Original Research Article

Study on Dietary Pattern of Selected Diabetic Patients

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ABSTRACT

Diabetes mellitus type 2 (DM2) is a metabolic disorder of multiple etiologies due to disturbances of carbohydrate, fat, and protein metabolism. It is characterized by chronic hyperglycemia associated with cardiovascular and renal complications. These complications result in diminished quality of life and reduced life expectancy. The present study has been aimed to observe the dietary pattern of 100 clinically diagnosed diabetic patients belonging to different areas of Jammu who were visiting Government Medical Hospital for the treatment of the disease. The information on dietary pattern of the diabetics included type of diet, frequency of non-vegetarian / ovo vegetarian diet, consumption of artificial sweeteners, junk foods, sweets, table sugar, fried foods, extra salt intake and type of milk consumed. The present study findings suggest that the diabetic patients in majority were taking vegetarian diet while those who were consuming Non-vegetarian / Ovo-vegetarian diet, junk foods, sweets, fried foods were taking it occasionally only. The diabetics in majority were found to be regular consumers of artificial sweeteners and the consumption of 1-2 teaspoons of table sugar has been recorded among both male and female diabetic patients while they were not in habit of sprinkling extra salt in their foods. The regular consumption of refined oil and double toned milk has also been found among majority of the diabetic patients.

Keywords: Diabetes Mellitus, glycemic index, Dietary pattern, DASH diet, Diabesity

INTRODUCTION AND REVIEW OF LITERATURE

Diabetes places a considerable economic burden on worldwide healthcare resources. The estimated number of deaths due to diabetes is similar to the combined number of deaths from several infectious diseases such as human immunodeficiency virus (HIV) / AIDS, malaria, and tuberculosis. The role of Indian diet in contributing diabetes in the country is not yet understood. Indian diet generally consists of high intake of whole grains, legumes, nuts and seeds and diary and spices. It is suggested that the intake of divergent vegetarian diet such as lacto-vegetarian and lacto-ovo vegetarian were blended with at least 30 per cent lower risk of diabetes. [1] Studies have shown that plant-based dietary patterns or diets restricted in animal products are associated with both lower cardio-metabolic risk and lower coronary heart disease, diabetes, cardiovascular disease and certain types of cancers. [2] A low fiber diet with a high glycemic index has been associated with an increased risk of diabetes and specific dietary fatty acids may differentially affect insulin resistance and the risk of diabetes. It is also known that dietary habits along with other factors play an important role in the development of diabetes. Diet constitutes a

crucial aspect of the overall management of diabetes, which may involve diet alone, diet with oral hypoglycemic drugs, or diet with insulin.

