Original Research Article

Progressive Study of Various Risk Factors for Type-2 Diabetes in a General Population

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Abstract

Objective:
The current study have undertaken to explore the effect of various factors likenon vegetarian diet, alcohol consumption, smoking and lack of physical activities which will going to have an increased risk of insulin resistance.

Material and Method:
A population-based study carried out from June 2020 to June 2021 at SVBP Hospital, LLRM Medical College Meerut, U.P. India. Subharti Medical Collage Meerut, Comparing 100 individuals, age group of 40 to 65 years, of which 50 study patients and 50 age sex matched control were studied. Anthropometric measurements, biochemical parameters including fasting plasma glucose, fasting plasma insulin and HOMA- IR were analysed using ELISA.The results were calculated & interpreted.

Results:
Present study highlights that Maximum patients were Non- Vegetarian62%,56% wereAlcoholic,58% were smoker and 48% were fromupper middle& higher class following sedentary life style. It was also found thatBMI, BP, Fasting insulin and HOMA-IR value in these patients were significantly raised as compared to normal healthy control($p < 0.001$).

Conclusion:
There is convincing evidence thatnon vegetarian diet, alcohol consumption, smoking and less physical activates are related to an increased risk of developinginsulin resistance in type 2 diabetes.Thus it is recommended for decreasing or delaying the detrimental effects of insulin resistance on body. These include lifestyle change and weight loss followed by diet modification.

Keywords: Alcohol, Homeostasis Model Assessment (HOMA-IR),Insulin resistance, physical activity, smoking, type 2 diabetes.

1. INTRODUCTION

Globally, an estimated 422 million adults are living with diabetes mellitus, according to the latest 2016 data from the World Health Organization (WHO)[1],Diabetes prevalence is increasing rapidly.Previous estimates from the International Diabetes Federation put the number at 381 million people having diabetes[2]. In 2000, India (31.7 million) topped the world with the highest number of people with diabetes mellitus followed by China (20.8

million) with the United States (17.7 million) in second and third place respectively[3]. Studies show that South Asians are inherently at high risk for type 2 diabetes[4].World Health Organization(WHO) report says that India is expected to house a major portion of these patients and almost 22% of patients withtype 2 diabeteswill be in India by 2030[5].

Insulin resistance is defined as decreased sensitivity in responsive metabolic actions of insulin to stimulate glucose utilization and inhibition of hepatic glucose production in diabetic patients[6]. Insulin resistance is closely associated with high blood pressure, obesity,coronary artery disease, dyslipidemia, and other disorders that are characterized as metabolicsyndrome[7]. The diagnosis of insulin resistance in humans is important for epidemiological, clinical, basic andapplied scientific research and clinical trials. There are lot of direct[EuglycemicHyperinsulinemic Clamp (EHC)and insulin suppression tests] and indirect methods [Glucose Tolerance Test (GTT), Oral Glucose Tolerance test (OGTT) and Homeostasis Model of Assessment-IR (HOMA-IR)] are commonly used in laboratory to check insulin resistance[8].Most of the methods are depend on analysis of fasting glucose andfasting insulin concentration and HOMA-IR index is widely usedin medicine for clinical studies[9].

The current study have undertaken to explore the effect of various factors likenon vegetarian diet, alcohol consumption, smoking and lack of physical activates which will going to an increased risk of insulin resistance.

2. MATERIAL AND METHOD

Material

This study was conducted during the period from june 2020 to june 2021 in SVBP Hospital, LLRM Medical College Meerut, U.P. India. A total of 100 subjects (50 patients of type 2 diabetes + 50 normal healthy controls) having an age group of 40-65 years were participated in our study taken from urban and rural area of Meerut . Patients with cardiovascular, thyroid function disorder, and other hormonal disorders that may exaggerate the insulin resistance in type 2 diabetes were excluded from the study. 5 ml of venous blood was obtained after a 12 hour fast from type 2 diabetic patients. Blood samples were transferred into tube, allowed to stand for 15 minutes at room temperature, centrifuged at 3500 rpm for 10 minutes.

