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EVALUATION OF DIET PATTERN AND ANTHROPOMETRY AMONG TYPE 2 DIABETES MELLITUS PATIENTS OF BANGALORE CITY

Physiology

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ABSTRACT

Background: In the management of diabetes mellitus evaluation of diet pattern and glycemic index of preferred food items becomes important to develop dietary guidelines for diabetics for a better glycemic control.

Objectives: To evaluate diet pattern with glycemic index of preferred food items , HbA1C (glycemic control), and anthropometry of the patients with type 2 DM

Materials & Methods: Study group consisted of 100 sedentary diabetics aged 40-60 years. 3days dietary recall was administered to assess diet pattern. Food frequency questionnaire was administered to identify the frequently consumed sources of carbohydrate. Nutritional breakdown and glycemic index of the food items were derived from standard references. Random blood samples were used to estimate Hb A1C. BMI and Waist:Hip Ratio were measured. Results obtained were presented as descriptive data.

Results: 52 males (mean age in years 55±6) and 48 females (mean age in years 53±4) completed the study. On evaluation of diet it was found that most of them consumed high-calorie, high carbohydrate diet compared to their recommended allowances and frequently consumed foods with high glycemic index. 69% of males and 92% of females had bad glycemic control (Hb A1C >7%).38.46% of males and 54.16 % of females were found to be overweight (BMI 25-29.9 kg/m2). 15% of males and 25 % of females were obese (BMI≥30). 61.4 % of males had WHR >1.0 and 95.8 % of females had WHR >0.8.

Conclusion: The bad glycemic control and the deviant anthropometric parameters can be attributed to the consumption of food items with high glycemic index and high calorie diet

KEYWORDS

anthropometry, diabetes, diet, glycemic control.

INTRODUCTION

The epidemic of diabetes is continuing to rise in alarming proportion. The WHO (2012) has estimated that 347 million people worldwide have diabetes, of which more than 95% are of Type 2 DM. Diabetes is rapidly gaining the status of a potential epidemic in India with more than 62 million diabetic individuals currently diagnosed with the disease.[1,2] In 2000, India (31.7 million) topped the world with the highest number of people with diabetes mellitus. The national average prevalence is around 8% with higher prevalence in South India. In Bangalore the prevalence is around 12%. According to Wild et al.[3] the prevalence of diabetes is predicted to double globally from 171 million in 2000 to 366 million in 2030 with a maximum increase in India.

The aetiology of diabetes in India is multifactorial and includes genetic factors coupled with environmental influences such as obesity associated with rising living standards, steady urban migration, and lifestyle changes. If left uncontrolled, it can be associated with complications which can affect various organs including kidneys, nerves, eyes, heart and blood vessels.

In the management of diabetes mellitus, while pharmacological therapies are clearly effective,diet has been recognized as a corner-stone of therapy. There is considerable evidence to show that better control of blood sugar prevents or delays the debilitating complications of diabetes [4]. The use of carbohydrate both in terms of quantity as well as quality in diabetic diet, has always been a key therapeutic issue [5]. Monitoring carbohydrate, whether by carbohydrate counting, choices, or glycemic index, remain a key strategy in achieving glycemic control.

The current study intends to evaluate the diet pattern and anthropometric status of the diabetics so that necessary interventions can be made for their betterment and to try to mitigate the potentially catastrophic increase in diabetes that is predicted for the upcoming years.

OBJECTIVES

To evaluate-

- Diet pattern with glycemic index of preferred food items
- HbA1C (glycemic control)
- Anthropometry of the patients with type 2 DM

MATERIALS & METHODS

This work is an observational, non-interventional study on 100 patients of Bangalore city with type 2 diabetes mellitus selected based on the eligibility criteria from the patients attending the Diabetic Clinic, Victoria Hospital, BMCRI, Bangalore.

