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Original Research Article

To Study the Relationship between Eating Habits and Physical Activities with Diabetes Mellitus

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ABSTRACT

The aim of the project was to study the relationship between eating habits and physical activities with diabetes. The objectives of the project were to study the relationship of diabetes with the income group of the people, the occurrence of the disease according to the gender (male/female), the relationship between diabetes and vegetarian diet, the effect of alcohol on the enhancement of the disease and the effect of exercise in delaying diabetes. The different methods used for the study were interview method in which a questionnaire containing information regarding their name, age, sex, education, caste, religion, family profile, housing condition, sleeping hours, activity spending hours, clinical examination, anthropometric measurements, food habits and eating pattern. On the basis of various results depicted, certain conclusions were drawn. It was concluded that the main reason for diabetes is improper dietary habits. The fat consumption in most of the cases was seen to be higher than the normal prescribed limit. Many of the diabetic patients were either overweight or obese also. They didn't spend much time on physical activities and also lead a sedentary life-style.

KEY WORDS: Diabetes Mellitus, Physical activity, Dietary Pattern

INTRODUCTION

Diabetes mellitus, often referred to simply as diabetes (to pass through urine), is a syndrome of disordered metabolism, usually due to a combination of hereditary and environmental causes, resulting in abnormally high blood sugar levels (hyperglycemia). Diabetes, a disease characterized by an excessive discharge of urine, and accompanied with great thirst (*Encyclopedia Britannica, 2008*).

It is a disease which is attended with a persistent, excessive discharge of urine. Most frequently the urine is not only increased in quantity, but contains saccharine matter, in which case the disease is generally fatal (*Webster's Revised Unabridged Dictionary 1913*).

Diabetes is not caused by high sugar. A person is diagnosed diabetic when you have abnormally high levels in your blood because your body can't metabolize the sugar (glucose) you do have effectively. When you eat your body breaks down the food, and glucose is absorbed into your cells by something called insulin. If your body is not producing enough insulin or if the insulin you have is ineffective the glucose stays in your blood stream and your cells

starve. To compensate your body breaks down fat.

Classification

The principal two idiopathic forms of diabetes mellitus are known as types 1 and 2. The term "type 1diabetes" has universally replaced several former terms, including childhood-onset diabetes, juvenile diabetes, and insulin-dependent diabetes (IDDM). Likewise, the term "type 2 diabetes" has replaced several former terms, including adult-onset diabetes, obesity-related diabetes, and non-insulin-dependent diabetes (NIDDM). Various sources have defined "type 3 diabetes" as, among others, gestational diabetes. There is one more type of diabetes called malnutrition type diabetes mellitus (*Encyclopedia Britannica, 2008*).

i. ***Type 1 diabetes or Insulin Dependent Diabetes Mellitus (IDDM):*** Type 1 diabetes mellitus is characterized by loss of the insulin-producing beta cells of the islets of Langerhans in the pancreas, leading to a deficiency of insulin. The main cause of this beta cell loss is a T-cell mediated autoimmune attack. There is no known preventive measure which can be taken against type 1 diabetes; it is about 10% of diabetes mellitus cases in North America and Europe, and is a higher percentage in some other areas. Most affected people are otherwise healthy and of a healthy weight when onset occurs. Sensitivity and responsiveness to insulin are usually normal, especially in the early stages. Type 1 diabetes can affect children or adults but was traditionally termed "juvenile diabetes" because it represents a majority of the diabetes cases in children.

ii. ***Type 2 diabetes or Non-Insulin Dependent Diabetes Mellitus (NIDDM):*** Type 2 diabetes mellitus is characterized differently due to insulin resistance or reduced insulin sensitivity, combined with reduced insulin secretion. The defective responsiveness of body tissues to insulin almost certainly involves the insulin receptor in cell membranes. In the early stage the predominant abnormality is reduced insulin sensitivity, characterized by elevated levels of insulin in the blood. At this stage hyperglycemia can be reversed by a variety of measures and medications that improve insulin sensitivity or reduce glucose production by the liver. As the disease progresses the impairment of insulin secretion worsens, and therapeutic replacement of insulin often becomes necessary.

