Original Research Article

Prevalence of type-II diabetes mellitus in relation to dietary habits and anthropometric status among adults

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ABSTRACT

Background: Type 2 diabetes is a metabolic-cum-vascular syndrome characterized by predominant insulin resistance with varying degrees of insulin secretory defect. It is more common in overweight and obese individuals of middle to late age but is increasingly being seen in younger age groups and in those with lower BMI as well. To determine the prevalence of type-II diabetes mellitus (DM) in relation to dietary habits among adult population of urban Meerut and to study anthropometric status associated with type-II diabetes mellitus.
Methods: The present study was conducted in the field practice area of urban health training centre, LLRM medical college, Meerut by house-to-house survey among adults 30 years and above.
Results: Prevalence of diabetes mellitus in the present study was found to be 13.1%. When prevalence of DM in relation to the type of diet was observed, it was more among those who were non vegetarians (17.8%) while it was only 7.2% among those who were vegetarians. The prevalence of diabetes in relation to the body mass index, waist-hip ratio shows statistically significant association.
Conclusions: Inappropriate and unhealthy dietary patterns, obesity and increased waist hip ratio (WHR) were the major risk factors to cause diabetes mellitus.

Keywords: Diabetes mellitus, Dietary habits, Anthropometry

INTRODUCTION

India has an estimated 77 million people with diabetes, which makes it the second most affected in the world, after China. The worldwide prevalence was 9.2%. In India it is 8.9% as of 2020.One in six people (17%) in the world with diabetes is from India.1

Type 2 diabetes is a metabolic-cum-vascular syndrome characterized by predominant insulin resistance with varying degrees of insulin secretory defect. It is more common in overweight and obese individuals of middle to late age but is increasingly being seen in younger age groups and in those with lower BMI as well. The "Asian Indian phenotype" refers to a peculiar constellation of abnormalities in south Asians, whereby for any given level of body-mass index, they tend to have higher total body fat, visceral fat, insulin resistance and prevalence of diabetes compared to white Caucasians.[2]

A high saturated fat intake has been associated with a higher risk of impaired glucose tolerance, and higher fasting glucose and insulin levels. In many controlled experimental studies, high intakes of dietary fibres have been shown to result in reduced blood glucose and insulin levels in people with type 2 diabetes and impaired glucose tolerance.[3] While recognizing an increasing prevalence of diabetes in urban population, the present study was conducted to know the prevalence of diabetes mellitus so that possible efforts can be made to reduce burden of the disease.

Aims and objectives

The aim and objectives of the study were to determine the prevalence of type-II DM in relation to dietary habits among adult population of urban Meerut. To study anthropometric status associated with type-II DM.

METHODS

Study area

Urban health and training centre (UHTC) Surajkund that have ten localities, and is a field practice area of L.L.R.M. medical college Meerut.

Study design

Study design was community based cross-sectional study.

Study period

The study conducted from November 2019 to October 2020 for a period of 1 year.

Sample size

Taking prevalence 11.1% and absolute precision as 2.5%, sample size for the study was calculated as was calculated using formula $n=(1.96)^2 \ pq/d^2$. Where, n=sample size, d=p=prevalence, q=(1-p). Sample size was calculated to be 606. Taking 10% non-respondents, sample size came to be 667 which is approximated to 670.

Inclusion criteria

All males and females of age 30 years and above were included in the study.

Exclusion criteria

Individuals not willing or severely ill were excluded from the study.

Sampling method

This study was conducted by house to house visit in the selected locality. Sampled population was taken equally among all the ten localities. From each of ten localities, sixty-seven adults aged thirty years and above were surveyed. After selection of area, pencil was dropped and the direction of pencil pointing towards the house was chosen as first house and the next adjacent houses were visited continuously without leaving a single house until the desired number of study subjects was covered. In every house, there were two house visits carried out in each family. First to collect the information pertaining to socio-demographic characteristics and other factors associated with diabetes on pretested and pre designed questionnaire. Second visit was done on the next day early morning for doing fasting blood sugar of the study subject using glucometer. Every individual was be interviewed and general physical examination was done along with anthropometric measurements. This information was filled on pretested and pre designed questionnaire and data was entered in MS excel sheet and was analysed using Epi info7.

RESULTS

Prevalence of diabetes mellitus in the present study was found to be 13.1%. Among the total diabetics, 10% were known diabetics 3.1% were newly diagnosed diabetics.

Diet type and diabetes mellitus

It is clear that given below that 56.3% of study population were non-vegetarians and 43.7% were vegetarians.

When prevalence of DM in relation to the type of diet was observed, it was more among those who were non vegetarians (17.8%) while it was only 7.2 percentage among those who were vegetarians and the difference was found to be statistically significant (p<0.05) (Table 1).

