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## Efficacy of Dietetics in Low Resource Communities: Dietary Intake and BMI of Type 2 Diabetics Living in Karachi Before and After Receiving Dietician's Guidance

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**Abstract:** This study was planned to assess the dietary intake of diabetic subjects and kind of dietary modification they have made after individualised dietary guidance. Information on clinical and dietary profile of 200 subjects was recorded at first visit of BIDE. Dietary guidance was given by dietician. Second visit was done after 3 months. Subjects having adequate intake of fruit and vegetable, milk and meat was 68, 38 and 63% for males and 52, 40 and 35% for females, respectively. Only 20.4% males and 5.9% females had usual adequate consumption of the four food groups. Overall adequacy of diet improved for 11.1% of males and 27% of females. Weight reduction was observed in 54.8% of females and 32.2% of males. Rate of BMI reduction was significantly higher in the group who had reduced their caloric intake. This first of its kind study from Pakistan, has documented the efficacy of dietary guidance and highlighted the need for further attention to assure balanced intake of foods from various food groups.

**Key words:** Dietetics, BMI, type 2 diabetics, low resource communities

### INTRODUCTION

Dietary adjustments are an integral part of the management of diabetes (Nathan *et al.*, 2006). As per current recommendations of relevant authorities none of the foods are to be excluded and instead, controlled intake of foods from various food groups is suggested. Variety in food intake is encouraged to ensure adequate and balanced dietary intake (Irwin, 2002; Lauber and Sheard, 2000). Persons having diabetes often need personal guidance so as to enrich their knowledge and thus aid suitable selection of foods and intake of balanced diet (Rafique and Shaikh, 2006). Awareness and guidance provided by dieticians is aimed toward empowerment of patients and facilitation of adequate and appropriate dietary intake (Lorenz *et al.*, 2000). The goal of MNT for diabetes management is to guide the patient to consume a balanced diet providing adequate energy and nutrition to maintain good glycemic control (Lauber and Sheard, 2000). In most cases due to high prevalence of obesity among people with type 2 diabetes restrictions in energy intake is often recommended by Daly *et al.* (2003), Franz

(2004), Basit *et al.* (2004) and Habib and Aslam (2003). Monitoring of the quantity and quality of fat intake and that of high glycemic index foods is also needed for prevention of complications and good glycemic control (Irwin, 2002). Thus there are possibilities that in an attempt to comply with these restrictions people with diabetes may either make imbalanced and undue food restrictions or may choose not to follow the guidance (Rafique and Shaikh, 2006; Serour *et al.*, 2007; Vijan *et al.*, 2005). Low literacy level and lack of availability of information about food contents further aggravates the problem of appropriate food choice and may lead to inadequate intake of nutrients. Dietary guidance provided by dieticians is found to be helpful in improving the diets however most of these studies are done in affluent countries having high rates of literacy, easily available information about food compositions and a wide range of food choices. The impact of such guidance needs to be evaluated in a variety of settings differing in terms recipients of guidance e.g., in areas having low literacy and relatively limited food choices, low level of general knowledge about composition of foods and in terms of

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resources and constraint to provision of guidance. Such assessments could help in determining the areas needing focus during dietary guidance. This study was planned to assess the dietary intake of diabetic subjects and kind of dietary modification they have made after individualised dietary guidance.

Assessment of impact of efforts made by dieticians to educate the patients is needed for maintaining and enhancing the output of these efforts.

**MATERIALS AND METHODS**

**Setting:** In Pakistan professional dietary guidance is not available to a vast majority of people with diabetes. Individual dietetic guidance is not provided in most public and private diabetes clinics. In a few private hospitals, where it is provided, the costs are high and only very affluent people use these services. Baqai Institute of Diabetology and Endocrinology (BIDE) is one of the rare institutes where professional and individual dietary guidance is provided without extra costs to all the patients consulting the physicians. The Socioeconomic Status (SES) of patient coming to BIDE OPD is varied because a certain proportion of patients can get services at subsidised cost also. Thus for the purpose of this study subjects were recruited in such a fashion that the data could be collected from a mix of high, middle and low income groups. Overall, the sample selected for this study represents the middle income group of people with diabetes living in Karachi.

