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Article

Socio-demographic characteristics, dietary habits and physical activity influence on nutritional status of the diabetics: a cross sectional study

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Abstract: Diabetes mellitus, a chronic, debilitating disease, is associated with a range of severe complications which include cardiovascular disease, renal disease and blindness. Demographic and epidemiological evidences suggest that the incidence of diabetes is increasing worldwide. Diabetes mellitus in people of all ages is reaching epidemic proportions in Bangladesh. The main objective of this cross sectional study was carried out to evaluate that nutritional status of the diabetic patients influence by socio-economic level, dietary habits and physical activity.A total of 282 diabetic outpatients were recruited using Simple Random Sampling technique from three referral diabetic centers namely-Kushtia Diabetic Shomity, Bheramara Diabetic Shomity and Diabetic Shomity Kumarkhali, Kushtia, Bangladesh. The nutritional status of each participant was screened. Direct method of nutritional assessment including anthropometric measurement, biochemical measurement, clinical assessment and dietary method was carried out. Socio economic data were also collected. Data were analyzed using the computer program Statistical Package for Social Sciences (SPSS) version 22.The result reveals that51.1% (n=144) of the total participants were male and 48.9% (n=138) were female. About 28.4% population studied were between 51-60 years, 94.7% married, 44.7% were unemployed and 50.4% were resided in urban area. Based on Body Mass Index (BMI), mean BMI of male was 23.32 ± 3.47 and that of female was 25.83 ± 4.46, half of the respondents (48.9%) had an acceptable nutritional status with a BMI between 18.5-24.9 (62.3% male; 37.7% female) whilst 4.6% of the respondents were underweight with BIMs below 18.5. The female who were observed were 22 (88.0%) and the male were 3 (12.0%) showing a very great prevalence of obesity (BMI more than 30.0). Study showed that 98 (34.7%) respondents bear diabetes from their family and 147 (52.1%) respondents have family history of hypertension The mean blood hemoglobin level was 12.49±1.47g/dl, in which male hemoglobin level was 12.85±1.48g/dl and of female was 12.11±1.36g/dl. The result shows that about 29.8% (n=84) patients had no formal education; among them more were female 65.5% (n=55). More of the patient (50.7%) had family member of 4-6. About 33.0% of the studied patients were low-income level (25.9% were from upper-lower and 7.1% were from lower socio-economic status). Among 37.6% (n=106) overweight (BMI 25.0-29.9) diabetic patients more were female 56.6% (n=60) and 55.7% (n=59) were unemployed. So, female sex, lower educational status, more family member, low monthly family income group and unemployment are associated with malnutrition. Unemployed housewives represented to have both extremes of nutritional status- under nutrition and over nutrition. In the study, most of the patient 126 (44.7%) were unemployed, among them almost all the patient 124 (98.4%) were female. Diabetic care seeking by rural people and female appeared encouraging emphasizing the need of decentralization of diabetic care center to periphery.

Keywords: diabetes; malnutrition; body mass index; hemoglobin; medical nutrition therapy