The study included males and females,40-60 years old, known cases of type 2 DM, with sedentary lifestyle We excluded patients on medications other than insulin or oral hypoglycemic drugs, history of complication due to DM, chronic systemic illness like hypertension or hypothyroidism, psychiatric illnesses

The study group consisted of 52 males and 48 females fulfilling the eligibility criteria. Written informed consent was taken followed by relevant history taking and general physical examination.

Height was measured using a wall-mounted stadiometer (CMS Instruments, London, UK) and body weight was recorded in fasting state using Equinox BR-9201 weighing scale. Waist: Hip Ratio was measured and BMI was calculated using Quetelet's index [BMI=weight(kg)/height^2(m)]

Recommended Daily Allowances (RDA) for each individual was noted separately using the reference values [6]. The dietary status was assessed using a 3-days dietary recall method. The mean nutritional breakdown (total energy, carbohydrate, proteins and fat intake) was calculated using the reference values [7,8,9] . A food frequency questionnaire (FFQ) was administered to identify the frequently consumed sources rich in carbohydrate i.e cereals, fruits, roots and tubers. Glycemic index of these food items were found from references [8]

On history taking it was found that none of the participants were involved in regular physical activity.

Random blood samples from the antecubital vein were collected in the sitting position, in an EDTA vacutainer and HbA1C was estimated using commercially available kits.

BMI (kg/m^2) was used to classify the study group into underweight (<18.50), normal (18.50-24.99), overweight (25-29.9) and obese (≥ 30).[9] HbA1C was used to categorise good(≤ 7%) and bad (> 7%) glycemic control. [10] Food items were classified into 3 groups as per their glycemic index- Low (<55), Medium (55-70), High (>70) [11]

Data are presented as mean (SD), and percentages dependent on the distribution of the data.

RESULTS

52 males (mean age in years 55±6) and 48 females (mean age in years 53±4) were enrolled in and completed the study.

Diet Pattern

The RDA for energy, carbohydrate, protein and fats for Indians recommends that contribution of carbohydrates to total energy intake should be 45-65%, from proteins 10-35% and from fats 20-35%. The recommended energy intake is on an average 2320 kcal/day for sedentary men and 1900kcal/day for sedentary women. The mean nutritional breakdown of the dietary intake of the sample as obtained from the 3-days dietary recall are shown in Table 1. It is observed that the study group is consuming high calorie diet with high consumption of carbohydrates.

Table 1. Mean composition of dietary intake of the sample.

	MALES		FEMALES	
	OBSERVED	RDA	OBSERVED	RDA
Energy (in kcal/day)	2336±311	2320	2283±384	1900
% Energy carbohydrate	69.53±6	45-65	69.2±7	45-65
% Energy protein	11.8±3.7	10-35	11.3±5	10-35
% Energy fat	18.69±3.9	20-35	19.5±4	20-35

Food frequency questionnaire

We identified the following foods to be frequently consumed by the diabetics:

- Cereals : white rice, wheat and ragi
- Fruits : apple, sweetlime and banana
- Roots and tubers : potato, carrot, beetroot, raddish

The glycemic index of these food items and the percentage of the study group consuming these is presented in **Table 2**

Table 2. Source of carbohydrates , their glycemic index and the distribution of diabetics preferring these items.

CEREAL	GLYCEMIC INDEX	FREQUENT CONSUMERS
White rice	73±4	46 (46%)
Wheat	52±4	46 (46 %)
Ragi	67±5	8 (8%)
FRUIT	**GLYCEMIC INDEX**	**FREQUENT CONSUMERS**
Apple	36±2	32 (32%)
Sweetlime	43±3	30 (30%)
Banana	51±3	38 (38%)
ROOTS & TUBERS	**GLYCEMIC INDEX**	**FREQUENT CONSUMERS**
Potato	78±4	24 (24%)
Carrot	39±4	38 (38%)
Beetroot	65	20 (20%)
Raddish	47	18 (18%)

Anthropometric status of the study group are described in **Table 3**

Table 3. Baseline anthropometric characteristics of the study group.

