Scholastic Case Reports

Research Article

Volume 1 Issue 2 - 2024

Nutritional Status and Dietary Patterns of Type 2 Diabetics at the Bamenda Regional Hospital

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Received: September 09, 2024**; Published:** September 30, 2024

Abstract

T2DM is a severe health problem in many developing countries, primarily affecting adults aged 40 and above. In Cameroon, the situation prevails and primarily affects middle-aged adults. The nutritional status of 80 people suffering from T2DM and attending the diabetic clinic at the RHB was determined using standard techniques. The objective of this study was aimed at assessing the nutritional status and dietary patterns of T2DM patients attending the RHB. A questionnaire was developed to collect information regarding the background of the patients, family and clinical history. Anthropometric measurements included measurement of height, weight and MUAC was carried out. Food intake was collected using a 24 hour recall and food frequency questionnaire. Biochemical data was collected by obtaining FBG and BP of the patients. The results of this study showed that 80% of all participants were overweight or obese, 86.26% had central obesity, which is a major cardiovascular risk factor. Consumption of fruits and vegetables was suboptimal with only 2.5% of all participants consuming them on a daily basis. 57% of participants had poor FBG control and 72.5% had poor blood pressure control. There was a positive significant correlation between SBP and WHR ($r = 0.389$, $p < 0.01$). These results tend to show that dietary practices of T2DM patients at the RHB are suboptimal and require improvement. The nutritional status of most of the patients is inclined towards overweight and obesity which puts patients at increased risk of comorbidities, especially cardiovascular diseases, with female clients at high risk due to the high prevalence of obesity among them. Education and counseling on diet and lifestyle changes is recommended to alleviate these risks.

Keywords: nutritional status, FBS, T2DM, anthropometry, central obesity, MUAC

Introduction

The association between diet and health is underpinned by the interdependent relation between dietary patterns, foods and components, including nutrients [1]. Too much or too little food intake may cause serious damage to the body system. This can result to various diseases; among them is diabetes, obesity, artherosclosis [2]. Nutritional status refers to health and wellbeing of individuals and populations influenced by their intake and utilization of nutrients [3]. Diabetes is, by its nature, a group of metabolic disorder caused by different factors characterized by a chronic high level of blood sugar/glucose with disturbances to carbohydrate, fat, and protein metabolism resulting from defects in insulin secretion, insulin action, or both [4]. Glucose is a chemical compound that delivers energy to the body cells and tissues, and insulin is the hormone that is responsible for converting glucose to help it reach the body cells [5]. Scientists have divided diabetes into three different types: Type 1 diabetes mellitus or insulin dependent or juvenile onset diabetes, type 2 diabetes mellitus or non-insulin dependent diabetes or adult-onset diabetes and gestational diabetes mellitus is defined as any degree of glucose intolerance with onset or first recognition during pregnancy [4]. The incidence of diabetes especially type 2, is rapidly growing in the world. By the end of 2006, the world's population stood at 230 million and 6% suffered from this chronic disease. It is estimated that, during the next 35 years, diabetes worldwide prevalence will reach 25%. In Africa, the prevalence rate of diabetes is about 1.4%, with the exception of South Africa, where the rate was estimated to be as high as 3.6% in 2001[6].

Like the rest of the world, the sub-Saharan Africa is experiencing an increasing prevalence of diabetes, alongside other non-communicable diseases like cancer and heart attack [2]. In 2010, 12.1 million people were estimated to be living with diabetes in Africa, and this is projected to increase to 23.9 million by 2030 [7].

In Cameroon, the prevalence of diabetes in adults in urban areas [8] is currently estimated at 6 -8%, with as much as 80% of people living with diabetes who are currently undiagnosed in the population. The burden of diabetes in Cameroon is not only high but is also rising rapidly [8]. Data in Cameroonian adults based on three cross sectional surveys over a 10-year period (2004-2014) showed an almost 10 fold increase in diabetes prevalence [9]. However, patients with diabetes can maintain

a satisfactory quality of life by preventing the adverse effects of the disease, which can be achieved through appropriate disease management by ensuring proper diet, exercise, medication, and healthy living habits to maintain their blood glucose levels within a desired range [10].

Dramatic incidences of T2DM have been observed in individuals, where there have been major changes in the type of diet consumed from a traditional indigenous diet to a typical Western diet, increase in obesity individuals, low levels of physical activity and alcohol intake [9]. Therefore, this study aims to assess the nutritional status of patients with T2DM.