1. Introduction

Diabetes is a chronic condition characterized by hyperglycemia. It is caused by deficient insulin production, resistance to insulin action or a combination of both (Alberti and Zimmet, 1998). It is accompanied in many cases by secondary alteration of fat and protein metabolism resulting in an array of physical disorder. Diabetes therefore, is a metabolic disease that can be well under control and reasonably managed with proper care, though it cannot be cured once it occurs (Thomas, 2005). Diabetes may present with characteristics symptoms such as polyuria, polydipsia, weight loss with sometimes polyphagia and blurred vision. Impairment of growth and susceptibility to certain infections may also accompany with chronic state of hyperglycemia. Acute life-threating consequences of diabetes are hyperglycemia with ketoacidosis or non-ketotic hyperosmolar syndrome (JakJervell, 2000). Diabetes mellitus can lead to long term complications many of which can be fatal, if not prevented and all of which have the potential to reduce quality of life for people with diabetes (Journal of American Medical Association, JAMA, 2002). The underlying pathophysiology and management of both forms are different; a common feature is development of long-term micro and macro vascular complications such as retinopathy, nephropathy macro vascular disease peripheral and autonomic neuropathy. These complications are associated with increased morbidity and mortality (DCCT, 1993). Malnutrition is still a devastating problem in certain parts of the world although proportion and absolute number of chronically under-nourished people have declined. Under-nutrition remains as a serious problem among poor families and of under-developed nations, resulting from consumption of poor diet over a long period of time (Awan, 1997). Protein energy malnutrition has been a common health problem of the third world (Khan *et al.,* 1990). Malnutrition has many adverse consequences. It is often argued that a malnourished is mentally and physically fatigued. He or she lacks in curiosity and is irresponsive to environmental situation. He is also frequently attacked by illness leading to higher absenteeism which is considered as another cause for poor performance (Berg, 1969). A proper diet is a fundamental element of therapy in all diabetic individuals. A diet recommended for a diabetic patient is, in fact a “balanced diet” for anyone. A balanced meal is a combination of carbohydrates, fats, proteins and fibers appropriate for the individual. A diet plan should be individualized according to his/her needs; it must be simple to understand and easy to follow. The primary goal of medical nutrition therapy of diabetics is to achieve metabolic control in order to prevent short-term and long-term complications of diabetes mellitus. Therefore the aims of nutritional intervention should include not only optimum control of blood glucose levels but also normalization of lipids and lipoprotein concentrations and blood pressure. The recent dietary recommendations of the American Diabetes Association for diabetics include an individualized approach based upon the diabetes management goals of each patient that takes into consideration preference of the patient and control of hyperglycemia and dyslipidemia. In consideration of the composition of the diet, besides a low saturated (high carbohydrate diet, a high monounsaturated fat diet may also be recommended (Grag, 1996). Intake of trans-fatty acids and cholesterol should be restricted and alcohol should be completely avoided in diabetic with dyslipidemia. Protein intakes should be between 15-20% of the total energy intake. Fiber rich sources of complex carbohydrates are preferred over refined sugars. The diet should be wholesome and provide the dietary allowances of all vitamins and minerals (www.bamboweb, 2005). A survey of nutritional status should show the relationship between food and nutrients, their use in the body and general health. It may be good, fair or poor, depending on the body ability to utilize these (Overt, 1980). Nutritional assessment is the process whereby the state of nutritional health of an individual or group of individuals is determined. Nutritional status is commonly assessed by anthropometric measurement, clinical examinations for ascertaining nutritional deficiencies and also biochemical assessment (J Am, 1969). In the present context, it is more important to assess the nutritional status of diabetes patients. As such the present study was undertaken to assess the nutritional status in relation to clinical presentations, anthropometrical measurements, hemoglobin level and dietary pattern of diabetes patients on three selected Diabetic centers in Kushtia district, Bangladesh.

2. Materials and Methods

2.1. Study area and period

The out-patient department based study was carried out at Kushtia Diabetic Shomity, Bheramara Diabetic Shomity and Diabetic Shomity Kumarkhali, Kushtia, Bangladesh. This descriptive cross-sectional study was carried out to evaluate that nutritional status of the diabetic patients influence by socio-economic level, dietary habits and physical activity from three diabetic centers, Kushtia during the period from August 2016 to July 2017. Total 282diabetes patients from both sexes (n = 282; 144 men and 138 women) were selected for the study by using Simple Random Sampling Technique.