Majority of the patients improve with weight loss and are maintained on diet therapy. Many patients have a long history of mild symptoms which may remain undiagnosed or ignored. These patients are less prone to ketosis. However, patients with NIDDM may develop ketosis under stress conditions like infection, burns, trauma or surgery. NIDDM is further classified into:

- ***Obese****:* 60-80% of patients with NIDDM, particularly in western hemisphere are obese.
- ***Non-obese***

iii. ***Malnutrition Related Diabetes Mellitus(MRDM):*** This is further classified into:

- ***Fibro Calculous Pancreatic Diabetes (FCPD):*** This is due to an onset of pancreatic disease during childhood, with peak onsets of

symptoms in the age of 15-35 years. There is moderate to severe hypoglycemia requiring large doses of insulin for control. There is calcification and parenchymal fibrosis of the pancreatic tissue.

- ***Protein Deficient Diabetes Mellitus (PDDM):*** The relationship between diabetes and protein deprivation is due to a dysfunction of beta-cells of pancreas in kwashiorkor. Several clinical characteristics are the same as that of FCPD. However, pancreatic classification and exocrine pancreatic dysfunction are absent. Family history of diabetes is present in less than 10% of subjects with PDDM.

iv. ***Gestational diabetes:*** Gestational diabetes mellitus (GDM) resembles type 2 diabetes in several respects, involving a combination of relatively inadequate insulin secretion and responsiveness. It occurs in about 2%–5% of all pregnancies and may improve or disappear after delivery. Gestational diabetes is fully treatable but requires careful medical supervision throughout the pregnancy. About 20%–50% of affected women develop type 2 diabetes later in life.

SIGNIFICANCE OF STUDY

Diabetes mellitus, often referred to simply as diabetes (to pass through urine), is a syndrome of disordered metabolism, usually due to a combination of hereditary and environmental causes, resulting in abnormally high blood sugar levels (hyperglycemia).

Diabetes mellitus is that form of diabetes in which urine contains saccharine matter.

Diabetes is a disease characterized by excessive discharge of urine, and accompanied with great thirst.

The disease diabetes is a commonly prevailing disease in India. It can occur in any age group but it is mostly found among adults. In a fast moving world of today, everybody is running after money and people are left with no time to look after their health. This increased urbanization and industrialization has led to an increased number of diabetic cases.

Expected outcomes

- The major expected factors affecting diabetes are sedentary life-style or lack of exercise and ill-eating habits.
- The other expected outcomes include income group of the people, alcohol or tobacco chewing, etc.

Aim

"To study the relationship between eating habits and physical activities with diabetes."

Objectives

- To study the relation of diabetes with the income group of people.
- To study the occurrence of disease according to the gender (male/female).
- To study the relationship between diabetes and vegetarian diet.
- To study the effect of alcohol on the enhancement of the disease.
- To study the effect of exercise in delaying diabetes.

METHODOLOGY

The present study was conducted out the dietary profile of Diabetic patients for all age groups in NCR. The present chapter attempts to describe in detail the methodology adopted for collection of data.

Locale of study

The study was conducted in the hospitals of NCR. The study was conducted keeping in mind the operational feasibility of the investigator.

Sample selection

a) *Type and size of the sample:* The present study was carried out on a sample of people of all age groups, out of which 50 were with normal clinical examination, and then they were excluded out.

b) *Selection of sample:* The cases for the present study were selected from other above mentioned area with specific focusing for sex, i.e., 25 each for males and females. Firstly, a list of these people was prepared, and then their clinical examination was done. Then, according to their clinical examination, they were categorized into two groups: Diabetic and Non-diabetic, irrespective of their weight and height or Body Mass Index (BMI). Normal was excluded out. Remaining formed the sample of study.

c) *Development of tools and collection of data:* A detailed interview schedule was prepared for the collection of data. The questions were asked to the patients keeping in mind their feasibility and comfort, after assuring that their data won't get leaked out. The following methods were used for gathering information:-

- Interviewing method
- Anthropometric measurements
- Clinical examination
- Dietary survey

Interview Method

A questionnaire was formed for interviewing the patients. It included the information regarding their name, age, sex, education, caste, religion, family profile, housing condition, sleeping hours, activity spending hours, clinical examination, anthropometric measurements, food habits and eating pattern.

