# Dietary Pattern and Nutrient Intake of Selected Type 2 Diabetic Subjects

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**Abstract:** *The purpose of the study was to assess the dietary practices and evaluate the nutrient intake of selected type 2 diabetic subjects. Total 160 type 2 diabetics were recruited for the study. Data on sociodemographic profile, nutritional andbiochemical assessment, dietary intake and other supportive information were collected using a specially designed questionnaireschedule. Dietary habits of the subjects revealed maximum male subjects as non vegetarians and female subjects as vegetarians. Eating out habit was found more in male subjects. The more percentages of female subjects were observing fast.The frequency of consuming salads was less among female subjects than male subjects. The majority of the subjects were consuming fruits occasionally. The mean nutrient intake of male subjects compared to RDA was marginally excess (1%) for protein intake, high (39.12%) for visible fat intake and deficit (15.89%) for intake of energy. The mean nutrient intake of female subjects ascompared to RDA was deficit for protein and energy intake (10.87% and 11.83% respectively). The visible fat intake was however found in excess as compared to RDA (58.35%). Statistical analysis revealed a significant difference between the mean nutrient intake of male and female subjects.*

**Keywords:** Dietary pattern, nutrient intake, type 2 diabetes

## 1. Introduction

Diabetes Mellitus is a heterogeneous group of metabolic disorders characterized by chronic hyperglycemia with disturbances of carbohydrate, fat, and protein metabolism resulting from defects in insulin secretion, insulin action, or both. It is one of the most common metabolic disorders affecting humans and is known since ancient times.

According to World Health Organization, prevalence of diabetes has been rising more rapidly in low and middle income countries than in high income countries. Jaacks et al. (2016) focused the fact that nearly 415 million people around the world have diabetes (9% of adults) of which the vast majority live in low- and middle-income countries and this number is predicted to increase to 642 million people over the next decade. Diabetes is considered as a multifactorial disease which involves socioeconomic, demographic, environmental and genetic factors. Diabetes is thought to be a one of the greatest global health challenges.

Diet and exercise is the mainstay of diabetes management. Diets based on whole grains and vegetables are important for lowering the blood glucose levels. Various population studies were carried out in different parts of India about the adaptations of dietary modifications by the diabetics. Bisht et al. (2012) reported higher intake of fried foods, unrefined cereals and pulses, milk and milk products amongst type 2 diabetes males of Ludhiana City. Shrivastava et al. (2014) assessed dietary habits and lifestyle of 15 male and 45 female type 2 diabetics belonging to Rewa city and found the dietary habits unhealthy. Chacko M and Begum K (2016) extensively studied dietary practices of type 2 diabetics of Bangalore city and concluded that the subjects had poor dietary practices and consumed protective foods inadequately.

Patient education and diet counseling are integral part of the diabetes care which focuses on adopting correct dietary measures and lifestyle. Lack of awareness and several other factors influence the intake ofbalanced diet and nutrition in type 2 diabetics. Hence, the present study was taken up to assess the dietary practices and to evaluate the nutrient intake of the selected type 2 diabeticsubjects.

## 2. Methodology

The subjects selected for the study were known type 2 diabetics with stable lifestyle since three months at the entry level in the study. Total 160 type 2 diabetics were recruited as per the inclusion and exclusion criteria set for the selection of the subjects. Data on sociodemographic profile, nutritional assessment, biochemical assessment, dietary intake and other supportive information was collected from the subjects using a specially designed and pretested schedule.

Anthropometric measurements were taken using standardized techniques.Data relating to biochemical parameters like blood glucose levels and blood lipid profile was procured from hospital records. Necessary dietary information was collected and also data on dietary intake was collected by 24 hours diet recall method combined with food frequency method.The nutrients intake of individual subject was calculated. In the statistical analysis, percentage, mean and t value were calculated.