2.2. Collection of data

All participants were informed of the purpose of the study and each patient signed a consent form. Data regarding anthropometric information and socioeconomic status like occupation, marital status, education, family size and monthly family income was collected by interviewing the subjects. All diabetic patients from out-patient departments of the three diabetic centers with the following criteria participated in the study: 1). having fasting blood sugar of (7.0 mml/L) 126 mg/dl and above. 2). require insulin or oral hypoglycemic agents or both for the control of blood sugar. Patient's weight and height measurements were taken by the following anthropometric procedures (WHO, 1995). Body weight was measured with a digital weighting scale in kilogram. Height was taken with a measuring scale in centimeters. BMI was calculated by using the formula: Wt (in kg) / Ht (in m^2) = BMI (in kg/m^2). Assessment of nutritional status was done by Body Mass Index method (WHO, 1995). Respondents having BMI < 18.5 were considered as underweight, having BMI 18.5-24.9 as normal weight, having BMI 25.0-29.9 as over-weight and having BMI >30 as obese. Blood samples were taken from each patient for the estimation of blood glucose, hemoglobin, serum creatinine and lipid profile. The estimation was performed following the new WHO diagnostic criteria (Diabetes care, 1997). Dietary intakes of the participants were collected by an interviewer administered 24-hour recall in the past 24 hours. It was done face to face early in the morning before the patients eat any food. Just like the name implies, the patients were asked to recall all they ate the previous day. The parameters in the food recall table were as follow: food and drink consumed, time the food eaten and description of the food.

2.3. Statistical analysis

Data were checked, entered and analyzed using the computer program Statistical Package for Social Sciences (SPSS) version 22. The statistical analyses include frequencies and mean ± SD. For all analyses, p value <0.05 was considered statistically significant.

3. Results and Discussion

3.1. Socio-demographic data

A descriptive cross-sectional study was carried out among 282 diabetic patients selected randomly from three diabetic centers in Kushtia district. Socio-demographic profiles of diabetic patients are shown in Table 1.

Table 1. Percentage distribution of socio-demographic characteristics of the respondents (Diabetic Patients).

Characteristics	Male	Female	Total
Age range (years)			
< 31	6 (4.2%)	17 (12.3%)	23 (8.2%)
31 – 40	17 (11.8%)	37 (26.8%)	54 (19.1%)
41 – 50	34 (23.6%)	40 (29.0%)	74 (26.2%)
51 – 60	47 (32.6%)	33 (23.9%)	80 (28.4%)
> 60	40 (27.8%)	11 (8.0%)	51 (18.1%)
Total	144 (100%)	138 (100%)	282 (100%)
Place of residence			
Urban	69 (47.9%)	73 (52.9%)	142 (50.4%)
Rural	75 (52.1%)	65 (47.1%)	140 (49.6%)
Total	144 (100%)	138 (100%)	282 (100%)
Educational background			
No formal education	29 (20.1%)	55 (39.9%)	84 (29.8%)
Primary school	35 (24.3%)	44 (31.9%)	79 (28.0%)
Secondary school	28 (19.4%)	12 (8.7%)	40 (14.2%)
Intermediate school	19 (13.2%)	14 (10.1%)	33 (11.7%)
Graduate and above	33 (22.9%)	13 (9.4%)	46 (16.3%)
Total	144 (100%)	138 (100%)	282 (100%)
Marital status			
Unmarried	2 (1.4%)	1 (0.7%)	3 (1.1%)
Married	138 (95.8%)	129 (93.5%)	267 (94.7%)