	MALES	FEMALES
Total number enrolled	26	24
Age (in years)	55±6	53±4
Height (in m)	1.66±0.08	1.62±0.08
Weight (in kg)	70.65±10	72.21±11
BMI (in kg/m^2)	25.86±4	27.61±4
Waist: Hip ratio	1.02±0.07	0.96±0.09

Glycemic control

Glycemic control of the study group as determined by the HbA1C levels is shown in **Table 4** . It is observed that women have a worser glycemic control than men.

Table 4. Glycemic control of the sample.

GLYCEMIC CONTROL	MALES	FEMALES
Good	16 (30.77%)	4 (8.33%)
Bad	36 (69.23%)	44 (91.67%)

Body mass index

Table 5 shows that the prevalence of obesity and overweight is more among females when compared to males.

Table 5. Distribution of study group as per BMI

	MALES		FEMALES	
CATEGORY	NUMBER	PERCENTAGE	NUMBER	PERCENTAGE
NORMAL	24	46.15	10	20.83
OVERWEIGHT	20	38.46	26	54.16
OBESE	8	15.38	12	25

Waist Hip ratio

WHR is an approximate index of intra-abdominal fat mass and total body fat. There is an increased risk of metabolic complications for men with WHR >1.0 and women with WHR>0.8. Table 3 shows that the mean values of WHR in both men and women are above this range. Table 6 shows the number of participants with increased WHR

Table 6. Distribution of study group as per Waist Hip Ratio

	NUMBER	PERCENTAGE
Males (with WHR >1.0)	32	61.4
Females (with WHR >0.8)	46	95.8

DISCUSSION

In this descriptive study we have tried to provide a snapshot of diet patterns and food preferences among diabetics of Bangalore city. On assessment of their diet pattern we found that majority of them consume high calorie, high carbohydrate diet and prefer food items with high glycemic index. Majority of the participants were found to have poor glycemic control and this percentage was higher among females. On assessment of BMI, it was found that majority of the participants are overweight or obese and also have high WHR. Again, this percentage was higher among females. Also none of the participants indulge in regular exercise routine. From a pathogenetic perspective our observation offers evidence for implicating imprudent diet pattern as index a cause for poor glycemic control and deviant anthropometric parameters in these diabetics.

Post prandial blood glucose and insulin responses are influenced by the amount of carbohydrate consumed and its glycemic index [12]. It has been hypothesised that low glycemic index foods may benefit weight regulation in two ways: by promoting satiety and promoting fat oxidation at the expense of carbohydrate oxidation [13] . There are data suggesting that by replacement with a low glycemic index multinutrient supplement can improve glycemic and weight control in type 2 DM 14 Diet and lifestyle management have a critical role in treatment of type 2 DM. Although much research has been done on glycemic index of different food items and their role in glycemic control, our observations depict clearly that there is a lack of public awareness regarding this important concept. It also throws light on the fact that clinicians are overlooking on the diet and lifestyle of the diabetics [15,16,17,18,19]. There are guidelines for nutritional management of hyperglycemia in type 2 DM but unfortunately these are rarely implemented. Hence, there is an urgent calling to develop necessary lifestyle interventions and make nutritional counselling mandatory for diabetics to improve their clinical prognosis and also to ring down the exuberantly emerging problem of diabetes.

The strength of this study is that it provides a true picture of how clinical medicine is overlapping the basic physiological and nutritional

principles in attempt to control diabetes solely by pharmacological treatment. Also, the study highlights the lack of awareness among the population about glycemic index and other related nutritional aspects. The limitation of this study includes a small sample size and also, since this study is done only on diabetics of Bangalore city, the results should be cautiously generalised. Assessment of other parameters like lipid profile would have added to the value of this study.

To conclude, diet patterns and anthropometry show unfavourable trends in diabetics despite regular pharmacological therapy. This would worsen the clinical prognosis and complications in them.

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Ethical Clearance: Institutional ethical committee

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