

Dietary Pattern and Anthropometric Dimensions of Middle Aged (40-60 Years) Type II Diabetes Subjects: Study Their Nutritional Status

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Abstract: Dietary patterns have shifted toward Westernized foods and people are becoming more sedentary resulting diabetes mellitus is a chronic disorder associated with derangements in carbohydrate, lipid and protein metabolism. About 30 diabetic subjects from Banasthali University, Rajasthan were selected aged between 40-60 years (17 females and 13 males) to understanding the pattern of dietary intake and anthropometric dimensions of the middle aged diabetic subjects. Diabetic, dietary and other information's was collected using a questionnaire. Dietary intake was assessed using the 24 h dietary recall method. Anthropometric measurements including weight and height were taken and Body Mass Index (BMI) and MUAC were computed to establish the extent of obesity. The findings from the dietary survey showed that the mean energy intake of the subjects achieved about 83.4 and 111.6% of the Indian Recommended Daily Allowance (RDA) while fat intake of all subjects was more than RDA and other nutrient intake was inadequate. The mean BMI of females and males were 25.35 ± 4.54 and 27.34 ± 4.57 kg m^{-2} and mean MUAC were 26.52 ± 2.47 and 34.48 ± 4.54 cm, respectively. Family history of diabetes was found in 24 subjects. The most common symptoms were polyuria (3.44 ± 1.82), polydypsia (5.68 ± 5.21), polyphagia (3.34 ± 0.90), decreased healing capacity (4.95 ± 4.01) and general weakness (4.19 ± 4.75) in terms of mean duration in months. Accordingly, nutritional status of diabetics is linked with various factors like educational level, physical activity, dietary pattern, etc.

Key words: Diabetes mellitus, dietary intake, anthropometric dimensions, clinical profile

INTRODUCTION

In the industrialized countries diets have changed remarkably over the past 100 years. This dietary shift combined with an increasing sedentary lifestyle is a major cause of many common disease heart disease, hypertension, diabetes, etc. These disorders so prevalent now were rare before 20th century (Eaton and Konner, 1985). Type II diabetes has long been regarded as a chronic progressive condition, capable of amelioration but not cure. A steady rise in plasma glucose occurs irrespective of the degree of control or type of treatment (UK Prospective Diabetes Study Group, 1998). Prevalence of diabetes in India will increase by 195% in 2025 and majority of sufferers will be young. Type II diabetes along with its fore-runner that is, Impaired Glucose Tolerance (IGT) are results of Insulin Resistance (IR) commonly associated with Obesity, Hypertension, Coronary Artery Disease (CAD) and Dyslipidaemia (King *et al.*, 1998). The prevalence is due to the embracing of western life pattern, smoking, high fat diet and lack of exercise, etc. Moreover, certain dietary factors may also play a role regarding the development of the disease (Schroder, 2007). It is one of the most common non-communicable

diseases and the fifth leading cause of death in the world (IDF, 2003; Samaras and Campbell, 2000). The Indian population exhibits high-risk metabolic profiles at younger ages and lower Body Mass Index (BMI) than their Western counterparts (Mohan and Deepa, 2008; Enas *et al.*, 2007).

Diet has been used as valuable therapeutic agents in traditional system. The identification of dietary correlates of diabetes is an important community health issue because dietary habits are at least in principle, modifiable. The dietary management of diabetes has varied considerably over the past century. The mainstay of treatment in the early decades of this century was carbohydrate restriction. Dietary fat intake was high to compensate for low caloric intake from carbohydrate. The role of carbohydrate restriction entered its modern era with the development of the glycemic index (Jenkins *et al.*, 1981). Dietary pattern analysis, through consideration of nutrients and foods, their interactions intercorrelations and cumulative effects has been used as an alternative approach to studying overall eating. Importantly, dietary patterns reflect real-world situations where foods are consumed in combination (Hu, 2002).