Characteristics	Male	Female	Total
Widow	4 (2.8%)	6 (4.3%)	10 (3.5%)
Divorced	0 (0.0%)	2 (1.4%)	2 (0.7%)
Total	144 (100%)	138 (100%)	282 (100%)
No. of household members			
≤ 3	58 (40.3%)	65 (47.1%)	123 (43.6%)
4 – 6	75 (52.1%)	68 (49.3%)	143 (50.7%)
> 6	11 (7.6%)	5 (3.6%)	16 (5.7%)
Total	144 (100%)	138 (100%)	282 (100%)
Occupation			
Unemployed	2 (1.4%)	124 (89.9%)	126 (44.7%)
Student	1 (0.7%)	0 (0.0%)	1 (0.4%)
Farmer	34 (23.6%)	0 (0.0%)	34 (12.1%)
Trader	55 (38.2%)	1 (0.7%)	56 (19.9%)
Junior civil servant	14 (9.7%)	7 (5.1%)	21 (7.4%)
Senior civil servant	18 (12.5%)	5 (3.6%)	23 (8.2%)
Retire/ Pensioner	17 (11.8%)	1 (0.7%)	18 (6.4%)
Others	3 (2.1%)	0 (0.0)	3 (1.1%)
Total	144 (100%)	138 (100%)	282 (100%)
Monthly household income in Taka (BDT)			
< 4000	15 (10.4%)	4 (2.9%)	19 (6.7%)
4000 – 9000	38 (26.4%)	36 (26.1%)	74 (26.2%)
9001 – 14000	20 (13.9%)	44 (31.9%)	64 (22.7%)
14001 – 19000	29 (20.1%)	29 (21.0%)	58 (20.6%)
> 19000	42 (29.2%)	25 (18.1%)	67 (23.8%)
Total	144 (100%)	138 (100%)	282 (100%)
Socio-economic status			
Upper	43 (29.9%)	25 (18.1%)	68 (24.1%)
Upper – middle	28 (19.4%)	29 (21.0%)	57 (20.2%)
Middle	21 (14.6%)	43 (31.2%)	64 (22.7%)
Upper – lower	36 (25.0%)	37 (26.8%)	73 (25.9%)
Lower	16 (11.1%)	4 (2.9%)	20 (7.1%)
Total	144 (100%)	138 (100%)	282 (100%)

Table 1 has shown that a total of 51.1% of the subjects were males and 48.9% were females. Only 8.2% of the subjects (4.2% were male and 12.3% were female) were within the age range of 30 years and below. Another 28.4% were within the age range of 51 to 60 years. About 32.6% were male and 23.9% were female subjects were within the age range of 51 to 60 years. About 50.4% of the diabetic patients were resided in urban area and 49.6% were resided in rural area. A total of 28.0% of the subjects (male were 24.3% and female were 31.9%) had primary education and about 95% of the subjects (94.7%) were married. About 44.7% of subjects were unemployed and 19.9% were traders. About half of the patient (50.7%) had 4 to 6 family members. About 23.8% families' monthly income were more than 19000 BDT. About 44.3% of the subjects were high income level (24.1% were upper and 20.2% were upper-middle socio-economic status), 22.7% were middle income level and 33.0% were low income level (25.9% were upper-lower and 7.1% were lower socio-economic status).

3.2. Biophysical characteristics

Biophysical characteristics of male and female diabetic patients in Kushtia district are shown in Table 2.

Table 2. Percentage distribution of biophysical characteristics of the respondents (Diabetic Patients).

Characteristics	Male	Female	Total
Systolic blood pressure			
= 140 normal	91 (63.2%)	109 (79.0%)	200 (70.9%)
> 140 high	53 (36.8%)	29 (21.0%)	82 (29.1%)
Total	144 (100%)	138 (100%)	282 (100%)
Diastolic blood pressure			
= 90 normal	88 (61.1%)	94 (68.1%)	182 (64.5%)
> 90 high	56 (38.9%)	44 (31.9%)	100 (35.5%)
Total	144 (100%)	138 (100%)	282 (100%)
Smoking			
Yes	74 (51.4%)	0 (0.0%)	74 (26.2%)
No	70 (48.6%)	138 (100%)	208 (73.8%)
Total	144 (100%)	138 (100%)	282 (100%)
Exercise			
Yes	92 (63.9%)	82 (59.4%)	174 (61.7%)
No	52 (36.1%)	56 (40.6%)	108 (38.3%)
Total	144 (100%)	138 (100%)	282 (100%)

Table 2 has explained that, a total of 29.1% of the subjects had high systolic blood pressure and 35.5% of the subjects had high diastolic blood pressure. Again about 36.8% and 38.9% of the diabetic male had high systolic and diastolic blood pressure, whereas 21.0% and 31.9% of the diabetic female had high systolic and diastolic blood pressure. So the result shows that male diabetic patients were more prevalent for high systolic and diastolic blood pressure than that of female. About 73.8% of the total subjects were non-smoker. About 63.9% of the male subjects and 59.4% of the female subjects had experience of regular physical exercise.