Subjects for this study were recruited from the OPD of BIDE. Starting from May 2004, a total of 200 patients were recruited. For the assessment of impact data was collected from a random sub-sample of 73 patients.

**Data collection:** Information about clinical profile including height and weight; and about dietary habits was recorded at first visit to BIDE. Dietary guidance was provided as usual by qualified and experienced dietician. The subjects were contacted again after 3 months during usual follow up or through phone to collect information about diet and weight status.

Interviews were conducted to estimate dietary patterns and to record usual daily diet. Food consumption was recorded in measures or numbers of servings or exchanges as considered appropriate according to type of food.

**Data entry and analysis:** Data was entered on SPSS 10 for analysis. Calculations were done to assess the total servings of food consumed from various food groups. Quality of diet was assessed by comparing the number of servings of foods consumed from various groups to that

recommended for healthy eating by USDA. For each food group if the subject consumed the appropriate number of recommended servings (cereals: 5-11; meat: 2-3; milk: 2-3; fruit: 2-3; vegetable: 3-4; fat: 2-3 and sweets: 1-2) one point was awarded. The scores for food groups were added to get Diet Adequacy Score. Paired sample T test was done to compare differences in adequacy of diet before and after dietary receiving guidance. Chi-Square test was done to compare differences between groups.

**RESULTS**

**Food intake of people with diabetes:** Data for the first visit was collected from 200 subjects. Characteristics of the subjects are shown in Table 1.

Dietary data was transformed to calculate the number of servings of foods usually taken per day from various food groups by the subjects. The number of servings of fats indicates fat added during cooking or consumed as spreads. The number of servings of sweets indicates foods or drinks with added sugar.

**Average numbers of servings of various foods consumed:** For vegetables, fruits and milk the average intake was below the recommendation among both males and females. For meat the average intake was below the recommendations only among females. Intake of cereals was adequate among both the groups mean energy intake was 2326 for males and 1870 for females and was less than mean of estimated energy requirements (2498 for males and 1834 for females). However, on individual basis, estimated energy intake was more than the estimated requirements for 37.5% of males and 43% of females (Table 2).

Table 1: Age and BMI of the subjects

Parameters	Sex of the patient	
	Male (No. = 98)	Female (No. = 102)
Age (years)	50.7±11.7	50.1±9.6
BMI (kg m <sup>-2</sup> )	25.7±4.00	28.3±5.4

Table 2: Average daily intake (in average servings) of food from various food groups by male and female subjects

Food groups	Sex of the patient	
	Male (No. = 88)	Female (No. = 102)
Cereals	8.0±3.4	6.2±2.4
Vegetables	1.2±0.8	1.1±0.8
Milk	1.4±0.8	1.4±0.7
Sugar/sweets	0.1±0.3	0.2±0.5
Added fat	3.0±2.8	2.1±1.9
Lentils	0.9±0.7	0.7±0.6
Fruit	1.3±1.1	1.2±0.9
White meat	0.8±1.0	0.5±0.6
Red meat	0.7±1.8	0.5±0.8
Total meat group	2.4±1.7	1.7±1.1
Vegetable and fruits	2.5±1.3	2.2±1.4

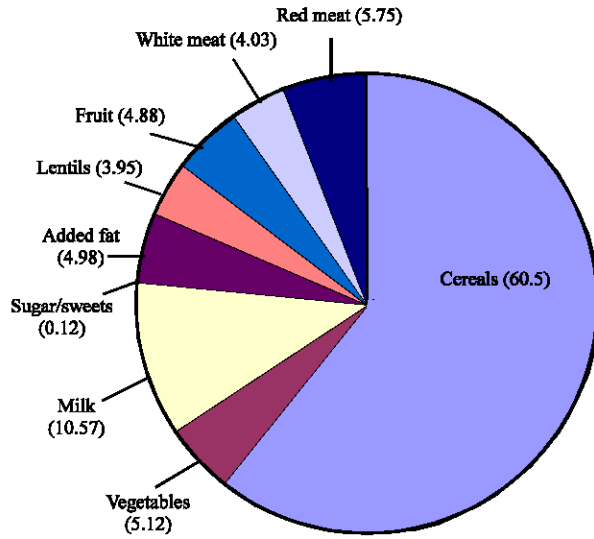


Fig. 1a: Percentage of energy from various food groups in the diets of male subjects having type 2 diabetes