Table 1: Prevalence of DM among the study population in relation to dietary habit.

| Type of diet | Diabetes mellitus | | | | Total | |
| | Present | | Absent | | | |
	No.	Percentage (%)	No.	Percentage (%)	No.	Percentage (%)
Non-vegetarian	67	17.8	310	82.2	377	56.3
Vegetarian	21	7.2	272	92.8	293	43.7
Total	88	13.1	582	86.9	670	100.0

$X^2=16.25$, df=1, p=0.00

Type of fat consumed and diabetes mellitus

Table shows distribution in relation to type of fat consumed among study population. It was observed that 44.1% were consuming unsaturated fat more while 37.5% consumed more saturated fat and rest 18.4% consumed both saturated and unsaturated fat almost equally.

Figure 1 reveals that, the prevalence of diabetes was highest among those who consumed saturated fat 19.1% followed by 12.2% in those who consumed both type of fat minimum prevalence was observed among those who used to consume unsaturated fat (8.4%) and the prevalence of diabetes in relation to the type of fat

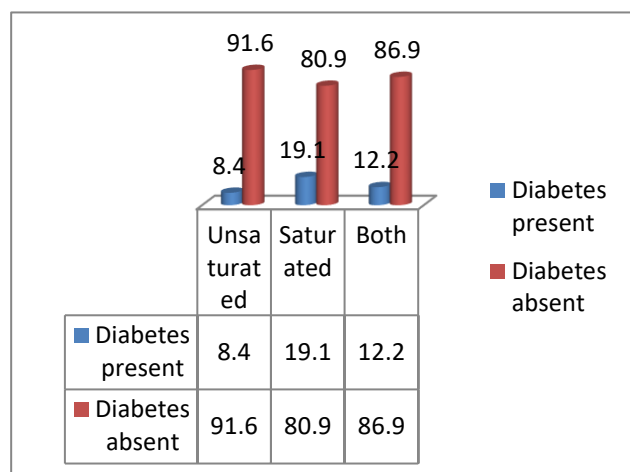consumed show statistically significant association (X^2=13.25, df=2, p=0.001).

Figure 1: Prevalence of DM among the study population in relation to type of fat consumed.

Calorie intake and diabetes

Table 2 shows the distribution of study subjects in relation to the calorie intake. 49.1% of the study subjects was having normal calorie intake, 20.6% were having

calorie intake in excess and 30.3% were having deficient calorie intake.

As shown in Table 2, prevalence of diabetes was more among study subjects having calorie intake in excess (26.4%) followed by 11.5 % in those who have normal calorie intake and was 6.3% in those who were having calorie deficient diet. The prevalence of diabetes in relation to calorie intake show statistically significant association (p<0.05).

Diabetes mellitus and waist-hip ratio

It was observed 52.8% of the study population had waist-hip ratio within normal, while 47.2% were having waist-hip ratio high.

Table 3 reveals prevalence of DM in relation to WHR was more among those who were having high waist-hip ratio (16.1%) while it was 10.4% among those who were having waist-hip ratio in normal range and the difference was found to be statistically significant (p<0.05).

Table given below shows that among the study population, 33.6% of study subjects were overweight, 25.6% were having BMI normal range, 24% were underweight and the rest 16.8% were obese.

Table 2: Prevalence of DM among the study population in relation to calorie.

| Calorie intake | Diabetes mellitus | | | | Total | |
| | Present | | Absent | | | |
	No.	Percentage (%)	No.	Percentage (%)	No.	Percentage (%)
Normal	38	11.5	291	88.5	329	49.1
Deficient	13	6.3	188	93.7	204	30.3
Excess	37	26.4	103	73.6	140	20.6
Total	88	13.1	582	86.9	670	100

X^2= 30.24, df=2, p=0.00

Table 3: Prevalence of DM among the study population in relation to waist-hip ratio.

| Waist-hip ratio | Diabetes mellitus | | | | Total | |
| | Present | | Absent | | | |
	No.	Percentage (%)	No.	Percentage (%)	No.	Percentage (%)
Normal	37	10.4	317	89.6	354	52.8
High	51	16.1	265	83.9	316	47.2
Total	88	13.1	582	86.9	670	100

X^2= 4.73, df=1, p=0.02

Table 4: Prevalence of DM among the study population in relation to body mass index (BMI).

| Body mass index | Diabetes mellitus | | | | Total | |
| | Present | | Absent | | | |
	No.	Percentage (%)	No.	Percentage (%)	No.	Percentage (%)
Underweight	5	3.1	156	96.9	161	24.0
Normal	18	10.5	153	89.5	171	25.5
Overweight	28	12.4	197	87.6	225	33.5
Obese	37	32.7	76	67.3	113	16.8
Total	88	13.1	582	86.9	670	100

X^2= 58.71, df=3, p=0.00

As shown in Table 4, the prevalence of diabetes was highest among those who were obese (32.7%) followed by overweight (12.4%), normal BMI (10.5%) and underweight 3%. The prevalence of diabetes in relation to the body mass index show statistically significant association (p<0.05).