3.3. Anthropometric indices

Anthropometric characteristics of the diabetic patients are shown in Table 3, Table 4 and Table 5.

Table 3. Distribution of mean body mass index (BMI) of the respondents (Diabetic Patients) according to sex.

BMI ranges (kg/m^2)	*Variables*							
	Sex.				*Total.*		*p*-value	
	N	*Male*	*N*	*Female*	*N*	*(%)*		*Mean*
‹18.5 (underweight)	9	16.30 ± 1.98	4	18.05 ± 0.38	13	4.6%		
18.5-24.9 (Normal)	86	21.92 ± 1.67	52	22.02 ± 1.93	138	48.9%		
25-29.9 (Overweight)	46	26.71 ± 1.24	60	27.00 ± 1.46	106	37.6%		
>30 (Obesity)	3	32.37 ± 1.17	22	33.07 ± 2.92	25	8.9%		
Mean	144	23.32 ± 3.47	138	25.83 ± 4.46	282	100.0%	24.55 ± 4.18	.000

Table 3 has revealed that the mean BMI of the males was 23.32±3.47kg/m2 and that of the females was 25.83±4.46 kg/m2. The BMI value for the females was significantly (p‹0.05) higher than that of males. A total of 37.6% (n=106) of the patients were overweight, 8.9% (n=25) were obese, 4.6% (n=13) were underweight and 48.9% (n=138) were normal.

Table 4. Cross tabulation of BMI with sex, place of residence, educational levels, occupation and socio-economic status of the respondents (Diabetic Patients).

Variables	< 18.5	18.5 – 24.9	25.0 – 29.9	> 30.0	Total
Sex					
Males	9 (69.2%)	86 (62.3%)	46 (43.4%)	3 (12.0%)	144 (51.1%)
Female	4 (30.8%)	52 (37.7%)	60 (56.6%)	22 (88.0%)	138 (48.9%)
Total	13 (100%)	138 (100%)	106 (100%)	25 (100%)	282 (100%)
Place of residence					
Urban	1 (7.7%)	46 (33.3%)	76 (71.7%)	19 (76.0%)	142 (50.4%)
Rural	12 (92.3%)	92 (66.7%)	30 (28.3%)	6 (24.0%)	140 (49.6%)
Total	13 (100%)	138 (100%)	106 (100%)	25 (100%)	282 (100%)
Educational background					
No formal education	7 (53.8%)	35 (25.4%)	35 (33.0%)	7 (28.0%)	84 (29.8%)
Primary school	5 (38.5%)	34 (24.6%)	34 (32.1%)	6 (24.0%)	79 (28.0%)
Secondary school	0 (0.0%)	27 (19.6%)	9 (8.5%)	4 (16.0%)	40 (14.2%)
Intermediate school	1 (7.7%)	16 (11.6%)	13 (12.3%)	3 (12.0%)	33 (11.7%)
Graduate and above	0 (0.0%)	26 (18.8%)	15 (14.2%)	5 (20.0%)	46 (16.3%)
Total	13 (100%)	138 (100%)	106 (100%)	25 (100%)	282 (100%)
Occupation					
Unemployed	4 (30.7%)	45 (32.7%)	59 (55.7%)	18 (72.0%)	126 (44.7%)
Student	0 (0.0%)	1 (0.7%)	0 (0.0%)	0 (0.0%)	1 (0.4%)
Farmer	6 (46.2%)	22 (15.9%)	5 (4.7%)	1 (4.0%)	34 (12.1%)
Trader	3 (23.1%)	29 (21.0%)	22 (20.8%)	2 (8.0%)	56 (19.9%)
Junior civil servant	0 (0.0%)	12 (8.7%)	6 (5.7%)	3 (12.0%)	21 (7.4%)
Senior civil servant	0 (0.0%)	15 (10.9%)	8 (7.5%)	0 (0.0%)	23 (8.2%)
Retire/Pensioner	0 (0.0%)	12 (8.7%)	5 (4.7%)	1(4.0%)	18 (6.4%)
Others	0 (0.0%)	2(1.4%)	1(0.9%)	0 (0.0%)	3 (1.1%)
Total	13 (100%)	138 (100%)	106 (100%)	25 (100%)	282 (100%)
Socio-economic status					
Upper	0 (0.0%)	35 (25.4%)	23 (21.7%)	10 (40.0%)	68 (24.1%)
Upper-middle	2 (15.4%)	28 (20.3%)	23 (21.7%)	4 (16.0%)	57 (20.2%)
Middle	4 (30.7%)	24 (17.4%)	31 (29.3%)	5 (20.0%)	64 (22.7%)
Upper-lower	6 (46.2%)	37 (26.8%)	24 (22.6%)	6 (24.0%)	73 (25.9%)
Lower	1 (7.7%)	14 (10.1%)	5 (4.7%)	0 (0.0%)	20 (7.1%)
Total	13 (100%)	138 (100%)	106 (100%)	25 (100%)	282 (100%)

