

Nutritional and Health Status of Diabetic Patients

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ABSTRACT To assess the nutritional and health status of diabetics, nutritional and health status of 80 subjects (40-60 years) suffering with type 2 diabetes mellitus was determined using standard techniques. A questionnaire was designed to collect background information, anthropometric measurements, biochemical estimations and diet history. Data revealed that overweight/obesity, hypertension and eye problems were the health disorders associated with the subjects. Body mass index of subjects revealed that a higher number of female subjects were obese compared to their male counterparts. Mean fasting blood sugar and postprandial glucose level was noted to be 175.2 mg/dl and 258.4 mg/dl respectively. Diet survey of the subjects indicated high intake of fats, carbohydrates and energy and inadequate intake of proteins, fibre and iron as compared to their recommended values. Wide prevalence of associated health problems among the hyperglycemic subjects clearly emphasized need of their diet and lifestyle modifications.

INTRODUCTION

Diabetes mellitus, is a complex disorder that in turn encompasses a whole spectrum of disease in westernized societies. India is known as the capital of this disease as the rate of diabetes is increasing day by day. Among these, type 2 diabetes is among the top ten leading causes of death. The management cost of the disease has been reported to be 2.5 times more than the management cost of the individuals without the disease. Diabetes is an inherited disease. It can affect people of any age from young infants to the elderly. It is estimated that 90-95 percent of all patients with diabetes mellitus are of 40 years or older (Balachandran 2001).

Many factors contribute to the onset of diabetes and these are termed as predisposing or risk factors. Environmental factors such as diet, obesity and sedentary life style increase the risk of diabetes (Zimmet et al. 2001). Other important risk factors include high familial aggregation, insulin resistance, nutritional status, age, life style changes due to urbanization etc. (Ramachandran 2000). The magnitude of diabetes as a problem is enormous and the implications for health services are staggering and it

is lifelong condition with the diabetic who are always at the risk of associated complications. However, these can be avoided by meticulous management of diet and lifestyle. The objective of this study was to assess the nutritional and health status of diabetics using standardized techniques.

MATERIAL AND METHODS

The subjects selected for the study were all type 2 diabetes mellitus patients between the age group of 40 to 60 years visiting the Diabetes clinic. The study was conducted on a total number of 80 patients, of whom 45 were male and 35 were female. A questionnaire was developed for the collection of data from the subjects on various aspects like background information, anthropometric measurements, associated diseases and risk factor profile, biochemical examination and diet history. Background information collected included age, sex, religion, education and income. Weight and height was measured by lever activated electronic weighing machine with an accuracy of 100 g and anthropometry rod with an accuracy of 2 mm respectively to find out their body mass index (BMI) using classification of WHO (2000). Waist hip ratio (WHR) is a useful tool for identifying individuals at risk for chronic diseases, hence it was also calculated. Further symptoms of diabetes, family history and presence of associated health problems were also diagnosed with the help of a physician and recorded for all the subjects. Under biochemical analysis, data

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on fasting blood glucose (FBS) and post prandial glucose was collected with the help of laboratory technician. Blood glucose level was estimated by GOD/POD enzymatic method based on end point colorimetry given by Trindes (1969) and Tietz (1976). For information regarding the diet history, food and nutrient intake of the subjects was determined making use of data from 24-hour recall method for 3 consecutive days. Pre-standardized cups and ladles were used to elicit information regarding the food intake and food composition tables were used to arrive at the nutrient intake of individual subjects (Gopalan et al. 2004). The data collected was classified age and sex wise and the mean values were recorded. 'T' test was used to assess the significance of difference between two means.

RESULTS AND DISCUSSION

The background information of the subjects revealed that the number of subjects increased with increase in age since type 2 diabetes mellitus is an age-related disease. Maximum subjects (36.2%) were of the age group of 55-60 years out of which 40 percent were males and 31.4 percent were females. Mean age of the subjects was 52 years, majority (97.5%) of them were Hindu, mostly studied up to undergraduate (26.3%) to post-graduate levels (37.5%) and were from middle (55%) and high income group (45%).

The mean weight of male (74.5 kg) and female (68.5 kg) subjects was noted to exceed the

weight of a reference Indian man (60kg) and women (55kg) (ICMR 2010). BMI of the subjects revealed that higher number of female subjects (45.7%) were obese compared to their males (20%) counterparts (Table 1). Therefore a greater number of male subjects was in normal BMI category (22.2%) than the female subjects (14.3%). According to WHO (1994), the risk of Type 2 Diabetes Mellitus increases continuously with BMI and decreases with weight loss. The mean WHR of males and females was calculated and it was found to be 0.93 and 0.91 respectively. This means that in females, the mean WHR values outranged the normal value (0.8) whereas in males, the mean value though was lesser than the normal value (0.95) but unquestionably not lesser alarming. A remarkable percentage of subjects (65%) were found to be having WHR greater than the normal limits including all female subjects and 37.78 percent males. About sixty-two percent males were found to be having WHR within the normal limits while none of the females belonged to normal category of WHR. Similarly higher numbers of females were found to be obese compared to the male subjects by Deepashree and Prakash (2007) while studying nutritional status of diabetes.