Materials and methods

1.1 Area of study

This study was carried out in Mankon at the RHB and its participants were recruited from the diabetes center. The diabetes center receives T2DM patients from the entire North West Region, Bamenda and its environs. The RHB is located in Azire Health area, Bamenda II sub division, Mezam division,North West Region of Cameroon. The hospital is bounded to the North by the Ntamulung Health area, to the South by the Atuakom Health area, to the West by the Alakuma health area, and to the East by the Ntambang Health area.

The RHB is the reference in the North West region and its existence dates back to the German colonial period. By 1890, the Germans had implemented their administration at the Bamenda up station including a hospital to serve the administrative workers. Across the years this hospital welcomed patients coming from all parts of the Bamenda grass fields. After the capitulation of the Germans to the British in January of 1916 and due to the increasing significance of the hospital, the location was changed to another area called Abakwa. Works for the construction of the hospital began which was completed in 1956. It was opened in 1956 by Sir Roberts the then British High Commissioner based in Lagos Nigeria [11].

1.2 Research design

This study is a descriptive, cross sectional survey of T2DM patients in the RHB. All the data for this study were both qualitative and quantitative data in nature. Qualitative data was from observations and interviews with the patients and staff of the diabetic clinic and the nutritionist, while quantitative data like existing history of type 2 diabetes are from existing records.

1.3 Study population

The study population consisted of 80 type 2 diabetics both male and female with age ranges from 40 to 80 years old coming for consultations and receiving medical care at the RHB Diabetic unit and, who were able to participate in this study and give appropriate information, were included in the study.

1.4 Sample size

The sample size was gotten using the available literature which was made of 80 T2DM patients comprising of 49 women and 31 men. From the statistics of the hospital 160 T2DM patients were registered and followed up at the diabetic clinic from the beginning of the year January 2019 to August 2019. The proportion of males to females is 45:115. From this population of patients, we chose a convenient sample of 80 patients divided in the proportion of 31:49, as 31 males and 49 females.

The sample size was calculated using the Cochran formula [12] at 95% confidence interval and the subjects were to be chosen randomly.

$$n = \frac{z^2 p(1-p)}{d^2}$$

Where,

n= required sample size

z= confidence level at 95% (standard value of 1.96)

p= estimated prevalence of the infection among the population under investigation.

According to the Implementation of Cameroon National Diabetes Programme, Cameroon, [8] the prevalence of diabetes in urban areas is currently estimated at 6-8%.

Averagely, p= 7% (=0.07)

d= margin of error at 5% (standard value of 0.05)

If;

z= 1.96

d= 0.05

p= 0.07

$$\text{Hence } n = \frac{1.96^2 \times (0.07) \times (1-0.07)}{(0.05)^2} = 100.04 \approx 100$$

Hence, a total of 100 subjects were to be included in this study but due to the prevailing circumstances in the North West Region, Bamenda, we had less than expected number of patients coming for clinic days.

1.5 The Research Method

Methods of data collection included interviews with T2DM patients and the diabetic staff. A structured face to face questionnaire was used to obtain information of dietary knowledge and practices. Twenty four hour dietary recall and food frequency questionnaire were used to establish diet patterns. Secondary data were collected from existing records, hospital books, and books in the diabetic clinic, nutritionist's office and other existing literatures. Anthropometric measurements were done for each patient after the interview. These measurements included weight, height, waist circumference and hip circumference.

Collection of demographic data of the patients

Here background information based on age, sex, level of education, marital status, religion, monthly income, race/ ethnicity and occupation were collected using a structured face to face questionnaire.

2.1 Determining the anthropometric measurements of subjects

This method involves taking physical dimensions such as body weight, body height, MUAC, and WC and HC for calculating the WTHR.

2.1.1 Body weight

It was measured using a calibrated beam type weighing scale with the graduation of 0.1kg and a measuring range of 150kg. Prior weight measurements, the scale pointer was calibrated at zero for accuracy, subjects were asked to remove any items located on them such as their shoes, heavy jackets, other objects such as mobile phones and wallets. During measurements the patients were asked to stand at the center of the scale in an upright position looking straight ahead to avoid faulty readings. The body's weights were read from the scale to the nearest 0.1 kg and recorded.

