

Original Research Article

Dietary Practices among Type 2 Diabetic Patients - A Cross-Sectional Study from a Major City in India

Martil Chacko¹, Khyrunnisa Begum²

¹Research Scholar, ²Professor,
Department of Studies in Food Science and Nutrition, University of Mysore, Manasagangotri, Mysore.

Corresponding Author: Martil Chacko

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ABSTRACT

Objective: The study aimed to evaluate dietary practices of patients with Type 2 diabetes from urban area.

Materials and Methods: The study was conducted at Karnataka Institute of Diabetology, Bangalore, during June 2013-July 2014. 677 patients with type 2 diabetes (having for < 3years) aged between 30-60 years formed the study population. Standardized questionnaires were used to obtain data about dietary practices and food frequency questionnaire (FFQ) was used to assess food intake.

Results: Results revealed 75.2 % maintained mealtime strictly, 57.8 % consumed 4-6 meals/day and majority (90.4 %) did not skip meals since diagnosed diabetes. There was a close time gap of 45 minutes between mean dinner time and mean bed time. Usual intake of foods from all the food groups were markedly less compared to national nutrition recommendations for adults. Changes in dietary practices incorporated due to diabetic state were: a decreased intake of sweets (73.5%), cereals (55%), fruits (41%) and meat and poultry (21.8%). Although 90.2 % of the participants received diabetic nutrition education, changes in the dietary behaviors before and after being diagnosed diabetic did not alter distinctly.

Conclusion: Diabetic patients had poor dietary practices and consumed protective foods inadequately. Dietary practices did not change markedly except for reduction in sweets, cereals, and meat. Diabetic nutrition education program need to be strengthened and tailor made to the individual for effective self care.

Keywords: Diabetes mellitus; Dietary practice; Food group; Portion size; FFQ; Usual intake.

INTRODUCTION

The prevalence of diabetes is growing rapidly worldwide in an alarming rate. [1] Latest global estimate of diabetes prevalence in adult population is 591.9 million by 2035, out of this 109 million to be in India. Global statistics indicates that prevalence of diabetes increase with age across all regions and income groups, while low- and middle-income countries share major proportions of diabetic population. [2]

The corner stone of diabetic management is the balance between diet,

exercise and timely medication. [3] Studies have revealed importance of the right diet in effective glycemic control, hence dietary recommendations for diabetic patients include consuming foods high in fiber especially legumes, whole grains, vegetables and fruits, while restricting sweets and fats. [4-6] In essence it advocates applying principles of balanced diet in daily food intake. [6] A high intake of fruits and vegetables has been attributed in lowering the incidence and in the management of diabetes. [6-8] Population studies have

reported a low consumption of these foods among both diabetic and non diabetics. [9,10] It is universally accepted that restricting dietary carbohydrate shows a greater reduction in post prandial and overall glucose concentration. [11,12] Certain dietary habits like skipping breakfast and late supper are also been linked to poor glycemic control. [13,14]

Diet counseling is regarded as indispensable in diabetic self-care. However it is reported that majority of diabetic subjects find it hard to identify recommended quality and quantity of food that are to be eaten [10] and often many are unaware about the role of diet in ensuring eglycemic control. [10,15,16] Surprisingly literature provides bulk of information regarding nutrient intake among diabetic patients while there are limited studies that have focused on actual dietary pattern of diabetic population in India. Information about the qualitative and quantitative aspect of diet and meal practices is important to develop and implement appropriate nutrition counseling practices for diabetic patients. Such information would facilitate health care providers to educate patients to follow diets successfully. Hence this study was executed with an interest to examine the dietary practices followed by patients with type 2 diabetes.

MATERIALS AND METHODS

This is a cross - sectional study conducted between June 2013 and July 2014 at Karnataka Institute of Diabetology, Bangalore, and Karnataka. Study population comprised of 677 patients (368 males and 309 females) with type 2 diabetes. Selection criteria included the following; Men and women aged 30 - 60 years, having diagnosed with diabetes for less than 3 years, belonging to middle and high income group, having BM1 less than 27.5, and not on any regular drugs except for diabetes and HTN. While patients on nutrition supplements, chronic alcoholics, pregnant and lactating women were excluded from the study. The questionnaire included

questions on demographic characteristics (age, education, gender, marital status, religion, duration of diabetes), detailed information about dietary practices and lifestyle factors. This included type of diet, regularity of meal timing, frequency of meals consumed, meal skipping, dining out, dinner time, and sleep time.