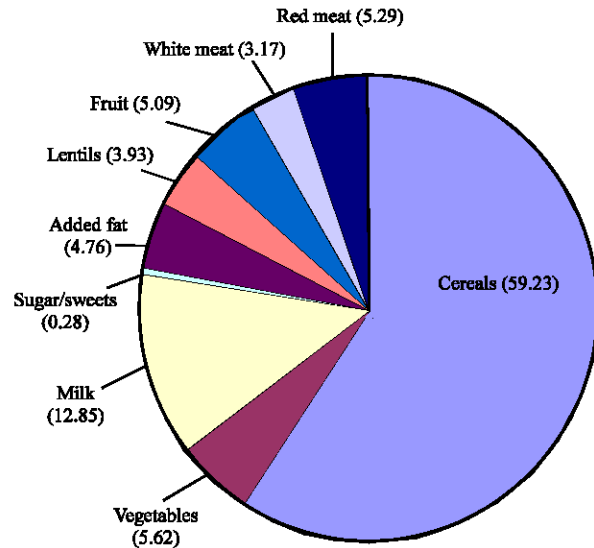


Fig. 1b: Percentage of energy from various food groups in the diets of female subjects having type 2 diabetes

About 60% of calories were being contributed by cereals in the diets of both males and females (Fig. 1a, b). A relatively lower proportion of calories were contributed by white meat and higher by milk in the diets of females (3.2 and 12.9%) as compared to males (4.0 and 10.6%).

Overall adequacy of diet was assessed on the basis of presence of minimum required servings of foods in the diet. For individual food groups a much higher proportion of subjects (38-68%) had adequate intakes as compared to proportion of subjects having overall adequate diet.

Table 3: Adequacy of subjects' intake of foods from various food groups

Food groups	Gender (%)		Total (%)
	Male	Female	
Cereals	100.00	100.00	100.00
Vegetables and fruits	68.00	52.00	59.90
Milk	38.10	40.00	39.10
Meat group	62.90	35.00	48.70
Overall adequacy	21.40	5.90	13.50

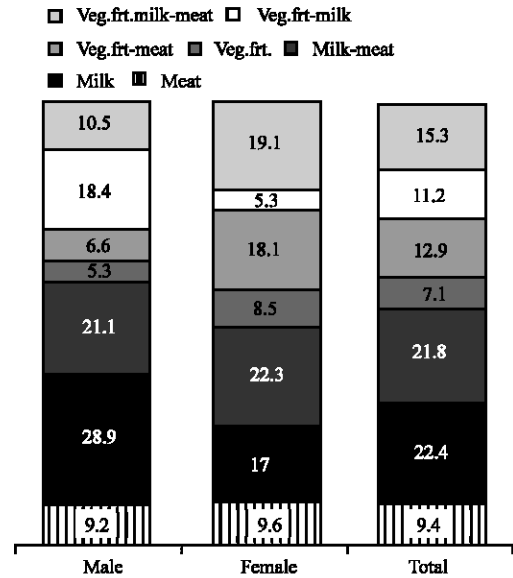


Fig. 2: Patterns of dietary inadequacy: Percentage of subjects having various combinations of inadequate intake of food groups)

Percentage of male and females having adequate intake of fruit and vegetable (>5 servings), milk (2 servings) and meat (2 servings) was 68, 38 and 63% for males and 52, 40 and 35% for female, respectively. Only 20.4% males and 5.9% females had usual adequate consumption of the four food groups (Table 3).

**Patterns of dietary inadequacy:** Males and females differed in patterns of dietary inadequacy (Fig. 2). Among males the usual patterns were inadequate intake of milk only (28.9%), milk and meat (21.1%) and milk and vegetable-fruits (18.4%). Among females the common patterns of dietary inadequacy were insufficient intake of meat and milk (22.3%), meat, milk and vegetable-fruits (19.1%) and meat and vegetable-fruits (18.1%).