Methods

Determination of Fasting Glucose

Fasting glucose concentration was measured by the enzymatic colorimetric method (GOD–POD)[13].

Determination of Fasting Insulin

Fasting insulin concentration was measured by Enzyme Linked Immune Sorbent Assay (ELISA) method based on the sandwich principle.

Determination of Insulin Resistance

The insulin resistance was calculated by a homeostasis model assessment (HOMA-IR) index = Fasting plasma glucose (mg/dl) X fasting plasma Insulin (uU/ml) / 405, as described by Matthews and colleagues 1985[14].

Stastical analysis:

Data analysis was performed using Epi info software version 3.5.1. Descriptive statistics, including mean, range, and standard deviations, were calculated for all variables. Proportions were compared using Chi- square tests and chi square for trend at 0.05 level of significance.

3. RESULTS

The study was conducted on 100subjects of different age group (50 T2DM subjects and 50 healthy subjects as controls).

Table no-1
Distribution of T2DM subjects (n=50) according to age

Age group (Years)	No of patients	Percentage
40-50	12	24%
51-60	17	34%
61 and above	21	42%

Table no-1 shows the distribution of patients according to age group. The result shows maximum patients (21) 42% were in the age group of 61 and above years followed by (17) 34% were in age group of 51-60years , while the least (12) 24% were in age group of 40-50 years.

Table no-2
Distribution of T2DM subjects (n=50) according to sex.

Sex	No of patients	Percentage
Male	38	76%
Female	12	24%

Table no-2 shows the distribution of patients according to sex. The result shows maximum patients (38) 76% were male and (12) 24% were female.

Table no-3
Distribution of T2DM subjects (n=50) according to food habit.

Vegetarian / Non-Vegetarian	No of patients	Percentage
Vegetarian	19	38%
Non-Vegetarian	31	62%

Table no-3 shows the distribution of patients according to diet. The result shows maximum patients (31) 62% were Non- Vegetarian and (19) 38% were vegetarian.

Table no-4
Distribution of T2DM subjects (n=50) according to consume alcoholic beverages.

Non-Alcoholic / Alcoholic	No of patients	Percentage
Non alcoholic	22	44%
Alcoholic	28	56%

Table no-4 shows the distribution of patients according to drinking habit. The result shows maximum patients (28) 56% wereAlcoholic and (22) 44% wereNon-Alcoholic .

Table no-5
Distribution of T2DM subjects (n=50) according to tobacco smoking habit.

Non- smoker/Smoker	No of patients	Percentage
Non- Smoker	21	42%
Smoker	29	58%

Table no-5 shows the distribution of patients according toTobacco smoking habit. The result shows maximum patients (29) 58% were smoker and (21) 42% Non -Smoker.

Table no-6
Distribution of T2DM subjects (n=50) according to socio economic status.

Socio economic status	No of patients	Percentage
Poor class	05	10%
Lower middle class	09	18%
Middle class	12	24%
Upper middle& higher class	24	48%

Table no-6 shows the distribution of patients according to socio economic status. The result shows maximum patients (24) 48% were from upper middle & higher class followed by (12) 24% were from middle class, (09) 18% from lower middle class and, while the least (05) 10% were from poor class.

Table no-7
Distribution of T2DM subjects (n=50) according to area locality.

Rural/ Urban	No of patients	Percentage
Rural	23	46%
Urban	27	54%

Table no-4 shows the distribution of patients according to area locality. The result shows maximum patients (23) 46% werebelong to urban and (27) 54% werefrom rural area .