Diets rich in whole grains, fruits, vegetables, legumes, nuts, moderate in alcohol consumption, and lower in refined grains, red/processed meats, and sugar-sweetened beverages have demonstrated to reduce diabetes risk and improve glycemic control and blood lipids in patients with diabetes. Adherence to the Dietary Approaches to Stop Hypertension (DASH) diet, which is a dietary plan rich in vegetables, fruits, and low-fat dairy products, was also associated with lower diabetes risk. Vegetarian diets devoid in animal products were demonstrated to reduce diabetes risk. [3] Obesity plays forms a rationale for obesity management in adults with diabesity. In addition to reducing the likelihood of developing T2DM in those with obesity, weight loss also has a beneficial impact on glycemic control and other metabolic features in diabesity. [4] It is recommended that the daily energy intake for non-obese patients should be in between 1500 and 2500 calories per day and the medium allocation should be 200 kilo calories per day. But for overweight diabetics falls between 800 and 1500 kilo calories per day and for underweight individuals should be at least 2500 kilo calories per day. The dietary pattern helps in lowering the risk of developing T2DM which insist on the consumption of fat taken from food that are rich in unsaturated fatty acids, daily intake of fruits, vegetables, low fat dairy products and whole grains, (prudent dietary pattern),low consumption of fish, poultry, tree nuts, legumes and very rare consumption of red meat (conservative pattern). The diet has a major impact on human health and act beneficially against the development of T2DM, including reduced oxidative stress and insulin resistance. [5] More intake of vegetables, fruits, legumes, nuts, cereals, nuts and oil leads to a high ratio of unsaturated fatty acids to saturated fatty, a low intake of trans fatty acids, and high intake of dietary fiber, antioxidants, polyphenols. Such diet characterizing low density of energy helps in preventing weight gain and progression of T2DM. Greater amalgamation of diet with lighter physical activity was intimated with lowering the development of diabetes and associated risk factors. [6] Abstain eating of animal products containing fat especially saturated, because it leads to heart disease, insulin resistance and hence ,a vegan diet-not contain any animal product should be taken. [7] The processed foods containing high salt are also avoided because it leads to hypertension which is a risk factor of diabetes. Dairy products should be taken less than 1 per cent fat and cheese should be of 10-20 per cent Milk fat. Other foods and fats like olive oil, soybean, and sunflower oil should be taken 3 tbsp. or less per day. [7] Swallowing of sugar-sweetened beverages (SSBs) including soft drinks (soda), fruit drinks and energy and vitamin water drinks has been slowly increasing to various levels on the world. [8] It is estimated that the consumption of SSBs in U.S will be increased from 64.4 to 14.17 kilo calorie/day. [9] It is also evident that continuous or addicted consumption of SSBs lead to T2DM. [10] A study in 2013 showed that both sugar-sweetened beverages and artificially sweetened beverages were responsible for causing the increase in risks of T2DM. [11] Epidemiological studies suggested that high intake of saturated fat is associated with the risk of IGT and increased fasting glucose and insulin levels. The higher proportion of saturated fatty acids in serum lipids or phospholipids in muscles associated with higher fasting insulin levels would reduce insulin sensitivity and increase the risk of type 2 diabetes. [12]

MATERIALS AND METHODS

The present study has been aimed to observe the dietary pattern of 100 clinically diagnosed diabetic patients belonging to different areas of Jammu who were visiting Government Medical Hospital for the

treatment of the disease. The information on dietary pattern of the diabetics included type of diet, frequency of non-vegetarian / ovo vegetarian diet, consumption of artificial sweeteners, junk foods, sweets, table sugar, fried foods, extra salt intake and type of milk consumed. The questionnaire was developed to collect the information on dietary pattern of selected diabetic patients. The collected information has been recorded on the pre-printed Performa for each patient. The collected information has been comprehended and put to statistical analysis using chi-square test.

RESULTS AND DISCUSSION

Table 1: Distribution of selected patients on the basis of Type of Diet Consumed

Diet Type	Total No. of Patients	Males	Females
Vegetarian	46	11(26.83)	35(59.32)
Non-vegetarian	30	21(51.22)	9(15.25)
Ovo-vegetarian	24	9(21.95)	15(25.43)
Total	100	41(100.00)	59(100.00)
Chi-square value =8.44 p<0.05 Significant			

Table 1 shows that majority of the diabetic patients i.e. 46.00 per cent were habitual of taking vegetarian diet followed by 30.00 per cent patients who were taking non-vegetarian diet. While the remaining 24.00 per cent of them were having ovo-vegetarian diet. Among males, majority of patients i.e. 51.22 per cent were habitual of taking non-vegetarian diet followed by 26.83 per cent patients who were taking vegetarian diet. 21.95 per cent patients were taking ovo-vegetarian diet. Among females, majority of patients i.e. 59.32 per cent had the habit of taking vegetarian diet followed by 25.43 per cent patients who were taking ovo-vegetarian diet. While the rest 15.25 per cent of patients were habitual of taking non-vegetarian diet. The chi-square value shows the statistically significant association between type of diet consumed among male and female diabetic patients. From the present study it has been observed that diabetic patients in majority were vegetarians. However, according to another study, variants of vegetarian diets such as lacto-vegetarian and lacto-ovo vegetarian were associated with at least a 30% lower risk of diabetes as compared with those consuming non-vegetarian diet after adjustment for a number of socioeconomic and lifestyle factors. [13]

Table 2: Distribution of selected patients on the basis of Frequency of Non-Vegetarian or Ovo- Vegetarian Diet