Information on qualitative and quantitative food intake was obtained using standard food frequency questionnaire (FFQ). Qualitative data on food intake was elicited as frequency of inclusion of various foods as daily, weekly, monthly or never. Quantitative data was obtained as usual intakes in the frequency of a day to a month. Foods were reported as portion size consumed per day, per week or per month/rarely. Respondents were explained to recall usual quantity of food items consumed. Description of usual intake was elicited in terms of portion size. Standard measures- cup, glass, and spoons- were used as displays to quantify food consumed. Foods consumed as reported by the respondents were grouped under cereals and millets, legumes, milk & milk products, green leafy vegetables, other vegetables, fruits, eggs, meat & poultry, fish , sweets and soft drinks. Food intake data was then reported as usual intake (average intake) per day as raw measures. Cooked foods were converted into raw equivalents based on raw verses cooked food equivalent provided by National Institute of Nutrition (NIN).Recommendations for healthy sedentary adult man/woman was considered for comparison. [17] Cooked versus raw measurements are given below.

Rice - $\frac{1}{2}$ cup=1 portion raw rice (30 gm), dhal- $\frac{1}{2}$ cup= $\frac{2}{3}$ portion raw dhal (20 gm), milk- $\frac{1}{2}$ cup= 1 portion milk(100 ml), curd- $\frac{1}{2}$ cup= 1 portion milk (100 ml) , cooked vegetables - $\frac{1}{2}$ cup=100 gm raw vegetables, fruit 100 gm fruit or 1 medium size fruit =1 portion, meat/chicken/fish 50 gm=1 portion. [17]

Standard measures used; 1 Cup= 200 ml, 1 tbsp= 15 ml, 1 tsp= 5 ml.

Microsoft Excel was used for statistical analysis. Descriptive analysis was employed to present the data. Mean±SD was used wherever required. Data was presented in percentage & Chi-Square test was used to derive associations at 5 % significance level.

Ethical Approval

The study was approved by “Institutional Ethical Committee, UOM”.

Informed written consent was obtained from each subject participated in the study.

RESULTS

Demographic characteristics of the participants are presented in Table 1. More than half (54.4%) of the participants were males. Majority of the participants (92.6%) belonged to Hindu religion and 98.7 % were married. All the participants were educated with a meager percentage (2.2) being illiterate.

Table1: Demographic characteristics and duration of diabetes of the participants

Characteristics	Group	Frequency(f)	Percent (%)
Gender	Male	368	54.4
	Female	309	45.6
Age(in yrs)	30-39	197	29.1
	40-49	258	38.1
	50-60	222	32.8
Marital status	Married	668	98.7
	Unmarried	6	0.9
	Divorced/Separated widowed	3	0.4
Religion	Hindu	626	92.5
	Muslim	42	6.2
	Christian	9	1.3
Education	Illiterate	15	2.2
	Schooling	289	42.7
	Dip/10 th	147	21.7
	Graduation	146	21.6
	Higher education	80	11.8
Duration of diabetes	0-12 months	278	41.0
	13- 24 months	188	27.9
	25-36 months	211	31.1

Dietary practices like diet type, meal skipping, eating from outside, regularity of meal timings and lifestyle factors were assessed (Table 2). Among the participants 73 % were non vegetarians while a small percentage (27 %) were vegetarians. About 57.8 % consumed small frequent (4-6times/day) meals, majority of the (90.4 %) participants reported that they did not skip main meals since diagnosed diabetic. The difference in practice of skipping meal before and after being diagnosed diabetic was significantly associated (chi sq-10.857) at 5% level. Although eating outside home was practiced by all the participants a small percentage, 16.5 % mentioned to eat outside home every day. Sunflower oil was the popular (71.2 %) cooking oil among the participants and nearly 20 % subjects used sunflower oil along with other oil such as coconut oil, palm oil and rice bran oil for

cooking. Among the participants, 90.2% mentioned to have received diabetes nutrition education at least once after developing diabetes

A close time gap between the mean dinner time and bed time was noticed, dinner time for majority of the participants ranged between 8.45 pm and 9.45 pm, with mean time being 8.55 ±0.030 pm, while the mean bed time was 9:40 ±0.1046 pm.