The information technology revolution, urban migration and consumerism have made Indians in cities to adopt the Coca Cola and lift culture, preferring fast food to desi cuisines. Instead of hand pound of carbohydrates today most homes go for super refined carbohydrates. While the fat and calorie content of the foods has increased (pizzas and cold drinks are part of the daily diet) there is little or no consumption of fiber foods like fruits and vegetables (Kaul, 2000). Unhealthy lifestyle behavior relating to eating habits is cited as one of the major causes of type II diabetes. It is estimated that 70% of premature deaths can be prevented through the promotion of healthy lifestyles and behaviors (Alto, 1994). Clinical examination has always been and remains, an important practical method for assessing the nutritional status of a community. Anthropometric measurements assess body size and composition and reflect inadequate or excess food intake, insufficient exercise and disease. They demonstrate that deprivation and excess may coexist not only across but also within, countries and even households and show too that certain kinds of development and health policy enhance nutrition while others do not (Jelliffe, 1966). Anthropometry is literally the measurement of man which could encompass any physiological, psychological or anatomical trait. In practice, anthropometry refers specifically to morphological traits which can be externally measured. Anthropometry has an important place in nutritional assessment and in addition to use in the clinical setting is used in nutritional screening, surveillance and monitoring (Ulijaszek and Kerr, 1999).

Under conditions of reduced food intake, lower levels of subcutaneous fat and muscle mass tend to correspond to a decrease in the Mid-Upper-Arm Circumference (MUAC). This measurement can be used to diagnose malnutrition (Harries *et al.*, 1984). Regular exercise plays a vital role in diabetes management along with diet regulation and pharmacological therapy. Daily exercise is preferable for the desired metabolic effect. Isotonic exercises like brisk walking, slow jogging, skipping, cycling, stair stepping are prescribed commonly. The duration should be 15-60 min. Exercise plays an important role in achieving regular long-term glycemic control, improvement in lipid profile and reduction in hypertension (Schneider and Euderman, 1990). Diet, genetics increased sedentary lifestyle and other societal changes have potentially increased non communicable diseases, specifically type II diabetes (Popkin and Doak, 1998). According to the World Health Organization (WHO), the rapid rise of Non-Communicable Diseases (NCDs) represents a major challenge to international development both health-wise and economically. It is estimated that by

2020 over 70% of the global burden of disease will be caused by NCDs. Undernutrition of essential vitamins and minerals are concurrently present within these populations (WHO, 2003). The aims of the present study were to explore understanding associations between dietary pattern and anthropometric dimensions using standard methods in subjects of type II diabetes mellitus.

MATERIALS AND METHODS

Locale: The present study was conducted on 30 type II diabetes mellitus subjects of middle income group (40-60 years). Subjects were sought from the main campus of Banasthali University which is a part of the Tehsil Newai, the Tehsil falls in district Tonk in Eastern Rajasthan, India by purposive sampling. Inclusion criteria for type II diabetic subjects:

- Patients of type II diabetic both sexes with well diagnosis
- Subjects who were willing to participate and extended full cooperation
- Subjects residing within approachable distance from the hospital for the convenience of repeated contacts
- Fasting blood glucose in a range of 126-400 mg dL⁻¹, in spite taking their usual antidiabetic medicines
- Age between 30-60 years
- Subjects not on insulin therapy
- Subjects not are taking any medication, other than that of diabetes
- Subjects not taking *Catharanthus roseus* in any form or any other herbal treatment to control diabetes
- Pregnant women would not be included in this study

Survey questionnaire details: A questionnaire was framed to collect the relevant information data from the subject. General information included the demographic profile name, age, gender, education level, occupation, monthly income, activity pattern. Disease history included type of diabetes when patient came to know he or she has diabetes, patient is on Insulin therapy, patient is using any hypoglycaemic drug etc. Presence of diabetes related complication like polyurea, polydipsia, blurred vision (Retinopathy), tingling sensation, burning feet, aches and pains, diabetic foot, etc. Dietary information included vegetarian or non vegetarian, 24 h meal pattern 2/3/4/5 meals, what kinds of wheat flour patient uses, what type of oil patient uses, follow any dietary restriction, etc. Anthropometric record include body weight (kg), height (cm), BMI (kgm⁻²), mid upper arm circumference (cm).