DISCUSSION

In the present study, 56.3% of study population were non-vegetarians and 43.7% were vegetarians and prevalence of DM in relation to the type of diet was maximum among those who were non vegetarians (17.8%) while it was only 7.2% among vegetarians and the difference was found to be statistically significant (p<0.05). Jha Kant et al.[4] Reported in their study that 64% of the total study subjects were non-vegetarian. Among non-vegetarian group 19.80% and 11.08% were pre-diabetic and diabetic respectively. The association of pre- diabetes and diabetes with non-vegetarian diet was found to be statistically significant. Ameesh et al observed that the participants having non-vegetarian diet showed higher risk of diabetes mellitus type-2 when compare with vegetarian diet.[5]

In the present study, prevalence of diabetes was highest among those who consumed saturated fat 19.1% followed by 12.2% and 8.4% in those who consumed both type of fat and unsaturated fat respectively and the prevalence of diabetes in relation to the type of fat consumed show statistically significant association (p>0.05). The findings are in consistent with the study done by Tribhuvan et al and Hu et al and found a positive association of prevalence of diabetes in relation to type of fat consumed.[6,7] This may be probably due to early introduction of fatty and junk foods leading to child overweight and obesity that might cause them to be inactive and more susceptible and prone to becoming victims to diabetes mellitus type-2.

In the present study, the prevalence of diabetes was highest among study subjects having calorie intake in excess 26.4% followed by 11.5% in those who have normal calorie intake and was 6.3% in those who were having calorie deficient diet. The prevalence of diabetes in relation to calorie intake show statistically significant association (p>0.05). No available data could be traced from available studies. Knowler et al in his study observed that calorie-restriction promote weight-loss, significantly reduced conversion to diabetes among high-risk patients with impaired glucose tolerance by 58%.

In the present study, 52.8% of the study population had WHR within normal, while 47.2% were having waist-hip ratio high. Prevalence of DM type-2 was more (16.1%) among those who have high WHR and was less (10.4%) among those who have normal WHR. The findings of the study were consistent with that of the study conducted by Ramchandran et al in which waist-hip ratio (>0.9 in men and >0.8 in women) was reported high (50.3%) and the prevalence of diabetes was 65.2%. Similar findings were reported by Vishwanath et al in which 55.2% diabetics were having increased WHR.[9,10] Singh et al conducted a study and found that prevalence of DM was higher (18.3%) among those having higher WHR as compared to the normal WHR category (14.0%). However, this difference is statistically insignificant.

In the present study, the prevalence of diabetes was highest among those who were obese 32.7% followed by overweight 12.4%, normal BMI 10.5% and 3% were underweight. The prevalence of diabetes in relation to the body mass index show statistically significant association (p>0.05). Obesity is a risk factor of DM type-2 and main cause of insulin resistance as seen in this study also. The findings were in line with the study conducted by Arora et al in which prevalence of diabetes increased from 9.4% among underweight to the level of 27.2% in normal, 36.6% in overweight participants and among obese participants at 48.0%.[11] This finding was also supported by the study conducted by Babu et al, Gopalakrishnan et al, Aravinda et al who found that obesity is significant risk factors for type 2 diabetes mellitus.[12-14]

CONCLUSION

When prevalence of DM in relation to the type of diet was observed, it was more among those who were non vegetarians and the difference was found to be statistically significant. In the present study, the prevalence of diabetes was highest among those who consumed saturated fat. Prevalence of diabetes was more among study subjects having calorie intake in excess followed by those who have normal calorie intake. Prevalence of DM in relation to WHR was maximum among those who were having waist-hip ratio more than one and the difference was found to be statistically significant. The prevalence of diabetes was highest among those who were obese followed by overweight, normal BMI and underweight. The prevalence of diabetes in relation to the body mass index show statistically significant association.

Recommendations

Based on the findings of the present study, the following recommendations are being made: Study revealed unhealthy dietary habits in relation to high prevalence of diabetes further play a very important role in causation of chronic disease. So, healthy and balanced diet should be encouraged. They should be encouraged to use healthy oils like olive oil, sunflower oil, safflower oil, mustard oil and avoid using saturated fatty acids and trans fatty acids as they are risk factors for diabetes mellitus. Calorie dense food should be avoided. In the present study it is recommended that high BMI and WHR had higher DM, so people should be made aware and motivated for adapting healthy lifestyle and habits like regular exercise, yoga and weight reduction to promote health and live a long and disease-free life specially for those who are having high BMI and high WHR.

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