Frequency and usual intake of foods from different food groups are presented in Table 3. Cereal being the staple was consumed by all the participant, usual intake of cereal was 10.2 portions per day. Pulses (including dhal) were included in the daily diet by majority (82.3%) of the participants and the usual daily intake was 1.1portion. 97.3 % participants consumed vegetables daily. On the other hand green leafy vegetables(GLV) and fruits were consumed

at varied intervals, merely 4.1% participants consumed GLV daily, 90.4% consumed weekly while 34.7 % and 58% participants consumed fruits daily and weekly respectively. The mean portion size of daily intake was 1.4 for vegetables, 1.6 for green leafy vegetables and 1.1 for fruits while

weekly intake of green leafy vegetables was 0.3 and fruits were 0.4. Milk (in the form of tea, coffee also), curds or buttermilk was also consumed by most subjects on regular basis. The average daily intake was 1.5 portion sizes.

Table 2: Dietary practices and lifestyle factors of the study population

Practices	Variables	Percent(frequency)		
Type of diet	Non veg	73.0 (494)		
	Veg	27.0 (183)		
No of meals & snacks per day	3 times/day	42.2(286)		
	4-6 times/day	57.8(391)		
Regularity of meal time	Yes	75.2(509)		
	No	24.8(168)		
Skipping meals	Before developing diabetes	Yes	15.2(103)	Chi Sq. 10.857 P< 0.5
		No	84.8(574)	
	After developing diabetes	Yes	9.6 (65)	
		No	90.4(612)	
Eating outside	Daily	16.5 (112)		
	Frequently	10.0 (68)		
	Occasionally	21.7 (147)		
	Rarely	51.8 (350)		
Type of oil	Sunflower oil	71.2(482)		
	Ground nut oil	3.9(26)		
	Sunflower oil+ any other oil	19.8(134)		
	Others	5.1(35)		
Diabetes nutrition education	Received	90.2(611)		
	Not received	9.8(66)		
Lifestyle factors	Mean ± SD			
Dinner time	8.55 pm ±0.030			
Bed time at night	9:40 Pm ±0.1046			

Table 3: Usual intakes (portion size) of different foods and their frequency of consumption by the study population

Food items	*Daily recommendation(in portion size)	Variables	Daily	Weekly	Monthly	Never
Cereals and millets	Man-12	% of participants	100	-	-	-
	Woman-9	Avg. intake/day	10.2	-	-	-
Pulses	Vegetarian -2	% of participants	82.3	17.7	-	-
	Non vegetarian-1	Avg. intake/day	1.1	0.4	-	-
Milk & products	3	% of participants	95.7	2.8	1.5	-
		Avg. intake/day	1.5	0.5	0.05	-
Green leafy vegetables	1	% of participants	4.1	90.4	5.5	-
		Avg. intake/day	1.6	0.3	0.3	-
Other vegetables	2	% of participants	97.3	2.7	-	-
		Avg. intake/day	1.4	0.9	-	-
Fruits	1	% of participants	34.7	58.0	7.3	-
		Avg. intake/day	1.1	0.4	0.09	-
Eggs	**	% of participants	3.4	46.4	50.2	-
		Avg. intake/day	0.9	0.3	0.08	-
Meat & Poultry	**	% of participants	2.2	66.0	31.2	0.6
		Avg. intake/day	4.1	0.55	0.2	-
Fish	**	% of participants	0.4	23.2	61.8	14.6
		Avg. intake/day	2.2	0.4	0.18	-

*Recommendations for a healthy sedentary Indian man/woman (ICMR recommendations)