Table 4 has shown the cross tabulation of BMI of subjects with sex, place of residence, educational level, occupation and socio-economic status. Among 13 diabetics who were underweight, 69.2% were males and 30.8% were females. Among those who were of normal weight 62.3% were males and 37.7% were females. Among the 25 diabetics who were obese 12.0% were males while 88.0% were females. As many as 56.6% of female were overweight, among the overweight category while 43.4% male were overweight. About 7.7% of the diabetics who lived in urban area were underweight while 92.3% who lived in rural were underweight. About 33.3% of diabetics who were normal weight live in the urban and 66.7% in the rural. Among the 106 subjects within the overweight category 71.7% of those that lived in urban area were overweight while 28.3% were from the rural area. Among the 25 subjects who were obese 76.0% were from the urban while 24.0% were from the rural area. Among 106 diabetics who were overweight 8.5% had secondary education while 33.0% had no formal education. In obese category, among 25 subjects 28.0% had no formal education, 16.0% had secondary education, while 20.0% of the subjects that had graduate and above. Unemployed respondents showed overweight 59 (55.7%) more and among 25 obese patients 72.0% were unemployed. On the other hand among 13 underweight respondents more (46.2%) were farmer. But no underweight with high family income could be detected. Among 25 obese patients more (40.0%) were from upper socio-economic status.

Table-5 shows relationship between the socioeconomic variables and BMI of diabetic patients. The BMI of patients was significant in different sex, resident and occupation. There were no significant differences ($p > 0.05$) in the BMI of patients in different educational attainments and age range.

Table 5. Relationship between respondent's (Diabetic Patients) variable and mean BMI.