2.1.2 Body height

Body height is the distance from the bottom of the feet to the top of the head standing erect. Height was measured using a stadiometer which was calibrated in centimeters (cm) but the final value was converted into meters (m) that is, it was divided by 100. The values of the stadiometer were recorded to the nearest 1 cm. Prior, height measurements, the patient was asked to remove his/her shoes, caps and all sorts of hair accessories. Also, they were asked to stand erect with their heels, buttocks and occiput touching the stadiometer and the drop down device was then lowered until it rested gently on the top of the patients head and the value was read from the stadiometer and recorded.

2.1.3 MUAC

The MUAC is taken using a MUAC tape which is calibrated in centimeters. The scale range of the tape is from 6 cm to 61 cm. The tape was put round the mid upper arm of the patient to precision to get the readings which were recorded. The MUAC is used to determine poor nutritional status in T2DM patients.

2.1.4 WC

It is measured using a constant tension non elastic tape which is calibrated in centimeters (cm). WC measurement is taken around the abdomen at the level of the navel. Measurements were done in a separate room to maintain privacy. Subjects were then asked to remove any bulky clothing which would hinder measurements and to stand erect with their feet fairly closed and breathe gently. During measurements, the tape was not held too tight so that it digs into the flesh or held loosely to get an incorrect result. This measurement helps in determining abdominal fat mass which is a cardiovascular risk factor.

2.1.5 HC

HC is also measured using a constant tension non elastic tape calibrated in centimeter (cm). It measures the greatest protrusion of the buttocks when the patient is standing erect with their feet fairly closed and breathe normally. Also, during measurements, the tape is not held too tight so that it digs into the flesh or held loosely to get an incorrect result.

2.1.7 WTHR

It is the ratio of waist circumference (WC) to Hip Circumference (HC).

It is calculated as WTHR = waist circumference (cm)/ hip circumference (cm)

It is an important indicator of visceral fat

2.1.8 Calculating the BMI of the patients

BMI was calculated using the formula, $$BMI = \frac{\text{Weight (Kg)}}{(\text{Height (m)})^2}$$

The base unit of weight is kilogram, Kg and the base unit of height is meters, m. BMI is the measure of body fat based on height and weight.

2.2 Determining the qualitative food intake of the diabetic patients using food frequency and 24 hour recall

In this analysis, information regarding the diet history of subjects, a food frequency table was formulated to study the frequency of consumption of various food groups and the nutrient intake of subjects was determined by making use of data from the 24 hour recall table, which was based on what the subjects ate the previous day. Subjects were asked to recall all foods and beverages consumed on the previous day. The food frequency data was obtained by evaluating consumption of particular food items on a daily, twice to thrice a week weekly, monthly basis or never consumption pattern of foods.

2.3 Determining the biochemical results of the patients

These investigations are extremely helpful in detecting early changes in the body's metabolism and nutrition before the appearance of clinical signs**.** The patients HDL, LDL, triglycerides and cholesterol levels were gotten from the patients' hospital books. Biochemical assessments including FBG and BP were involved.

Blood glucose levels were checked using a blood glucose monitor. The blood glucose usually collected was FBG, which required an overnight fast that usually 7 or 8 hours. Blood was collected either from the tip of the third or fourth finger. The chosen finger was massaged to make it warm, so as to ease blood flow. The tip of the finger was decontaminated by swabbing it with cotton wool which had drops of distilled water and it was allowed to get dry. A sterile lancet was used to prick the tip of the finger. The finger was gently squeezed for blood to flow out. The blood was then collected directly onto the test strip, inserted to the glucometer and the blood glucose value was read off. Dry cotton wool was put to the punctured area and the patient was advised to apply pressure on it until blood stopped oozing out.

Checking of the patients BP was done using a blood pressure monitor. It is important to monitor blood pressure because high blood pressures and low blood pressures increases health risk problems in the future. High blood pressure puts extra strain on the arteries and heart. Overtime, the arteries can become thicker and less flexible and eventually become narrow which can lead to stroke.

2.4 Statistical analysis

The data was systematically collected and analyzed using the computer software, Microsoft excel and the software programme Epi info volume 7. The mean and standard deviation of the results obtained was calculated. T-test and ANOVA was used for analysis using SPSS package version 18. Values with p-value < 0.05 were considered statistically significant in this study. The analyzed data was interpreted and the results represented using tables, graphs and charts, where it was necessary.

Results

The results of this study presented in this chapter evaluated the anthropometric indices of the subjects including (MUAC, BMI, WC, and WHR), dietary intake by food frequency and 24 hour recall, and biochemical parameters (FBG and BP).