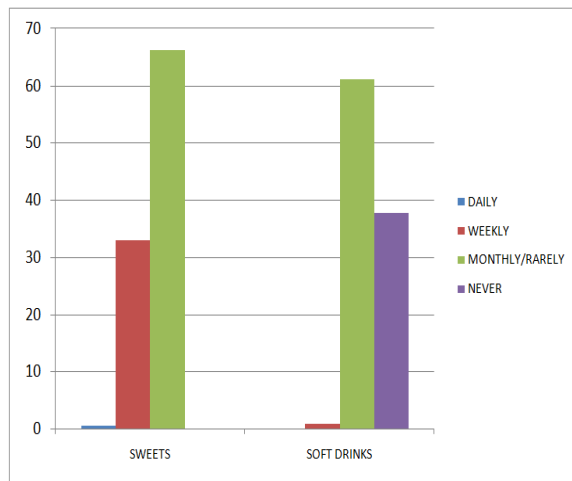
**Recommendations for the above foods not provided

Intake of foods like eggs, meat & poultry, fish, sweets and soft drinks were also assessed. Only a small proportion of people consumed eggs daily with a usual intake of 0.9 portions per day while 46.4 % participants consumed it weekly, the intake was 0.3 portions. Sixty six percent of the

participants consumed meat & poultry weekly only 2.2% consumed daily, their usual intakes varied markedly, daily consumers ate higher quantity compared to others. Fish was consumed less frequently, 23.2 % and 61.8 % participants consumed

weekly and monthly, usual intake was 0.4 and 0.18 portions respectively.

Intake of sweets and soft drinks are presented as fig 1. An insignificant proportion of the participants reported to consume sweets regularly while 33 % consumed less frequently. Intake of soft drinks was also found to be very low.



Graf 1. Frequency of Intake of sweets and soft drinks by the study population

Table 4: Changes in intake of foods incorporated by participants due to diabetic state

Foods	Change in intake due to diabetes		
	Increased % (N)	Decreased % (N)	No change % (N)
Cereals & millets	1.0 (7)	55.0 (372)	44.0 (298)
Legumes	3.2 (22)	1.1 (7)	95.7 (648)
Milk & milk products	10.2 (69)	4.8 (33)	85.0 (575)
Green leafy vegetables	11.5 (78)	1.0 (7)	87.5 (592)
Other vegetables	22.0 (149)	1.3 (9)	76.7 (519)
Fruits	9.0 (61)	41.0 (278)	59.0 (399)
Eggs	1.7 (12)	13.0 (88)	85.3 (577)
Meat & Poultry	0.0	21.8 (148)	78.2 (529)
Fish	0.0	9.0 (61)	91.0 (616)
Sweets	0.0	73.5 (498)	26.5 (179)
Soft drinks	0.0	2.5 (17)	97.5 (660)

Changes incurred in intake of foods from different food groups after developing diabetes as reported by the participants is presented in Table 4. It can be seen that 55 % participants decreased intake of cereals and millets while 44 % participants did not alter their cereal intakes. Consumption of pulses and milk & milk products did not change, as 95.7 % and 85 % continued their intake as before. Small changes were noted in intake of green leafy vegetables and other vegetable, 11.5 & 22 % participants reported to have increased their intakes. Fruit intake was found to be decreased

wherein 41 % participants reduced intake of fruits after developing diabetes. Consumption of eggs was decreased by 13 % and meat & poultry was reduced by 21.8 % while fish intake did not change. Sweet consumption was decreased by 73.5 % of the participants and soft drinks were rarely consumed food hence there was no change.

DISCUSSION

Diabetes care is complex and requires health risk-reduction strategies beyond blood sugar control. [18,19] The complexity of diabetes self-management activities needs lifelong support and education. [20] Dietary carbohydrate restriction has been documented as single most effective intervention in the control and management of diabetes. [12] Self-care is considered important in diabetes control; self-management remains one of the bases of diabetes self-care mechanism. [21,22] As such, SMBG (self-monitoring of blood glucose), carbohydrate counting, and activity regimens are important and should be individualized for each diabetes patient in everyday life. [3,4,23]

Healthful eating lifestyle has been demonstrated to maintain low HbA1c levels and is positively related to specific food habits, i.e. limiting the amount of high-sugar foods and portion sizes, reducing high-fat foods, eating regularly, eating large amounts of vegetables, limiting specific carbohydrate foods, fast-food and large-chain restaurants. Deviations in prescribed eating patterns, particularly breakfast skipping and snack additions and deletions, were also associated with poor metabolic control. It is frequently realized that dietary practices of diabetic patients are less satisfactory, although diabetic nutrition education has become obligatory in diabetes management. [23,24]