Table- 8
Clinical characteristics and laboratory findings between the study groups(T2DM subjects) and control group (Non – diabetic Healthy subjects)

Parameters	Study group (no=50) Mean ± S.D.	Control group (no=50) Mean ±S.D.	P value
BMI (kg/m^2)	28.13± 3.18	22.74 ± 2.09	$p < 0.001$
SBP (mmHg)	134.4 ± 12.21	121.5 ± 10.03	$p < 0.001$
DSP (mmHg)	89.29± 8.04	81.1 ± 07.93	$p < 0.001$
FPG (mg/dl)	179.93 ± 18.14	84.57 ± 12.98	$p < 0.001$
Fasting Plasma Insulin (uU/ml)	8.66 ± 1.97	5.12 ± 1.22	$p < 0.001$
HOMA-IR	3.85 ± 0.09	1.07 ±0.04	$p < 0.001$

Demographic characteristics and laboratory findings of study groupand healthy control group are presented in Table-8. In brief, T2DM subjects had significantly higher BMI, SBP, DBP, FPG, Fasting Plasma Insulin and HOMA-IR values than non – diabetic subjects ($p < 0.001$).

4. DISCUSSION

The goal of this study was to identify the effect of various factors likenon vegetarian diet, alcohol consumption, smoking and lack of physical activates which might affect on insulin resistance were investigated.Epidemiological data from different parts of India showed a rise in incidence of insulin resistance in type 2 diabetic mellitus The present study showed high incidence of insulin resistance (54%) in urban population of Meerut, while similar study reported high prevalence (5.2%) in rural population in costal Karnataka (Mohan *et al.*, 2008, Bhalerao, 2013, Chow, 2006 and Kokiwar, 2007).There were no significant gender differences in incidence of insulin resistance . Similar findings were reported by multicentric studies in India (WHO, 2000 and Khatib, 2008). However few studies have showed a higher prevalence in females and some other studies showed higher prevalence in males (Prabhakaran, 2005).It is also found significantly increased BMI, BP, Fasting insulin and HOMA-IR value in these patients as compared to normal healthy control($p < 0.001$).

In present study it is also observed that the increasing in age was significantly associatedwith higher risk of insulin resistance.The result shows maximum patients (21) 42% were in the age group of 61 and above years followed by (17) 34% were in age group of 51-60years , while the least (12) 24% were in age group of 40-50 years. Bhalerao (2013) and Howard (2004) had reported the similar results.

Dietary habits also demonstrated a significant association with incidence of of insulin resistance in type 2 diabetic mellitus. This study showed that 62% patients wereNon vegetarian.Non vegetarian dietary habits were associated with high incidentof insulin resistance in type 2 diabetic mellitus comparedwith those with good dietary habits (Chow, 2006).

The present study showed that smoking is associated with diabetes. Smoking habits wereassociated with 1.94 times odds for incident T2DM.This study showed that 58% patients weresmokers. This finding agrees with several other cohort studies (Nakanishi *et al.*, 2000 , Sakai *et al*., 2006 and Chow, 2006).

The present studyshowed a significant association between alcohol consumption and risk of type 2 diabetes.This study showed that 54% patients were alcoholic. This is probably due to the development of insulin resistance, which is a key factor in the pathogenesis of T2DM among heavy alcohol drinkers and this has been shown by some studies to be mediated by increased obesity, especially abdominal obesity. Literature showed varied association of alcohol consumption and increased risk of diabetes (Wei *et al.*, 2000 and Howard, 2004).

In summary, there is convincing evidence thatnon vegetarian diet, alcohol consumption, smoking and less physical activates are related to an increased risk factors of insulin resistance in type 2 diabetes. Thus it is recommended for decreasing or delaying the detrimental effects of insulin resistance on body. These includes lifestyle change and weight loss followed by diet modification.

5. CONCLUSION

In the present study it was observed that non vegetarian diet, alcohol consumption, smoking and less physical activates are related to an increased risk factors of insulin resistance in type 2 diabetes. This study created awareness of diabetes and its complication in population of this region. The baseline data of the present study regarding insulin resistance and its associated risk factors could be useful for implementation of the National Program for control of Diabetes, cardiovascular diseases and Stroke (NPDCS). Therefore, future research in this direction is a need of the time.

Conflict of interest - No conflict of interest was declared.

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6. REFFERENCE

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