Dietary information: Data regarding the food consumption and meal pattern was collected using a pretested 24 h recall schedule using standardized cups (Thimmayamma, 1987). Based on the dietary data collected, nutrient intake, adequacy and distribution between different meals was computed. The cooked foods were converted into raw ingredients. The amount of raw food used for cooking the family meal, the total volume of food cooked and volume of cooked food consumed by the subjects was recorded using standard tools (utensils). The data so obtained was utilized for calculating the approximate amount of raw food consumed by the subjects. The nutritive value of raw ingredients viz., energy, fat, carbohydrate, protein, fiber and vitamin C. Subsequently, nutrients intake of each subjects was calculated. The nutritive value of food was obtained from the food composition data published in the book entitled Nutritive Value of Indian Foods, Indian Council of Medical Research (ICMR), New Delhi. Recommended Dietary Allowances suggested by ICMR was utilized to assess the nutritive intake of each subject (Gopalan *et al.*, 1999).

Nutritional anthropometry: Anthropometric measurements like height (cm), weight (kg), mid upper arm circumference (cm) (Rosalind, 1990). The height was measured by anthropometric rod to the nearest 0.1 cm. The subjects were weighed on a portable platform weighing balance to nearest 0.5 kg with light cloths without support and footwear. A narrow non-elastic tape was used to measure the mid upper arm circumference. The measurements were made to nearest 0.1 cm.

Body mass index was computed by using the formula given by Garrow (1987). Body Mass Index (BMI) = Weight (kg)/height (m²).

Statistical analysis: All samples were analyzed in triplicate. The data were entered in MS-Office-2007 Excel worksheet. All data were numeric in nature except for the parameters like name and address. Mean±SD, median, range were used to carried the statistical analysis.

RESULTS

The mean age of the subjects was 49.82 and 49.92 years in diabetic females and males, respectively. It was found that all subjects were in the age group of 30-50 years. Majority of the patients (82.9%) belonged to urban area of residence. All the patients were married and 8 diabetic females out of 17 are housewives. About 6 of the subjects were illiterate. The data revealed that 21 subjects were belonging to middle income group. Data were also collected on the personal habits of subjects. None of the patients had history of smoking and

consumption of alcohol. Only 10 patients were involved in regular physical exercise compared to 20 were not performed any type of exercise. About 18 subjects were vegetarians and 9 were non vegetarians in their dietary habits. The history of diabetes in family was reported by 13 and 11 subjects in females and males, respectively (Table 1).

Clinical profile of patients: The distribution of diabetic subjects according to the presence of clinical symptoms and their mean duration (months) is depicted in Table 2. Nearly 26 of the subjects reported the general weakness with the mean duration of 4.19±4.75 months. Polyphagia was reported by 22 of the subjects with a mean duration of 3.34±0.90 months. About 21 of the subjects reported

Table 1: Distribution of study subjects according to their socio-demographic profile

Parameters	Categories	Diabetic females	Diabetic males
Age (years)	30-40	9	8
	40-50	8	5
	Mean±SD	49.82±5.91	49.92±4.94
	Median	47	48
	Range	42-59	43-58
Educational status	Illiterate	4	2
	Can read and write only	2	1
	Matric	0	0
	High school	3	1
	College	8	9
Socio-economic status	Lower	1	1
	Lower middle	4	0
	Middle	10	11
	Upper middle	2	1
	Upper	0	0
Occupation status	Unskilled	0	1
	Skilled	4	1
	Clerical	1	4
	Professional	4	7
	Housewife	8	-
Physical exercise	Yes	4	6
	No	11	7
Family history	Yes	13	11
	No	4	2
Dietary habits	Vegetarian	16	2
	Ovo-vegetarian	-	3
	Non-vegetarian	1	8
Duration of DM (years)	Mean±SD	3.22±2.6	4.11±2.3

Table 2: Distribution of study subjects according to their clinical sign and symptoms profile

Clinical profile	n	Mean duration (months)
		Mean±SD
Polyuria	21	3.44±1.82
Polydipsia	19	5.68±5.21
Polyphagia	22	3.34±0.90
General weakness	26	4.19±4.75
Dehydration	5	2.00±0.0
Retinopathy	0	0
Tingling sensation	6	3.27±1.93
Aches and pains	8	2.50±2.12
Decreased healing capacity	3	4.95±4.01
Diabetic foot	0	0

Table 3: Mean dietary intake of nutrients amongst the diabetic females and males subjects