The present study points to three salient aspects of dietary practices among diabetic patients, they are eating pattern, frequency of eating and portion size as well as changes in eating practice incorporated due to diabetes. Meal frequency has been considered an important factor in glycemic

control, although studies have yielded inconsistent results, higher meal frequency is reported to acutely subdue glucose excursions and reduce insulin levels. [25,26] In the present study certain dietary behaviors found to be beneficial among the participants, they are consumption of more than 3 meals a day (58%), maintaining regular meal times (75%) and only a small percentage of the participants ate outside home (16.6% daily, 10.0% frequently). These aspects in fact are central components in diabetic nutrition education. Although the proportion of participants practicing rightfully is not striking but more than fifty percent of the diabetic patients followed better practices.

Further, skipping meals was found common among the study population before diagnosis, which reduced thereafter the difference in reduction in meal skipping before and after diagnosis exhibited statistically significant association (chi Sq, 10.8573; $P < 0.5$). Studies have assessed the relation between meals skipping and glucose control, recently Reutrakul S et.al [13] reported that breakfast skipping caused poor glycemic control and incidentally higher HBA1c values. In the present study the difference between mean dinner time and the mean sleep time was just 45 minutes and a less gap between supper and sleep is reported to affect digestion as well as sleep quality. [27]

A diabetic diet is similar to the diet recommended for general population except that special attention to food choices is advocated, notably foods rich in carbohydrates and the portion size have to be controlled. [16,28] Our results point to poor dietary intakes; protective foods were consumed markedly in less quantity compared to recommended portion size. Based on the usual intakes it is evident that intake of pulses and milk & milk products were markedly low. Protein rich foods like legumes and dairy foods are known for their benefit on glycemic control and improvement in insulin secretion in people with T2DM. [29,30] Our findings are in line

with other Indian studies reporting low consumption of these foods among population in general. [31,32]

National nutrition guidelines recommends average daily intake of 1 portion of green leafy vegetables, 2 portions of other vegetables and 1 portion of fruit for a healthy adult. In diabetes additional intake of low glycemic index vegetables and fruits are found to have beneficial effects on glucose control. [33,34] Average daily intake of vegetables other than green leafy vegetables was 1.4 portions per day by majority (97.3%) of participants. Green leafy vegetable intake was separately assessed as it is shown to have hypoglycemic effect. [35] Merely 4.1% participants consumed green leafy vegetables daily while majority (90.4%) consumed only 0.3 portions per day. 34.7 % participants fruit intake was satisfactory (1.1 portions per day) while 58 % consumed just 0.4 portions per day. These results are also in accordance with other studies reporting low intakes of vegetable and fruit among population. [9,36]

Major differences in intakes of foods after developing diabetes were cereals, fruits, meat, poultry and sweets. Intake was reduced by a small percentage of participants, while drastic decrease was noted for sweets (73.5%), cereals & millets (55%) and fruits (41 %). In general, dietary intakes remained essentially similar, although 90.2 % of the study participants had received diabetic nutrition education. Changes in the dietary behaviors before and after being diagnosed diabetic were not distinct.

It has been realized that, diabetic patients generally exhibit poor response to nutrition education. A generalized pattern for education may not provide fruitful results; also reinforcement in nutrition information by providing opportunities to listen to or participate in discussion about diabetic nutrition care may motivate them to adopt right practices as well as enhance their skills.

CONCLUSION

Findings of this study indicated that a marked proportion of the population had poor dietary practices and inadequate intake of protective foods. Changes in certain dietary practices were obvious such as reduction in frequency of eating outside home, meal skipping and following meal time strictly. Also decrease in intake of cereals, sweets, non vegetarian foods were noted, however, majority of the participants continued to remain with their dietary practices, despite received diabetic nutrition education. It could be appropriate to state that knowledge about dietary behaviors in community should be available to design nutrition education program that can be custom-made to suit each individual concerned.

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