**Changes in food intake of people with diabetes after receiving professional dietary guidance:** According to reported food intakes, at 3 months follow up visit several statistically different changes were observed in the subjects' diets. The changes were calculated in terms of absolute intake i.e., mean difference in the intake of number of servings of foods from various food groups; in

terms of changes in diet pattern i.e., percentage of calories coming from various foods in the subjects diets; and in terms of variations in diet adequacy i.e., recommendation for intake of food from various groups met or not.

In terms of absolute difference in intakes, intake of lentils was decreased significantly both among men and women; intake of cereals was decreased significantly among women only and intake of fat and red meat was decreased significantly among men only (Table 4). On the other hand in terms of changes in dietary patterns as represented by differences in percentage of calories coming from various foods in the diet (Table 5), a relatively higher percentage of calories were contributed

Table 4: Mean difference in number of servings of foods taken after dietary guidance as compared to before dietary guidance

Food groups	Male		Female	
	Mean±SD	p-value	Mean±SD	p-value
Cereals	-1.05±3.61	0.089	-1.16±1.88	0.001
Vegetables	-0.16±0.84	0.272	-0.08±0.67	0.456
Milk	+0.10±1.33	0.650	-0.29±0.96	0.073
Sugar/sweets	-0.03±0.29	0.571	-0.07±0.29	0.169
Added fat	-0.97±2.82	0.047	-0.38±1.28	0.076
Lentils	-0.65±0.54	0.000	-0.37±0.39	0.000
Fruit	-0.05±1.43	0.830	+0.17±1.49	0.493
White meat	-0.19±0.96	0.237	-0.13±0.67	0.249
Red meat	-0.53±1.55	0.043	-0.14±0.82	0.319
No. of food groups with adequate intake	-0.39±0.84	0.009	-0.19±1.17	0.334

Table 5: Mean difference in percentage of calories from various food groups in the diets of males and female subjects after receiving dietary guidance as compared to before receiving dietary guidance

Food groups	Male		Female	
	Mean±SD	p-value	Mean±SD	p-value
Cereals	+1.2±13.8	0.616	-3.8±100	0.025
Vegetables	+0.4±3.90	0.580	+0.7±3.6	0.251
Milk	+3.90±7.1	0.002	+4.3±7.7	0.002
Sugar/sweets	+0.05±0.4	0.510	-0.1±0.5	0.321
Added fat	-0.55±3.3	0.322	-0.2±2.9	0.611
Lentils	-2.6±3.10	0.000	-1.3±2.3	0.002
Fruit	+0.4±5.60	0.680	+1.4±6.3	0.185
White meat	-0.4±4.90	0.600	-0.4±0.567	0.567
Red meat	-1.0±9.00	0.497	-3.4±0.037	0.037
Total meat group	-2.3±8.40	0.109	-0.5±8.2	0.696

Table 6: Changes in adequacy of food intake after receiving dietary guidance among male and female subjects

Adequacy of intake		Sex of the patient					
		Male		Female		Total	
		No.	(%)	No.	(%)	No.	(%)
Adequacy of Vegetable-fruit intake	Improved	2	5.6	5	13.5	7	9.6
	Worsened	10	27.8	6	16.2	16	21.9
	Remained the same	24	66.7	26	70.3	50	68.5
Adequacy of milk intake	Improved	10	27.8	11	29.7	21	28.8
	Worsened	2	5.6	6	16.2	8	11.0
	Remained the same	24	66.7	20	54.1	44	60.3
Adequacy of meat intake	Improved	0	0.0	4	10.8	4	5.5
	Worsened	14	38.9	13	35.1	27	37.0
	Remained the same	22	61.1	20	54.1	42	57.5

by milk and lower by lentils after getting dietary guidance both among males and females. Percentage of calories contributed by cereals and red meat decreased significantly only among females.

Differences in overall adequacy of diets and that intake of various food groups before and after getting dietary guidance were bilateral. Overall adequacy of diet remained the same for 47.2% of males and 35.1% of females; improved for 11.1% of males and 27% of females; and worsened for 41.7% of males 37.8% of females. In the case of milk the proportion of men and women whose adequacy of milk intake was improved was higher than of those whose adequacy of milk intake had worsened. In the case of vegetable and meat the proportion of men and women whose adequacy of intake was improved was lower than of those whose adequacy of milk intake had worsened Table 6.

