk factors associated with T2DM besides family history of diabetes. In our study Seventy percent of case group consumed alcohol for more than 5 years and Control group 42% were alcoholics. The association was found to be significant.

A growing body of evidence links moderate alcohol consumption with reduced risk of heart disease. The same may be true for type 2 diabetes. Moderate amounts of alcohol—up to a drink a day for women, up to two drinks a day for men—increases the efficiency of insulin at getting glucose inside cells. And some studies indicate that moderate alcohol consumption decreases the risk of type 2 diabetes[18- 23]. If you already drink alcohol, the key is to keep your consumption in the moderate range, as higher amounts of alcohol could increase diabetes risk[24]. If you don't drink alcohol, there's no need to start—you can get the same benefits by losing weight, exercising more, and changing your eating patterns.

Increased FFAs are thought to be crucial for the development of the peripheral insulin resistance as a result of intracellular accumulation of triglycerides and fat-derived metabolites in muscle and the liver [25, 26].

Exercise mediates regulation of gene expression in muscle cells. Thus, physical activity modulates insulin signalling and reduces insulin resistance through increased glucose transport and glycogen synthesis after muscular exercise [27, 28]

CONCLUSION

Type 2 diabetes is more common among those who have a family history of diabetes, overweight, unhealthy dietary patterns, lack of physical activity and high lipid profile. Family history of Diabetes is an important clinical marker, but is useful only when it is positive and it should not be used as a general screening tool. Weight reduction and increased physical activity contribute to enhanced insulin action and decreased demands on the β-cell and hence reduced risk of T2DM.

Author Contribution*:* Conception and design, acquisition of data, analysis and interpretation of data done by Dr. Wasnik Vinod & Dr. Mahakalkar S M Drafting the article & revising it critically for important intellectual content has been done by the author Dr Ajay Jawarkar.

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