Under clinical history years of suffering from diabetes, symptoms of diabetes, family history and presence of associated health problems were studied. Majority of the subjects (67.5%) were found to be suffering from type 2 diabetes for last five years and only 32.5 percent were suffering diabetes from 5 to 10 years. Various symp-

Table 1: Anthropometric measurements of the subjects

<i>Anthropometric indices</i>	<i>Classification</i>	<i>Percentage (number) of the subjects</i>		
		<i>Male (n = 45)</i>	<i>Female (n = 35)</i>	<i>Overall (n = 80)</i>
<i>Body Mass Index (Kg/m²)</i>				
< 18.5	Underweight	-	-	-
18.5-24.99	Normal range	22.2 (10)	14.3 (5)	18.7 (15)
25.0-25.99	Overweight	11.1 (5)	5.7 (2)	8.7 (7)
26.0-29.99	Pre-obese	46.6 (21)	34.3 (12)	41.2 (33)
30.0-34.99	Obese grade I	11.1 (5)	20.0 (7)	15.0 (12)
35.0-39.99	Obese grade II	6.7 (3)	25.7 (9)	15.0 (12)
≥ 40	Obese grade III	2.2 (1)	-	1.2 (1)
<i>Waist-hip Ratio (WHR)</i>				
<i>Male</i>				
< 0.95	Normal	62.2 (28)		35.0 (28)
≥ 0.95	High	37.8 (17)		21.2 (17)
<i>Female</i>				
< 0.8	Normal		-	-
≥ 0.8	High		100.0 (35)	43.7 (35)

Classification devised by WHO Expert Committee (2000)

toms of diabetes reported by the subjects were polydipsia (82.5%), polyphagia (65%), polyuria (61.3%), excess weakness (32.5%), frequent perspiration (31.3%) and loss of weight (16.3%) (Table 2). Among associated health problems of diabetes, majority of the subjects, that is, 81.3 percent and 80 percent were overweight/obese and hypertensive respectively. This may be due to their sedentary life style or lack of physical activity level. Further majority of the subjects had other associated complications of diabetes like eye problems (61.2%), dental problems (30%), cardiac problems (28.7%), skin problems (12.5%), neurological problems like peripheral neuropathy (8.8%), foot problems (6.3%) and kidney problems (2.5%). Prevalence of many associated health problems among the studied subjects is alarming since the chronic uncontrolled diabetes gives rise to many complications which can be life threatening.

Table 2: Clinical history and associated health problems of the subjects

Risk factor	Percentage (Number)		
	Male (n = 45)	Female (n = 35)	Overall (n = 80)
Polydipsia	84.4 (38)	80.0 (28)	82.5 (66)
Polyphagia	62.2 (28)	68.6 (24)	65.0 (52)
Polyuria	57.8 (26)	65.7 (23)	61.3 (49)
Frequent perspiration	40.0 (18)	20.0 (7)	31.3 (25)
Excess weakness	24.4 (11)	42.9 (15)	32.5 (26)
Loss of weight	20.0 (9)	11.4 (4)	16.3 (13)
Associated health problems			
Overweight/obesity	77.8 (35)	85.7 (30)	81.3 (65)
Hypertension	84.4 (38)	74.3 (26)	80.0 (64)
Eye problems	60.0 (27)	62.9 (22)	61.2 (49)
Dental problems	22.2 (10)	40.0 (14)	30.0 (24)
Cardiac problems	28.9 (13)	28.6 (10)	28.7 (23)
Skin problems	6.7 (3)	20.0 (7)	12.5 (10)
Neurological problems	11.1 (5)	5.7 (2)	8.8 (7)
Foot problems	-	14.3 (5)	6.3 (5)
Kidney problems	4.4 (2)	-	2.5 (2)

During present study, known diabetic patients were identified whose FBS was found between 150 and 200mg/dl, that is, against normal values between 70 and 100 mg/dl. The mean FBS

value of the subjects was recorded to be 175.2 mg/dl. The mean FBS level in females (176.9 mg/dl) was slightly higher than males (173.8 mg/dl) with a non-significant difference. Akin to mean FBS, the mean value of postprandial blood glucose was also found to be higher in females (268.3 mg/dl) with significant difference ($p < 0.001$) from males (247.5 mg/dl) (Table 3). Similar findings have been reported by Singh and Choudhary (2006) stating higher level of fasting blood sugar and post prandial blood glucose in female subjects than their male counterparts.