## 3. Results and Discussion

**Sociodemographic profile of the subjects**
Among the 160 type 2 diabetic subjects recruited for the study, 95 were male and 65 were female with the mean age 50.63±6.80and 51.43±7.08 respectively. For education, it

was found that male subjects were more educated than female subjects. Regarding occupation, 29.47 per cent male subjects were involved in business, 11.58 per cent in agricultural work, 9.47 were retired but majority of them 49.47 per cent were in service. All the female subjects recruited for the study were home managers. The mean family income of the male subjects was 36,958/- and of female subjects was 28,677/-. The majority of both male and female subjects belonged to nuclear family.Out of 160 subjects, highest 48.42 per cent male and 44.62 per cent female subjects belonged to semi urban area, 20 per cent male and 33.85 per cent female subjects belonged urban area and 31.58 per cent male and 21.54 per cent female subjects belonged to rural area.

### Disease related and lifestyle factors

Majority of the subjects had duration of diabetes ranging from 1to 5 years.Family history is a well-known risk factor for developing of type 2 diabetes and it was found that 60 per cent male subjects and 72.31 per cent female subjects had positive family history of diabetes. Data on exercise pattern which included walking, yoga and pranayama reflected that more male subjects were involved in all types exercises compared to female subjects. For addictions, it was observed that only male subjects had addictions for prohibited substances.

### Anthropometric and biochemical assessment

**Table 1:** Anthropometric data of the subjects

| Parameters | Male (N=95) | | Female (N=65) | |
|---|---|---|---|---|
| | Mean | Standard* | Mean | Standard* |
| Height (cm) | 167.02 | 165 | 156.24 | 152 |
| Weight (Kg) | 69.99 | 60 | 60.56 | 55 |
| BMI (Kg/m$^2$) | 25.07 | 18.5 - 22.9 | 24.77 | 18.5 - 22.9 |
| Waist (cm) | 91.97 | 90 | 92.0 | 80 |
| Hip (cm) | 91.25 | NA | 94.70 | NA |
| WHR | 1.00 | <0.95 | 0.94 | <0.80 |

*For standards
Mamidi et al 2011was referred for height standards
ICMR 2010 standards were referred for weight, waist and WHR
WHO cut off for Asians was referred for BMI

It is observed from the table 1 that mean anthropometric measurements of male and female subjects were more than their respective standards. Excluding height, increased weight, BMI, waist circumference and WHR were of great concern posing health risk. Body weight is the crucial factor in the diabetes as overweight and obesity are closely associated with incidence of type 2 diabetes. Also, researchers have demonstrated that upper body fat, particularly abdominal obesity computed by waist hip ratio is associated with high prevalence of diabetes.

In the biochemical assessment, for the glycemic profile, the mean fasting blood glucose level (mg/dL) of the male subjects (134.66±17.55) was higher than the female subjects (125.58±31.99). Similarly, the mean post prandial blood glucose level (mg/dL) was also found higher in the male subjects (239.93±54.72) than the female subjects (195.21±38.27). Glycosylated hemoglobin (HbA1c) concentration reflects time-averaged blood glucose during

the previous 2-3 months and is used as a gold standard for long term follow up of glycemic control. The mean HbA1c% of male subjects 8.37±1.5 was more than the female subjects (7.02±0.84). Overall, the mean values of fasting, post prandial blood glucose and HbA1c % of the subjects showed significant difference (p<0.05) and it revealed better glycemic control of the female subjects than the male subjects.

Diabetics are more prone for dyslipidemia which in turn possess higher risk for cardiovascular diseases. In the lipid profile, mean serum triglyceride levels (mg/dL) of the male and female subjects (136.18±27.36 and 135.36±29.93, respectively) were almost similar (p>0.05). Higher serum cholesterol level is associated with atherosclerosis and other metabolic complications in diabetes. The results indicated that majority of the subjects were within desirable range for serum cholesterol. However, mean serum cholesterol level (mg/dL) of both male and female subjects (175.63±34.76 and 160.15±30.39, respectively) were found significantly different (p<0.05) and depicted good control of female subjects than male subjects.