Anthropometric Measurements

Nutritional anthropometry is a measurement of human body at various age and levels of nutritional status. It is based on the concept that an appropriate measurement should reflect any morphological variation occurring due to significant physiological changes and biological determinants including sex, intra-uterine development, birth order, birth weight, parental size, genetic constitution, environmental factors such as climate conditions (*ICMR, 1989*).

The measurement techniques used are:-

- *Height:* The height of the patient was measured using a stature meter. Patients were asked to remove their shoes and stand on a flat floor against the wall, with their feet parallel their heels, buttocks, shoulders and back of the head held comfortably erect. The arms were made to hang at sides in a natural manner.
- *Weight:* Body weight is the most commonly used and the simplest reproducible anthropometric measurement. It takes into account length, frame size, proportion of fat, muscle and bone. The weight of the children was measured with the help of bathroom weighing machine without any footwear and with minimal clothing. The measurement was recorded to the minimum of 500 gms.

Body Mass Index (BMI): The BMI indicates muscle-fat mass in the body. The ratio of weight (kg) to height (sq. meter) is referred

to as BMI. It provides a reasonable indication of nutritional status.

BMI = Weight (kg)/ Height (sq.m.)

Clinical Examination

It was done in accordance with the description list of physical signs given for nutritional deficiencies. The selected patients were observed from head to toe in order to find out the presence of any sign of nutritional deficiencies or excesses. The features which were observed included their appearance, skin and nails.

Dietary Survey

Diet is a vital determinant of health and nutritional status of people. The dietary habits of individuals/families/communities vary according to socio-economic factors, regional customs and traditions. Dietary enquiries are mainly of two types: - qualitative and quantitative.

Qualitative aspects of food consumption include information on the types of food eaten by individual, the frequency of consumption of different foods – daily, weekly, monthly or occasionally, meal pattern, dietary habits and his/her likes and dislikes.

In *quantitative type*, exact amount of foods consumed in terms of grams or litres are assessed and their nutrient contents are estimated. Comparision of nutrient intake of individual with the RDA is carried out which provides a measure of adequacy or inadequacy of the nutrients.

Both the qualitative and quantitative methods of dietary enquiry were used to collect data regarding the food intake of children.

Oral questionnaire (24 hrs. Recall Method)

The dietary intake data of the subject was collected for 3 consecutive days in a week (inclusion of 1 holiday, Sunday), using 24 hr. Recall Method. According to Dwyer (1994), 3 days dietary recall avoids the possibility of over or under estimation of the intakes and thus improves the accuracy of dietary assessment. A set of standardized utensils was used to ask about the total amount of the cooked food prepared for the family and the amount of raw ingredients used in food item, standardization was done in the Nutrition laboratory of the college. The nutrient content of the food consumed was calculated using food comparison tables. The comparison of dietary and nutrient intake of subject was done with the RDA given by ICMR.

Food consumption pattern of the selected subject was assessed using food frequency tables with regards to consumption of various food products daily, weekly, monthly or occasionally.

RESULTS AND DISCUSSION

Table 1: Personal Profile

S.No.	Personal variables	Frequency (%)
1.	*Age*	
	15-40	20
	40-65	50
	65-90	30
2.	*Category*	
	General	80
	SC	10
	ST	6
	OBC	4
3.	*Type of Family*	
	Joint	54
	Nuclear	46
	Any Other	0
4.	*Food Habit*	
	Vegetarian	82
	Non-vegetarian	18
5.	*Educational Status*	
	10th	18
	12^{th}	32
6.	Graduation	30
	Post graduation	20
	10+2	19
	Graduate	6
	Post-graduate	2
7.	*Ocuupation*	
	Govt. Service	20
	Private Service	26
	Business	30
	Petty Business	6
	Any Other	18
8.	*Income (Rs.)*	
	10,000-40,000	48
	40,000-70,000	34
	70,000-1,00,000	18

A total of 50 samples from the study area were included in the analysis. Various criteria like socio-economic profile, anthropometry, biochemical parameters, clinical examination, food consumption pattern etc. were studied and analysed and the data presented herewith.