Frequency of Non-Veg or Ovo-Veg Diet	Total No. of Patients	Males	Females
Occasionally	40(74.07)	25(83.33)	15(62.50)
Twice a week	5(9.26)	2(6.67)	3(12.50)
Once a week	8(14.82)	3(10.00)	5(20.83)
Daily	1(1.85)	0(0.00)	1(4.17)
Total	54(100.00)	30(100.00)	24(100.00)
Chi-square value =6.21 p<0.05 Significant			

It has been shown from Table 2 that majority of the diabetic patients i.e. 74.07 per cent were habitual of taking non-vegetarian or ovo-vegetarian diet occasionally followed by 14.82 per cent patients who were taking the same type of diet, once in a week. 9.26 per cent patients had taken non-vegetarian or ovo-vegetarian diet, twice in a week followed by 1.85 per cent patients who were taking the non-vegetarian or ovo-vegetarian diet daily. Among males, majority of the patients i.e. 83.33 per cent were habitual of taking non-vegetarian or ovo-vegetarian diet occasionally followed by 10.00 per cent patients who were taking the same type of diet, once in a week. 6.67 per cent patients had taken non-vegetarian or ovo-vegetarian diet, twice in a week. None of the male patients had taken non-vegetarian or ovo-vegetarian diet daily. Among females, majority of patients i.e. 62.50 per cent were habitual of taking non-vegetarian or ovo-vegetarian diet occasionally followed by 20.83 per cent patients who were taking the same type of diet, once in a week. 12.50 per cent patients were taking non-vegetarian or ovo-vegetarian diet, twice in a week followed by 4.17 per cent patients who were taking the non-vegetarian or ovo-vegetarian

diet daily. The chi-square test reflects the statistically significant association between frequency of non-vegetarian or ovo-vegetarian diet among male and female diabetic patients. Thus, it is concluded from the present study results that majority of the diabetic patients were taking ovo-vegetarian or non-vegetarian diet occasionally, to control their blood glucose level.

Table 3: Distribution of selected patients on the basis of Consumption of Artificial Sweeteners

Artificial Sweeteners	Total No. of Patients	Males	Females
Yes	33	16(39.02)	17(28.81)
No	67	25(60.98)	42(71.19)
Total	100	41(100.00)	59(100.00)

It has been observed from Table 3 that majority of the diabetic patients i.e. 67.00 per cent were not habitual of taking artificial sweeteners while 33.00 per cent of them were taking artificial sweeteners. Among males, majority of the patients i.e. 60.98 per cent were not taking any artificial sweeteners however 39.02 per cent of the patients who were found to be habitual of taking artificial sweeteners. Among females, majority of the patients i.e. 71.19 do not have habit of taking artificial sweeteners while 28.81 per cent of the females were taking artificial sweeteners regularly. Thus, it is analyzed from the present study results that 33.00 per cent of the patients were in habit of consuming artificial sweeteners.

Table 4: Distribution of selected patients on the basis of Frequency of Consumption of Artificial Sweeteners

Frequency of Artificial Sweeteners	Total No. of Patients	Males	Females
Occasionally	14(42.42)	8(50.00)	6(35.29)
Daily	19(57.58)	8(50.00)	11(64.71)
Total	33(100.00)	16(100.00)	17(100.00)
Chi-square value =3.52 p<0.05 Non-Significant			

Table 4 shows that majority of the diabetic patients i.e. 57.58 per cent were habitual of taking artificial sweeteners daily while 42.42 per cent patients were taking artificial sweeteners occasionally. Among males, majority of the patients i.e. 50.00 per cent were habitual of taking artificial sweeteners daily and 50.00 per cent of them were found to be habitual of taking artificial sweeteners occasionally. Among females,

majority of the patients i.e. 64.71 per cent were habitual of taking artificial sweeteners daily while the rest 35.29 per cent of them were taking it occasionally only. The chi-square value reflects the statistically non-significant association between the frequency of artificial sweeteners consumption among both male and female diabetic patients. It has been shown from the present study results that 33.00 per cent of diabetic patients were habitual of taking artificial sweeteners and among them majority were taking it daily. Cohort studies in adults have shown associations between artificial sweetener intake and incidence of the metabolic syndrome and its components, including waist circumference, blood pressure, and fasting blood glucose. Some studies in adults have demonstrated links between artificial sweetener consumption and insulin resistance, incidence of type 2 diabetes, and poor glucose control in patients with pre-existing diabetes, while others have found no association with diabetes incidence or glycemia control. [14]