Nutrients	Diabetic subjects (female) (n=17)			Diabetic subjects (male) (n=13)		
	RDA	Mean intake	% intake of RDA	RDA	Mean intake	% intake of RDA
Calorie (kcal)	1875	1564±411	83.4	2425	2707±303	111.6
Protein (g)	50	32.0±2.3	64.0	60	45.5±2.3	75.8
Fat (g)	20	26.1±7.5	130.5	20	46.3±3.9	231.5
Fiber (g)		1.6±0.5			5.7±1.0	
Iron (mg)	28	5.8±4.2	20.7	30	14.8±7.7	49.3
Vitamin C (mg)	40	33.3±20.1	83.2	40	49.3±9.4	123.2

Table 4: Mean anthropometric measurements of type II diabetic subjects

Measurements	Type II diabetic patients (females) (n = 17)	Type II diabetic patients (males) (n = 13)
	Mean±SD	Mean±SD
Weight (kg)	59.75±10.92	74.44±13.24
Height (cm)	153.54±4.830	165.04±2.700
BMI (kg m ⁻²)	25.35±4.540	27.34±4.570
MUAC (cm)	26.52±2.470	34.48±4.540

polyuria with a mean duration of 3.44±1.82 months. These are the most common criteria used for the diagnosis of diabetes mellitus.

Dietary pattern: In this study, dietary data from a 24 h recall method was used. Mustard oil or refined oil was used as cooking medium by most of the subjects. The average frequency of taking meal was 3.77 and 3.12 times a day in males and females, respectively. This is due to their job pattern in males and most of the females are housewives. The specific foods which were taken to reduce the sugar level were bitter gourd, curry leaves, cloves and fenugreek powder. The common food preparations included in the daily diet of subjects were tea, pulses, vegetable, chapattis, curd and milk, etc. Among allopathic, Glized-M, Digitraco, Glucono SR, Diabtone, Zomet, Metlong, Glocubay were taken. The findings from the dietary survey showed that the mean energy intake of the subjects achieved about 83.4 and 111.6% of the Indian Recommended Daily Allowance (RDA) while fat intake of all subjects was more than RDA and other nutrient intake was inadequate (Table 3).

Anthropometric measurements: The anthropometric details of 30 type II diabetes mellitus subjects (females: males, 17:13) is shown in Table 4. The male subjects had a statistically higher mean weight (74.44±13.24 kg) compared to females (59.75±10.92 kg). However, there was significant difference with respect to their mean height 153.54±4.83 and 165.04±2.70 cm in females and males, respectively. The mean BMI of female subjects was 25.35±4.54 kg m⁻² compared to 27.34±4.57 kg m⁻² in males. The mean Mid Upper Arm Circumference (MUAC) of females and males was 26.52±2.47 and 34.48±4.54 cm, respectively (Table 4).

Report from studies done in India and other parts of the globe also showed that female gender are at risk of being overweight and obese (Mohammadpour-Ahramjani *et al.*, 2004; Hanley *et al.*, 2000). MUAC is easy to measure and is relatively independent of gender and age (Waterlow, 1973).

CONCLUSION

This study contributes to the understanding on anthropometric status of type II diabetes subjects and how well current dietary recommendations are being followed with designed to determine some of the behavioral and other factors that may contribute to the overweight and obesity status of the diabetic patients. The dietary results showed that the male subjects had sufficient intake of all nutrients while the female subjects did not have sufficient intake of nutrients. Physical activity has a great impact on many of the components of the type II diabetes mellitus. A person is changing as a result of developmental activities raising the socio-economic status of the population. These improved socio-economic conditions have resulted in a decreasing the quality of life and an increase in obesity which has led to an increase in the prevalence of type II diabetes mellitus and its related complications. The data from the study also suggests that those leading a sedentary lifestyle develop diabetes more frequently than those whose occupation or routine life involves more physical work. Similar findings were reported by Williams *et al.* (1994). Obesity is an established risk factor for type II diabetes and a significant association was found between higher BMI = 25 and occurrence of the disease. A diet that might serve the purpose of both preventing diabetes in healthy subjects and contribute to glycemic control in patients with established disease. There is no cure for diabetes. However, you can control or holdup diabetes through diet, exercise, weight control. A healthier diet with increased vegetables and fruits and reduced fat combined with increased physical activity must be recommended.

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