This table depicts that most of the cases i.e. 50% belonged to the category 40-60 years, rest were in the category of 65-90 years (30%) and 15-40 years (20%). This means most of the people developed this disease in their middle ages as compared to young or old ages. Most of the samples studied belonged to general category i.e. 80% as compared to other categories i.e. SC (10%), ST (06%) and OBC (04%). This table shows that more number of patients lived in joint families (54%) and lesser in nuclear families (46%). Most of the samples studied were vegetarian (82%) and only few were non-vegetarian (18%). This data depicts that most of the samples were either graduate (30%) or 12^{th} passed (32%). Comparatively less number of people were either 10^{th} passed (18%) or post-graduate(20%). According to this table not much demarcation was there on the basis of the occupation of people. Patients belonged to all the occupations in almost equal percentage i.e. Govt. service (20%), private service (26%), business (30%), petty business (06%) and any other (18%). Most of the patients belonged to the income group ranging from Rs.10,000-70,000 i.e. 48% from Rs.10,000-40,000 and 34% from Rs.40,000-70,000. Comparatively less number of samples belonged to higher income group category i.e. ranging from Rs.70,000-1,00,000.

This data shows that most of the patients had normal BMI i.e. 62% belonged to the category 20-26 kg/mt. sq. Rest were overweight or obese i.e. 12% had BMI ranging from 32-38 and 04 % from 38-44.

Table 2: BMI (Body Mass Index)

S. No.	*Range (kg/mt. sq.)*	*Total*	*Percentage*
1.	20-26	31	62
2.	26-32	11	22
3.	32-38	06	12
4.	38-44	02	04

Table 3: FOOD CONSUMPTION PATTERN.

S. No.	*Food Group*	*Daily (%)*	*Thrice a week (%)*	*Once a week (%)*	*Twice a month (%)*	*Once a Month (%)*	*Occassionally (%)*
1.	Cereals	40	28	13	05	08	07
2.	Pulses	0	0	24	25	22	14
3.	Vegetables	0	0	19	30	23	14
4.	Fruits	20	27	13	10	08	14
5.	Milk & Milk Products	10	18	06	05	08	07
6.	Meat & Poultry	0	0	06	10	08	0
7.	Sugars	10	09	06	0	0	07
8.	Fats	20	09	0	0	0	0
9.	Nuts & Oilseeds	0	09	13	15	23	37

This table shows that many cereals (40%) and fruits (20%) were consumed daily but no same pulse (0%) or vegetable (0%) was eaten daily. Fats (20%) and milk products (10%) were also consumed daily.

Further the data shows that many of the cereals (28%), fruits (27%) and milk products (18%) were consumed thrice in a week. Again no pulse (0%) or vegetable (0%) was consumed with this frequency. Sugar, fat and nuts & oilseeds consumption was 09%.

The table also depicts that many of the pulses (24%) and vegetables (19%) were consumed once in a week. Some fruits, cereals and nuts & oilseeds (13%) were consumed in the same frequency. Milk, meat and sugar consumption was 06%.

This table shows that most of the pulses (25%) and vegetables (30%) were consumed every fortnight. Many fruits (10%), meat products (10%) and nuts (15%) were also consumed every 15 days. Fat and sugar consumption was nil and cereal consumption was 05%.

Further the data depicts that the consumption of the same pulse (22%) or vegetable (23%) was done every month. Besides that, most of the nuts (23%) were also consumed once in a month. Cereals, milk, meat and fruit consumption is 08% and sugar & fat consumption was nil.

According to this data, mostly nuts and oilseeds (37%) were consumed occasionally. Some pulse (14%), vegetables (14%), fruits (14%), milk products (07%) and sugars (07%) were consumed occasionally.