### Dietary Pattern and nutrient intake of the subjects

A higher percentage of male subjects, 52.62 per cent were non vegetarian whereas maximum 64.62 per cent female subjects were vegetarian. Majority of the male subjects took 4 meals per day whereas most of the female subjects took 3 meals per day.Most of the subjects followed fixed meal timings.Although higher percentage of subjects received diet counselling, those who did not receive diet counselling formed substantial percentages.A very high percentage of subjects reported no use of artificial sweeteners.Data on frequency of eating meals out of home revealed that eating out habit was found more in male subjects than female subjects.More percentages of female subjects were observing fast than male subjects.Most of subjects were using homemade flour than readymade flour and occasionallyusing multigrain flour. It was interesting to note that highest per cent of female subjects were taking tea without sugar whereas majority of male subjects 54.74 were taking tea with sugar. Among the cooking oils, Soybean oil was preferred by most of the subjects for cooking.

Frequency of consuming salads was less among female subjects than male subjects. Only 21.05 per cent male and 26.15 per cent female subjects were taking salad daily. The inclusion of sprouts was also found less. Male subjects 6.31 per cent and female subject only 1.53 per cent were taking sprouts daily. Regarding consumption of fruits, it was found that nearly same percentage of male and female subjects 4.21 and 4.61 respectively had frequency of consuming fruits daily whereas 22.1 per cent male and highest 35.38 percent female subjects were having fruits occasionally.Male subjects, 4.21 per cent were taking green leafy vegetables daily and 5.26 percent were taking occasionally. Among female subjects, none reported taking green leafy vegetables on daily basis, however, 24.61 per cent were taking 3-4 times/week and 4.61 percent were consuming occasionally.

**Table 3:** Mean nutrient intake of the subjects in comparison with RDA

| Nutrients | Male (Mean intake) | RDA* | Per cent excess /deficit | Female (Mean intake) | RDA** | Per cent excess /deficit |
|---|---|---|---|---|---|---|
| Protein (g) | 61.15 | 60 | +1.0 | 49.01 | 55 | -10.87 |
| Total Fat (g) | 58.49 | NA | NA | 53.34 | NA | NA |
| Visible Fat (g) | 34.78 | 25 | +39.12 | 31.67 | 20 | +58.35 |
| CHO (g) | 296.26 | NA | NA | 248.91 | NA | NA |
| Energy (kcal) | 1956.49 | 2320 | -15.89 | 1675.24 | 1900 | -11.83 |
| Fiber (g) | 11.06 | NA | NA | 9.78 | NA | NA |

*RDA for sedentary man, ICMR 2010, **RDA for sedentary woman, ICMR 2010

Mean nutrient intake of male subjects compared to RDA was marginally excess (1%) for protein intake, high (39.12%) for visible fat intake and deficit (15.89%) for intake of energy.Mean nutrient intake of female subjects when compared to RDA was deficit for protein and energy intake (10.87% and 11.83% respectively). The visible fat intake was however found in excess as compared to RDA (58.35%).Statistical analysis revealed significant difference between mean nutrient intake of male and female subjects.

The mean intake of all nutrients was higher in male subjects as compared to the female subjects. The calculated 't' value for mean nutrient intake of protein, fat (total and visible), carbohydrates, energy and fiber was higher than the critical value at $p<0.05$. Hence, a significant difference was found between mean nutrient intake of male and female subjects.

## 4. Conclusion

Sociodemographic information revealed good educational status and earning capacities of male subjects than female subjects. However, data related to dietary information, biochemical assessment and lifestyle factors indicated better compliance of female subjects than male subjects justifiably by older age, semi-urban locale, prevalent social norms and self-control. Anthropometric indices concerned with health issues were found high in both male and female subjects.The percentage of carbohydrates in the diets of subjects was found satisfactory but concerning issue about high fat percentage in comparison with protein and carbohydrates pointed towards the need for corrective dietary measures.

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