Table 5: Distribution of selected patients on the basis of Consumption of Junk Foods

Junk Foods	Total No. of Patients	Males	Females
Yes	15	1(2.44)	14(23.73)
No	85	40(97.56)	45(76.27)
Total	100	41(100.00)	59(100.00)

It has been observed from Table 5 that majority of the diabetic patients i.e. 85.00 per cent were not habitual of taking junk foods while 15.00 per cent of them were taking junk foods. Among males, majority of the patients i.e. 97.56 per cent were not in habit of taking junk foods while 2.44 per cent patients who were found to be habitual of taking junk foods. Among females, majority of the diabetic patients i.e. 76.27 per cent do not have the habit of taking junk foods and 23.73 per cent of them were habitual of taking junk foods. Thus, it has been observed that only 15.00 per cent of the selected diabetic patients were found to be habitual of taking junk foods.

Table 6: Distribution of selected patients on the basis of Frequency of Junk Food Consumption

Frequency of Junk Food	Total No. of Patients	Males	Females
Occasionally	13(86.67)	1(100)	12(85.72)
Twice a week	2(13.33)	0(0.00)	2(14.28)
Total	15(100.00)	1(100.00)	14(100.00)
Chi-square value =1.78 p<0.05 Non-Significant			

Table 6 reveals that majority of the diabetic patients i.e. 86.67 per cent were habitual of taking junk foods occasionally and 13.33 per cent of them were taking the same type of foods, twice in a week. Among males, majority of the patients i.e. 100.00 per cent patients had the habit of taking Junk foods occasionally. None of the male patients were taking junk foods, twice in a week. Among females, majority of the patients i.e. 85.72 per cent were habitual of taking junk foods occasionally and 14.28 per cent of them were taking it, twice in a week. However none of the diabetics selected for the present study was found to be habitual of having junk foods more frequently. The association between frequency of junk food consumption among diabetic males and females was found to be statistically non-significant.

Thus it is concluded from the present study results that, 15.00 per cent of diabetic patients were taking junk foods. Junk foods as pizza, burger, fried chicken, and chips usually has high amount of saturated fats which put people on being overweight, a risk factor for diabetes. [15] However, it is also analyzed from the present study observations that majority of patients were taking it occasionally. It is predicted by various investigators from the Singapore Chinese Health Study that who ate western style fast foods more than twice a week had 27.00 per cent increased risk of developing type 2 diabetes. [16]

Table 7: Distribution of selected patients on the basis of Sweets Consumption

Consumption of Sweets	Total No. of Patients	Males	Females
Yes	19	8(19.51)	11(18.64)
No	81	33(80.49)	48(81.36)
Total	100	41(100.00)	59(100.00)

It is revealed from Table 7 that majority of the diabetic patients i.e. 81.00 per cent were not habitual of taking sweets while 19.00 per cent of them were found to be habitual of taking sweets. Among males, majority of the patients i.e. 80.49 per cent were not taking sweets and 19.51 per cent of them were having the habit of taking sweets. Among females, majority of the patients i.e. 81.36 per cent do not have the habit of taking sweets while the remaining 18.64 per cent female diabetics were also have the habit of taking sweets. Thus, it is concluded from the present study results that only 19.00 per cent of the selected diabetic patients were in habit of taking sweets.

Table 8: Distribution of selected patients on the basis of Frequency of Sweets Consumption

Frequency of Sweets Consumption	Total No. of Patients	Males	Females
Occasionally	18(94.74)	7(87.50)	11(100.00)
Twice in a week	1(5.26)	1(12.50)	0(0.00)
Total	19(100.00)	8(100.00)	11(100.00)
Chi-square value =2.58 p<0.05 Non-significant			

It is depicted from the Table 8 that majority (94.74 per cent) of diabetic patients were taking sweets occasionally while the rest of 5.26 per cent patients were the habit of taking it, twice in a week. Among males, majorities i.e. 87.50 per cent have been taking sweets occasionally and 12.50 per cent patients were taking sweets, twice in a week. Among females, all the diabetics were found to be habitual of consuming sweets occasionally and none of them was taking it more frequently such as twice a week. The chi-square value shows the statistically non-significant association between frequency of sweets consumption among male and female diabetic patients. It has been shown from the present study results that majority of diabetic patients were taking sweets occasionally. It was suggested that excessive consumption of sugary foods along with increased fat consumption, especially saturated fats is leading the Indian population to obesity, which is a primary factor behind type 2 diabetes. [17]