3.1 Socio demographic characteristics of the study population

Table 1 shows the socio- demographic characteristics of the study population. The subjects were categorized into 4 age groups; 40-49, 50-59, 60-69 and 70 -80. The results for age showed that majority of the subjects were within the age range of 60 -69 years; 30(37.5%), this was followed by subjects within the range 50 -59 years; 20 (25%); 70 -80 years; 38 (25%) and 40 -49 years; 12 (15%). Regarding the level of education of the subjects, majority attended primary school 32 (40%), 23 (28.75%) had attained secondary school; 17(21.25%) were graduates and 8(10%) of the subjects were post graduates. Based on marital status, 59 (75%) were married; 19 (23.75%) were widows; 1(1.25%) was married and 1(1.25%) was divorce. Most of the participants earned < 100,000 FCFA per month, 33(41.25%); 24 (30%) earned > 100,000 FCFA per month and 23(28.75%) earned >250,000 FCFA per month. However, most participants were farmers 23(28.75%, followed by traders 19(23.75%); teachers 14 (17.5%); retired civil servants 14(17.5%) and others professions 10 (12.50%).

Variables		Frequency	Percentage
Age stratification	60 -69	30	37.5%
	50 -59	20	25%
	70 -80	18	25%
	40 -49	12	15%
Level of education	Primary	32	40%
	Secondary	23	28.75%
	Graduates	17	21.25%
	Post graduates	8	10%
Marital status	Married	59	75%
	Widow	19	23.75%
	Single	1	1.25%
	Divorce	1	1.25%
Salary of participants	<100, 000	33	41.25%
	>100. 000	24	30%
	>250, 000	23	28.75%
Occupation	Farmers	23	28.75%
	Traders	19	23.75%
	Teachers	14	17.5%
	Retired civil servants	14	17.5%
	Others	10	12.50%

Table 1: Socio-Demographic data of the study population

3.2 Anthropometric measurements of the subjects

3.2.1 MUAC

As it can be observed from the table 2 below, no participant had severe acute malnutrition while 2 (2.5%) participants had moderate acute malnutrition in which all were males. The cutoffs for normal MUAC, 25 (80.6%) men and 19 (38.8%) females were normal, this made an overall prevalence of 44 (55.0%) of the patients had normal MUAC. 34(42.5%) of the participants were overweight, with 30 of the 34 being females with just 4(12.9%) males.

Cut offs points adopted from CDC, 2010; WHO, 2004.

MUAC classification	Male		Female		Overall Prevalence
	Cutoff	Frequency	Cutoff	Frequency	
SAM	<22.4	0 (0.0%)	<21.4	0(0.0%)	0 (0.0%)
MAM	22.4-23.0	2(6.5%)	21.4-22.1	0(0.0%)	2 (2.5%)
Normal	23.1-32.9	25(80.6%)	22.1-30.0	19(38.8%)	44 (55.0%)
Overweight	≥33.0	4(12.9%)	>30.0	30(61.2%)	34 (42.5%)

Table 2: Classification of nutritional status by MUAC

3.2.2 BMI

Based on the BMI histogram as shown on figure 1 below, 2.5% of the subjects were underweight, 17.5% had normal BMI, 35(43.8%) subjects are overweight with males (19) making up most of the cases, while 29(36.3%) were obese, that is 23.8% forming class I obesity and 12.5% forming class II obesity, most of them being females were 26 in number, there were no persons classifies under obesity class III.

3.2.3 Waist Circumference

World Health Organization (2011) defines central obesity (also referred to as abdominal obesity) as Waist Circumference >=94cm in males and >=80cm in females. On this basis as shown on table 7 below, 98% (48) of the females and 67.7% (21) of the male subjects were found to be centrally obese, making an overall prevalence of 86.25%(69) centrally obese participants. Further, 10 (32.3%) males were not obese and 1 (2.0%) female was not obese, this formed a total of 11(13.75%) participants who were not obese.