The percent energy contribution from carbohydrates, fats and proteins also indicated imbalance as compared to the recommended values stated by Shrilakshmi (2011), that is, 60-65 percent, 15-25 percent and 20 percent respectively. The mean intake of fats (78.73g), carbohydrates (269.11g) and energy (2011.42 kcal) by the subjects was found to be high enough to enhance the associated health problems for those at risk subjects in view of their high blood glucose, enhanced mean weight and conglomeration of risk factors. It is important to note from the Table 4 that protective constituents of diet like proteins, iron and fibre were consumed in inadequate amounts by the subjects. Low fibre intake is also suggestive of high glycemic index food in the diet consumed by the subjects. The mean intake of vitamins and minerals was found to be above optimum as per the recommended intakes. Significant gender difference in nutrient intakes was found in case of protein, carbohydrate, energy, calcium, B-complex vitamins and vitamin C.

These findings are in close conformity with the results of the study conducted by Soni and Bhatnagar (2009) who also observed higher intake of fat, B complex vitamins, vitamin C and calcium and lower intake of protein, iron and fibre among diabetic subjects.

CONCLUSION

In view of high prevalence of overweight, obesity, associated health problems and imbal-

Table 3: Blood glucose level of the subjects

Blood glucose level (mg/dl)	Mean \pm SD				
	Male (n = 45)	Female (n = 35)	Total (n = 80)	t value	p value
Fasting blood glucose	173.8 \pm 16.47	176.9 \pm 18.54	175.2 \pm 17.19	0.80 ^{NS}	>0.05
Post prandial	247.5 \pm 16.92	268.3 \pm 22.46	258.4 \pm 19.36	4.73 ^{**}	<0.001

^{**} Significant 1% level, NS – Non Significant.

Table 4: Mean \pm SD values of nutrient intake of the subjects

Nutrient intake	RDA*	Male (n = 45)	Percent adequacy	Female (n = 35)	Percent adequacy	Total (n=80)	t value	p value
Protein (g)	70	58.44 \pm 6.70	83.5	49.82 \pm 4.3	71.17	54.13 \pm 5.5	6.61***	<0.001
Fat (g)	41	80.22 \pm 13.2	195.6	77.25 \pm 5.51	188.41	78.73 \pm 9.35	1.24 ^{NS}	>0.05
Crude Fibre (g)	37	11.44 \pm 1.1	30.92	11.0 \pm 1.1	29.73	11.22 \pm 1.1	1.86 ^{NS}	>0.05
Carbohydrate (g)	244	273.93 \pm 20.2	112.27	264.30 \pm 16.4	108.3	269.11 \pm 18.3	2.29*	<0.05
Energy (kcal)	1500	2058.79 \pm 181.2	137.25	1964.05 \pm 105.6	130.94	2011.42 \pm 143.4	2.28*	<0.05
Calcium (mg)	400	656.35 \pm 91.0	164.08	616.38 \pm 49.3	154.09	636.36 \pm 70.15	2.34*	<0.05
Iron (mg)	28**	26.32 \pm 1.9	94.0	25.50 \pm 1.7	91.07	25.91 \pm 1.8	1.94 ^{NS}	>0.05
β -Carotene (μ g)	2400**	5068.46 \pm 1659.5	211.18	4596.83 \pm 749.0	191.5	4832.64 \pm 1204.25	1.56 ^{NS}	>0.05
Thiamine (mg)	0.8**	1.65 \pm 0.3	206.25	1.45 \pm 0.2	181.25	1.55 \pm 0.25	3.39**	<0.01
Riboflavin (mg)	0.9**	1.55 \pm 0.2	172.22	1.3 \pm 0.1	144.44	1.42 \pm 0.32	5.50***	<0.001
Niacin (mg)	9.9**	13.5 \pm 1.4	136.36	11.89 \pm 3.1	120.1	12.69 \pm 2.25	3.08**	<0.01
Vitamin C (mg)	40**	106.21 \pm 41.2	265.52	89.10 \pm 17.4	222.75	97.65 \pm 29.3	2.30*	<0.05
Sodium (mg)	1500***	2784.56 \pm 88.6	185.64	2765.2 \pm 96.2	184.35	2774.88 \pm 92.4	0.93 ^{NS}	>0.05

RDA* Raghuram et al. 2000

** ICMR 1989

*** American Heart Association 2010

anced dietary intakes, the results clearly indicates prompt treatment of the subjects through their lifestyle modifications.

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