Table 9: Distribution of selected patients on the basis of Frequency of Daily Intake of Table Sugar

Frequency of Sugar Intake	Total No. of Patients	Males	Females
1-2 tbsp.	21(77.78)	12(80.00)	9(75.00)
2-3 tbsp.	6(22.22)	3(20.00)	3(25.00)
Total	27(100.00)	15(100.00)	12(100.00)
Chi square value =1.36 p<0.05 Non-significant			

Table 9 shows that majority of the diabetic patients i.e. 77.78 per cent were taking 1-2 tbsp. of sugar while 22.22 per cent of them were taking 2-3 tbsp. of sugar. Among males, majority of the patients i.e. 80.00 per cent were taking 1-2 tbsp. of sugar and the rest 20.00 per cent of them were taking 2-3 tbsp. of sugar daily. Among females also, majority i.e. 75.00 per cent were taking 1-2 tbsp. of sugar while 25.00 per cent diabetic females were taking 2-3 tbsp. of sugar daily. The association between the frequency of daily intake of table sugar among diabetic males and females has been found to be statistically non -significant. It is concluded from the present study results that only 21.00 per cent diabetic patients were found to be taking table sugar in their diet and among them majority were taking 1-2 tbsp. of sugar in their diet. However, it was suggested that excessive sugar intake may be a primary and independent cause of rising diabetes rates. [18] While reduced sugar exposure was associated with decline in diabetes prevalence. [19]

Table 10: Distribution of selected patients on the basis of Intake of Fried Foods

Fried Foods Intake	Total No. of Patients	Males	Females
Yes	18	9(21.95)	9(15.25)
No	82	32(78.05)	50(84.75)
Total	100	41(100.00)	59(100.00)

From the Table 10 it is depicted that majority (82.00 per cent) of the diabetic patients were not habitual of taking fried foods while 18.00 per cent of them were taking fried foods. Among males, majority of the patients i.e. 78.05 per cent were not in habit of taking fried foods and 21.95 per cent of them were taking fried foods. Among females, majority of the patients i.e. 84.75 per cent were not habitual of taking

fried foods. Only 15.25 per cent of the diabetic females were in habit of taking fried foods. It is observed from the present study findings that only 18.00 per cent diabetics were habitual of taking fried foods. It has been found that higher intake of vegetable fat and PUFA reduces the risk of type 2 diabetes as well as decreased fasting plasma glucose concentration and the two-hour glucose concentration. [12]

Table 11: Distribution of selected patients on the basis of Frequency of Fried Foods

Frequency of Fried Food	Total No. of Patients	Males	Females
Occasionally	16(88.90)	9(100)	7(77.78)
Once a week	1(5.55)	0(0.00)	1(11.11)
Daily	1(5.55)	0(0.00)	1(11.11)
Total	18(100.00)	9(100.00)	9(100.00)
Chi-square value =5.21 p<0.05 Non-Significant			

Table 11 reveals that majority of the diabetic patients i.e. 88.90 per cent patients were taking fried foods occasionally. 5.55 per cent patients were taking fried foods, once in a week. Another 5.55 per cent were consumed it daily. Among males, majority of the patients i.e. 100.00 per cent were taking the same type of foods occasionally. None of the male patients were taking fried foods once and daily in a week. Among females also majority of patients i.e. 77.78 per cent were taking fried foods occasionally followed by 11.11 per cent patients who were taking fried foods once in a week. While the rest 11.11 per cent of the patients were taking it daily. The chi-square value reflects the statistically non-significant association between the frequency of fried foods consumption among both male and female diabetic patients. It is predicted from the present study that majority of the diabetic patients i.e. 88.90 per cent were taking fried foods occasionally in order to control their blood glucose level. According to study participants who had consumed fried foods once per week or 1-3, 4-6 and greater than 7 times per week show higher risk for type 2 diabetes. [16]

It has been observed from Table 12 that majority of the diabetic patients i.e. 91.00 per cent were not habitual of

sprinkling extra salt in their foods while 9.00 per cent of them were sprinkling extra salt in their foods. Among males, majority of the patients i.e. 87.81 per cent were not sprinkling extra salt in their foods and 12.19 per cent were sprinkling extra salt in their foods.