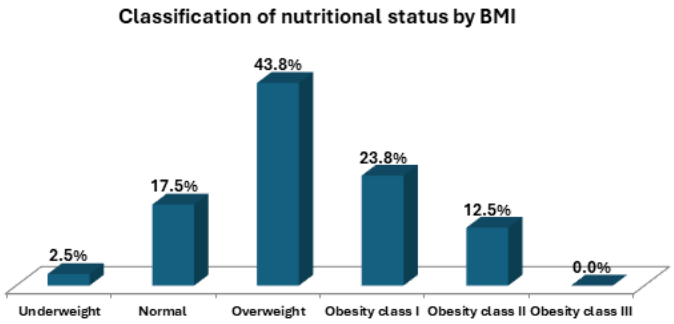

Figure 1: Classification of nutritional status by BMI

WC classification	Male		Female		Overall Prevalence
	Cutoff	Frequency	Cutoff	Frequency	
Central obesity	>=94 cm	21 (67.7%)	>=80 cm	48 (98.0%)	69 (86.25%)
Not obese	<94 cm	10 (32.3%)	<80 cm	1 (2.0%)	11 (13.75%)

Source: World Health Organization (2011).

Table 3: Classification of nutritional status by Waist Circumference

3.2.4 Waist to Hip Ratio (WHR)

On the basis of WHR as depicted on table 8 below, 91.8% (45) of the female and 32.2% (10) of the male participants have high risks of comorbidities. Overall, 55(68.8%) of participants have a high risk of comorbidities. Based on the moderate risk 20 (64.5%) of the males and 4 (8.2%) of the female have moderate risks, overall 24 (30.0%) of the participants had moderate risk of comorbidities. For the low risk, 1(3.2%) male participant and no female participant had low risk of commodities; overall 1 (1.3%) participant had low risk.

Health Risk	Male		Female		Overall Prevalence
	Cutoff	Frequency	Cutoff	Frequency	
High risk	>1.0	10 (32.3%)	>0.85	45 (91.8%)	55(68.8%)
Moderate risk	0.90 - 1.0	20 (64.5%)	0.80 - 0.85	4 (8.2%)	24(30.0%)
Low risk	<0.90	1 (3.2%)	<0.80	0 (0.0%)	1(1.3%)

Source: Cut off point adopted from WHO, 2011.

Table 4: Classification of Waist-to-Hip Ratio (WHR)

3.3 Food frequency and 24 hour recall

3.3.1 Food frequency

From the figure 2 below it shows that very few people consumed, bread and alternatives 12.5% (10), vegetables 12.5%(10), meat and alternatives 8.8% (7), and fruits 2.5% (2) were consumed on an almost daily regular basis. 48.8% (39) consumed bread and bread products, 33.8% (27) consumed meat and products, 20% (16) consumed fruits, 60% (48) consumed vegetables, 13.8% (11) subjects consumed milk and alternatives twice to thrice per week. 38.8% (31) consumed bread and alternatives, 17.5% (14) consumed meat and alternatives, 46.3% (37) consumed fruits, 21.3% (17) consumed vegetables, 10%(8) participants consumed milk and alternatives weekly. No participant never consumed bread and alternatives monthly whereas 8.8% (7) consumed meat and alternatives, 30% (24) consumed fruits, 6.3% (5) consumed vegetables and 38.75% (31) participants consumed milk and alternatives monthly. All participants consumed bread products and vegetables whereas 6.3% (5) participants never consumed meat and products, 1.3% (1) never consumed fruits, 37.50% (30) never consumed milk and alternatives.

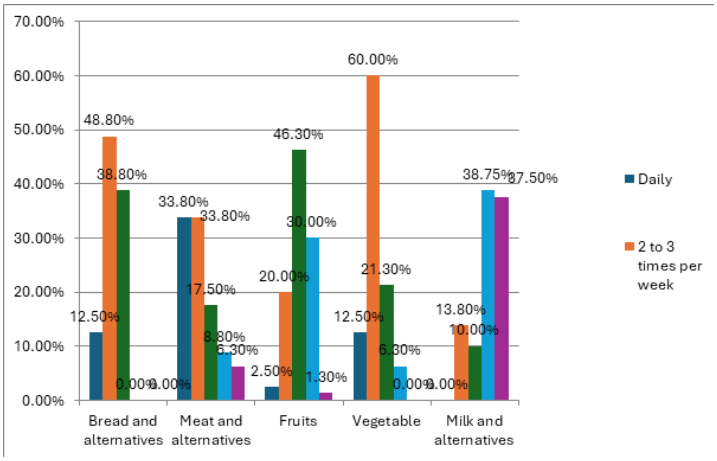

Figure 2: Variation in food consumption frequency by food group

3.3.2. 24 Hour Recall

From the figure 3 below, bread and cereals were the most consumed by participants (67.5%).while milk and alternatives were the least consumed (4.1%). Fruits and vegetables were consumed at 29.1% and meat was consumed at a percentage of 28.8%. The consumption and fruits and vegetables with that of meat and alternatives interfered.