Variables	N	BMI	P. value
Sex			
Male	144	23.32 ± 3.47[b]	
Female	138	25.83 ± 4.46[a]	
Mean	282	24.55 ± 4.18	.000
Age range (years)			
< 31	23	25.63 ± 5.06[a]	
31 – 40	54	25.28 ± 4.27[a]	
41 – 50	74	25.10 ± 4.28[a]	
51 – 60	80	23.71 ± 3.99[a]	
61 and above	51	23.79 ± 3.49[a]	
Mean	282	24.55 ± 4.18	.051
Place of residence			
Urban	142	26.15 ± 3.97[b]	
Rural	140	22.92 ± 3.74[a]	
Mean	282	24.55 ± 4.18	.000
Educational background			
No formal education	84	24.26 ± 4.58[a]	
Primary school	79	24.68 ± 3.64[a]	
Secondary school	40	24.29 ± 4.67[a]	
Intermediate school	33	24.58 ± 4.00[a]	
Graduate and above	46	25.05 ± 4.04[a]	
Mean	282	24.55 ± 4.18	.860
Occupation			
Unemployed	126	25.72 ± 4.31[b]	
Student	1	21.60 ± 0.00[b]	
Farmer	34	21.78 ± 3.95[b]	
Trader	56	24.20 ± 3.53[b]	
Junior civil servant	21	25.35 ± 4.97[b]	
Senior civil servant	23	23.59 ± 2.89[b]	
Retire/Pensioner	18	23.38 ± 3.13[b]	
Others	3	22.93 ± 2.74[a]	
Mean	282	24.55 ± 4.18	.000

***ab**: values with different subscript letters in the same column are significantly different (P < 0.05).*

3.4. Biochemical tests

Biochemical indices of the diabetic patients are shown in Table 6.

Table 6. Mean biochemical indices of the respondents (Diabetic Patients).

Biochemical indices: Combined range	**Male**	**Female**	**Male & female**	**P. value**	**Normal**
Blood hemoglobin level (g/dl)	12.85 ± 1.48	12.11 ± 1.36	12.49 ± 1.47	.000	M: 14-18, F: 11.5-16.5
Fasting blood glucose (mmol/L)	8.69 ± 1.48	9.04 ± 1.84	8.86 ± 1.67	.080	< 7.0
Bl. Glucose 2 hours after breakfast	13.86 ± 2.92	14.01 ± 2.84	13.94 ± 2.88	.673	< 11.1
Serum creatinin (mg/dl)	1.17 ± 1.05	1.26 ± 1.05	1.22 ± 1.05	.480	0.70 – 1.20
Total cholesterol (mg/dl)	198.49 ± 51.87	195.92 ± 45.96	197.23 ± 48.99	.660	Up to 200
LDL (mg/dl)	119.66 ± 48.34	114.65 ± 40.45	117.21 ± 44.65	.347	< 150
HDL (mg/dl)	35.31 ± 5.53	34.59 ± 5.21	34.96 ± 5.38	.263	M: >45, F: >35
Triglycerides (mg/dl)	217.57 ± 70.95	233.37 ± 76.63	225.30 ± 74.08	.073	50 - 150

HDL = High density lipoprotein
LDL = Low density lipoprotein

The mean blood hemoglobin level was 12.49±1.47g/dl, in which male hemoglobin level was 12.85±1.48g/dl and of female was 12.11±1.36g/dl. The mean fasting blood glucose level of the patients was 8.86±1.67mmol/L and blood glucose level two hours after breakfast was 13.94±2.88mmol/L. The mean serum creatinine level of the male patients were 1.17±1.05mg/dl and female were 1.26±1.05mg/dl. The patients mean total cholesterol, low density lipoprotein; high density lipoprotein and triglyceride levels were 197.23±48.99mg/dl, 117.21±44.65mg/dl, 34.96±5.38mg/dl and 225.30±74.08mg/dl respectively.

3.5. Clinical findings

The distributions of family history of chronic diseases of the diabetics have shown in Table 7.

Table 7. Family history of chronic diseases of the respondents (Diabetic Patients) according to sex.