Table 12: Distribution of selected patients on the basis of Extra Salt Intake

Extra Salt Intake	Total No. of Patients	Males	Females
Yes	9	5(12.19)	4(6.78)
No	91	36(87.81)	55(93.22)
Total	100	41(100.00)	59(100.00)
Chi-square value =7.08 p<0.05 Non-significant			

Among females, majority of the patients i.e. 93.22 do not sprinkling extra salt in their foods while the rest 6.78 per cent diabetic females were sprinkling extra salt in their foods. The association between extra salt intake among diabetic males and females has been found to be statistically non-significant. Males were found to be more in number than females who were habitual of sprinkling extra salt in their foods. According to study which reported that diabetes mellitus was found to be more prevalent among those patients who were sprinkling extra salt in their foods. [20]

Table 13: Distribution of selected patients on the basis of Consumption of Fat/Oil

Type of Oil/Fat	Total No. of Patients	Males	Females
Mustard oil	43	19(46.34)	24(40.68)
Refined oil	57	22(53.66)	35(59.32)
Desi ghee	0	0(0.00)	0(0.00)
Dalda	0	0(0.00)	0(0.00)
Total	100	41(100.00)	59(100.00)
Chi-square value =3.88 p <0.05 Non-significant			

Table 13 shows that majority of the diabetic patients i.e. 57.00 per cent were consuming refined oil and 43.00 per cent of them were consuming mustard oil. None of the patients were consuming Desi ghee and Dalda. Among males, majority of patients i.e. 53.66 per cent were taking refined oil and 46.34 per cent were taking mustard oil. None of the male patients were taking Desi ghee and Dalda. Among females, majority of patients i.e. 59.32 per cent were habitual of taking refined oil and 40.68 per cent of

them were taking mustard oil. None of the females diabetics were taking Desi ghee and Dalda. The chi-square value show the association between type of oil is being consumed by both male and female diabetic patients was found to be statistically non-significant. The present study findings revealed that the majority of the diabetic patients were habitual of consuming refined oil however it was found in study that majority of diabetic patients were using mustard oil only as a medium of cooking. [21]

It is depicted from Table 14 that majority (88.66 per cent) were habitual of consuming double toned milk while 11.35 per cent of them were consuming toned milk. Among males, majority of the patients i.e. 82.50 per cent were taking double toned milk and 17.50 per cent were consuming toned milk. Among females, majority of the patients i.e. 92.98 per cent were consuming double toned milk. Only 7.02 per cent of the female diabetics were consuming toned milk.

Table 14: Distribution of selected patients on the basis of Type of Milk Consumed

Type of Milk Consumed	Total No. of Patients	Males	Females
Toned milk	11(11.35)	7(17.5)	4(7.02)
Double toned milk	86(88.66)	33(82.5)	53(92.98)
Total	97(100.00)	40(100.00)	57(100.00)
Chi-square value =6.58 p<0.05 Significant			

The chi-square value shows the statistically significant association between types of milk is being consumed among male and female diabetic patients. The present study findings are similar to the observations of another study which also reported that the majority of diabetic patients prefer to take double toned (skimmed or low fat) milk instead of toned (full cream) milk. [22]

CONCLUSION

It can be concluded from the present study findings that the dietary habits such as intake of non-vegetarian or ovo- vegetarian diet and milk consumption might be a contributing factor for increasing blood glucose level among the type 2 diabetic

patients. The diabetic patients in majority were taking vegetarian diet while those who were consuming Non-vegetarian / Ovo-vegetarian diet, junk foods, sweets, fried foods were taking it occasionally only. The diabetics in majority were found to be regular consumers of artificial sweeteners and the consumption of 1-2 teaspoons of table sugar has been recorded among both male and female diabetic patients while they were not in habit of sprinkling extra salt in their foods. The regular consumption of refined oil and double toned milk has also been found among majority of the diabetic patients.

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