**Energy intake and weight change:** Energy intake was reduced by more than 10 for 55% of subjects. Weight reduction was observed in 54.8% of females and 32.2 % of males. Mean percentage of weight loss was 2.2% in males and 2.5% among females, range being 1-4% in both. BMI was decreased among 27.7% of subject, increased in 21.5% and remained the same others (50.8%). When viewed according to reported reduction in caloric intake rate of BMI reduction was significantly higher in the group who had reduced their caloric intake (Fig. 3).

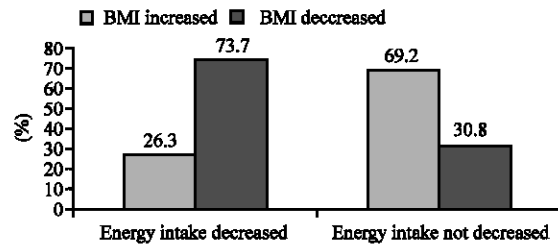


Fig. 3: Rate of reduction in BMI within the two groups of subjects whose caloric intake was decreased or not

## DISCUSSION

This study has given a comprehensive picture of the dietary habits of type 2 diabetics living in Karachi. It is the first prospective study from Pakistan reporting the impact of dietary interventions on energy and food intake and BMI of subject with type 2 diabetes. The findings demonstrate that the interventions were successful in bringing out certain major desired dietary changes i.e. reduction in caloric intake in the majority of patients and as a result significantly high rate of BMI reduction amongst those who had reduced their every intake as compared to those who had not. These observations support the suggestion that input in providing service of trained dietician to people with diabetes is a very cost effective investment even within a low resource community as has been observed in affluent economies (Franz *et al.*, 1995; Kaplan and Davis, 1986; Sheils *et al.*, 1999). Further research is needed to quantify the contributions made by dietary interventions to the overall outcome of treatment.

This study has also been successful in indicating the areas of dietary guidance where further attention is to be given by dietician i.e., balanced intake of foods from various food groups. The observation that people with diabetes in an attempt to reduce energy intake may not be able to retain adequate intake of certain foods, has implications not just for dietetics but for other areas of food policies in developing countries like Pakistan. Overall attention given to food supply and nutrition situation is far from sufficient in Pakistan (Khalil, 2000). For example opportunities for higher education and research in human nutrition and dietetics are very limited, there is no legislation about minimum information to be provided on food labels, no information about food and nutrition is compulsory at school level etc. Consequently even for a well meaning and motivated person it is not easy to make appropriate food choices and at times even professionals are unable to find accurate information about composition of foods. Though undoubtedly even within the existing circumstances dietary intervention would contribute to better management of diabetes and prevention or delay in onset of complications, improvement in education and research opportunities and presence and implementation of legislation is definitely needed. Besides, while assessing the impact of any dietary intervention in Pakistan we should keep in mind the overall education level of the concerned population.

In terms of cost effectiveness of dietary interventions, the impact is underestimated by both policy makers and patients. Governments and NGOs are always willing to invest in tertiary health centres but not in preventive

strategies like provision of professional dietary guidance. Even in big cities of Pakistan only 39% of hospitals have any dietician (Afzal, 1999). Usually General Physicians (Rani, 2000) and Consultants (Khan, 2000) provide dietary guidance themselves and even in case of diabetes where dietary guidance plays an important role only a printed leaflet is handed to patients with diabetes (Khan, 2003). Most patients can neither afford nor consider it important to consult private dieticians. The message for Policy makers, health care providers and patients is:

Investing in dietetic centres and nutrition science to help and educate people about making good food choices is one of the most cost effective investments. Training a dietician is much less expensive than training a physician and government must take at least the same if not more interest in training dieticians and providing dietetic services to all the people with diabetes free of cost. This would certainly reduce the burden of diabetes and its complications in the community as well as could possibly help in primary prevention of the diseases high risk groups.

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