Variables: ***Family history of chronic diseases***	**Male**	**Female**	**Total**
None	71 (49.3%)	39 (28.3%)	110 (39.0%)
DM	8 (5.5%)	11 (8.0%)	19 (6.7%)
HTN	35 (24.3%)	39 (28.3%)	74 (26.3%)
HTN and DM	12 (8.3%)	26 (18.7%)	38 (13.5%)
HTN, DM and CVD	1 (0.7%)	6 (4.3%)	7 (2.5%)
HTN, DM and Asthma	7 (4.9%)	11 (8.0%)	18 (6.4%)
DM and Renal disease	3 (2.1%)	3 (2.2%)	6 (2.1%)
HTN, DM and renal disease	7 (4.9%)	3 (2.2%)	10 (3.5%)
Total	144 (100%)	138 (100%)	282 (100%)

HTN = Hypertension
DM = Diabetes Mellitus
CVD = Cerebral Vascular Disease

About 39.0% of the diabetic patient had no family history of chronic diseases. Only 6.7% of the diabetic patient had family history of diabetes alone and 26.3% patients had family history of hypertension alone. About 13.5% and 2.5% patients had family history of hypertension and hypertension with CVD along with diabetes. About 2.1% patients had family history of renal disease and 3.5% had hypertension and renal disease along with diabetes.

3.6. Dietary results

The food consumption patterns of the respondents are shown in Table 8.

Table 8. Percent distribution of the respondents (Diabetic Patients) by consumption frequencies of selected food groups (Multiple responses).

Food groups	**Male (133)**	**Female (126)**	**Total (259)**
Rice	132 (99.2%)	125 (99.2%)	257 (99.2%)
Wheat flour/ Bread	120 (90.2%)	118 (93.6%)	238 (91.9%)
Meat	30 (22.5%)	27 (21.4%)	57 (22.0%)
Fish	82 (61.6%)	90 (71.5%)	172 (66.5%)
Egg	79 (59.4%)	73 (57.9%)	152 (58.7%)
Pulses, nuts	108 (81.2%)	98 (77.8%)	206 (79.5%)
Green leafy vegetables	131 (98.5%)	125 (99.2%)	256 (98.8%)
Fruits	50 (37.5%)	72 (57.0%)	122 (47.2%)
Milk and milk products	36 (27.0%)	52 (41.2%)	88 (34.0%)
Tea, biscuits	61 (45.8%)	17 (13.5%)	78 (30.0%)
Fats and oils	4 (3.0%)	3 (2.4%)	7 (2.7%)
Dairy products	23 (17.3%)	27 (21.4%)	50 (19.3%)

Majority (99.2%) consumed rice once per day while few (34.0%) consumed milk and milk product once per day. Averagely (58.7%) of the respondents consumed egg while majority (98.8%) consumed green leafy vegetables once per day. Fried and dairy products were consumed by 19.3% once per day while fruits were consumed by 47.2% respondents once per day. Approximately 79.5% consumed pulses and nuts once daily while 30.0% consumed tae and biscuit once per day. Majority of the patients (66.5%) consumed fish once per

day while few (22.0%) consumed red meat once per day. About only 2.7% patients consumed fats (butter, margarine) once per day.

4. Conclusions

Based on the findings of the study, it could be concluded that Middle to elder age group (41-60 years) appeared to suffer more from diabetes with no sex differences (male were 56.2% and female were 54.1%). No underweight with high family income might be explained as an association of more calorie intake and less physical activities. Among the diabetic patients, retired and unemployed persons appeared particularly vulnerable to become overweight to obese and on the other hand younger patients, poor education, lower income group and patients consuming low calorie were prone to develop under nutrition. So, health education should be aimed to enhance awareness of particularly rural and illiterate people for regular visit to nearby diabetic center and to strictly adhere to dietician's advice.

Combination of intensive nutrition education, medical nutrition therapy, prescribed medication and counseling are keys to successful management of diabetes mellitus. People should be able to discipline themselves to eat less sugar containing food like chocolate, pastries and also eating of junk food which has no nutrients. The older people need to exercise regularly to avoid the ailment because lack of it can lead to obesity which is one of the complications of diabetes. The obese diabetics must reduce weight and adiposity to be successful in the management of their diabetes.

Conflict of interest

None to declare.

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