TABLE 4: 24 HOUR RECALL

ENERGY			
S. No.	*Range (kcal)*	*Total*	*Percentage*
1.	1500-2000	06	12
2.	2000-2500	13	26
3.	2500-3000	25	50
4.	3000-3500	06	12
FAT			
S. No.	*Range (grams)*	*Total*	*Percentage*
1.	20-30	07	14
2.	30-40	21	42
3.	40-50	17	34
4.	50-60	05	10
PROTEIN			
S. No.	*Range (grams)*	*Total*	*Percentage*
1.	30-40	05	10
2.	40-50	12	24
3.	50-60	26	52
4.	60-70	07	14
CARBOHYDRATE			
S. No.	*Range (grams)*	*Total*	*Percentage*
1.	250-300	12	24
2.	300-350	18	36
3.	350-400	16	32
4.	400-450	04	08

Many of the subjects consumed normal amount of energy, very few consumed either less or more than the normal energy range. 12% belonged to the group 1500-2000 kcal, 26% to 2000-2500 kcal, 25% to 2500-3000 kcal and 12 % to 3000-3500.

The fat consumption was more than the normal amount in most of the cases. Very few numbers of people were under the normal range. 14% were from the category 20-30 gms, 42% from 30-40 gms, 34% from 40-50 gms and 10% from 50-60 gms.

The protein consumption was also normal in most of the samples. Only a few number consumed less amount of protein. 10% consumed proteins ranging from 30-40 gms, 24% from 40-50 gms, 52% from 50-60 gms and 14% from 60-70 gms.

This table shows that mostly people consumed normal amount of carbohydrates. But some even consumed the amount more than the normal range i.e. 24% consumed from range 250-300 gms, 36% from 300-350 gms, 32% from 350-400 gms and 08% from 400-450 gms.

SUMMARY & CONCLUSION

Diabetes Mellitus is the most common endocrine disorder. India leads the world with largest number of diabetic subjects earning the dubious distinction of being termed the "diabetes capital of the world". According to the Diabetes Atlas 2006 published by the International Diabetes Federation, the number of people with diabetes in India currently
around 40.9 million is expected to rise to 69.9 million by 2025 unless urgent preventive steps are taken. The so called "Asian Indian Phenotype" refers to certain unique clinical and biochemical abnormalities in Indians which include increased insulin resistance, greater abdominal adiposity i.e., higher waist circumference despite lower body mass index, lower adiponectin and higher high sensitive C-reactive protein levels. This phenotype makes Asian Indians more prone to diabetes and premature coronary artery

disease. Urbanization and increasing prosperity have raised the prevalence rate.

Diabetes Mellitus is a metabolic disorder characterized by the decreased ability or complete inability of the tissues to utilize carbohydrates, accompanied by changes in the metabolism of fat, protein, water and electrolytes. The disorder is due to the deficiency or diminished effectiveness of the hormone insulin. The metabolic derangement in the long standing cases is frequently associated with permanent and irreversible functional and structural changes in the vascular system of the body characteristically affecting the eye, kidney and nervous system (International Diabetes Federation, 2011).

In this project, various tables are made on the basis of the data of the samples. Various results are also drawn on the basis of tables formed like; diabetes is more common among middle-aged people as compared to the old-aged or younger ones. Also males are more likely to develop this disease as compared to females.

On the basis of various results depicted, certain conclusions can also be drawn. It can be concluded that: -

The main reason for diabetes is improper dietary habits. The fat consumption in most of the cases was seen to be higher than the normal prescribed limit.

Many of the diabetic patients are either overweight or obese also. They don't spend much time on physical activities and also lead a sedentary life-style.

A large portion of our population is suffering from diabetes and among them a high percentage includes the adult age group i.e. above 20 years. Among adults also, males have a higher ratio of developing diabetes i.e. 58% than females i.e. 42%. The reasons might be the stress, tensions or work load or ill-eating habits. Most of the samples are either graduate or 12^{th} passed and most of them belong to the general category. A large ratio of the patients lives in joint families and lesser number of people in nuclear families.

According to the project, not much demarcation is there on the basis of the occupation of people. Patients belong to all the occupations in almost equal percentage and they mostly belong to the income group ranging from Rs. 10,000-40,000.

Most of the samples have normal BMI, less number are overweight and very few are obese and most of them are vegetarian.

The energy consumption in most of the cases is normal. But some are even consuming less than the normal amount and some consume a little more than the normal amount whereas the fat consumption is normal only in a few cases. Most of them consume the amount more than the normal.

The protein and carbohydrate consumption is also normal in most of the cases. Only a few consume either less or more amount of these nutrients.

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