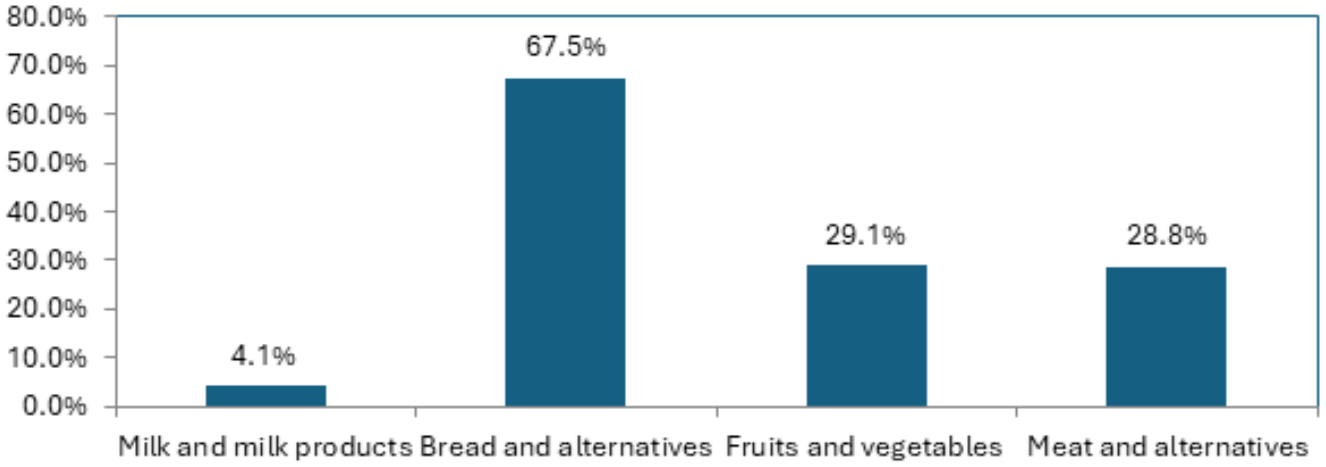

Figure 3: Consumption from the four food groups

3.4 Fasting Blood Glucose (FBG)

According to ADA standards of care (2018) poor FBG in a type 2 diabetic patient is >130mg/dl and < 70mg/dl. Good blood glucose control was in the range 70 to 130 mg/dl for diabetics. From the table 9 below, most respondents, 46 (57.5%), (hyperglycemic) and 2(2.5%) out of 80 participants (hypoglycemic) recruited for this study had poor FBG control values. 32 (40.0%) had good FBG values.

FBG control	Cutoffs (mg/dl)	Frequency	%
Poor	<70	2	2.5%
Good	70-130	32	40.0%
Poor	>130	46	57.5%

Source: ADA standards care, 2018

Table 3.1: The fasting blood glucose of participants

3.5 Blood Pressure

From the table 4 below, 54 (67.5%) respondents had poorly controlled SBP while 32 (40.0%) had poorly controlled DBP. In all, 58 (72.5%) subjects had poorly controlled blood pressure (systolic or diastolic).

Control	Systolic blood pressure(mmHg)		Diastolic blood pressure(mmHg)	
	Cutoff	Frequency	Cutoff	Frequency
Good	<130	26 (32.5%)	<85	48 (60.0%)
Poor	>=130	54 (67.5%)	>=85	32 (40.0%)

Table 4.1 : Blood pressure control

3.5 Correlation between variables

There is a positive, significant correlation (r= 0.328) between SBP and abdominal obesity, between SBP and WHR (r=0.389, p<0.01), between Waist Circumference and BMI (r=0.787, p<0.01) between WC and MUAC (r=0.661, p<0.01).

Discussions

Nutritional status for T2DM patients in this study was measured by use of BMI, MUAC, WC, WTHR and biochemical assessment, whereas dietary intake was determined by use of the food frequency questionnaire and the 24 hour food recall. This study showed that majority of the respondents with T2DM were between the age range of 60 to 69 years (37.5%) and most were from 40 years and above, this is similar to the finding of [13, 14] who reported that majority of people with diabetes are 40 and above. Diet and drug therapy is vital to ensure the successful outcome of diabetes management.

The findings in the present study showed that for the MUAC 2 subjects (2.5%) suffered from moderate acute malnutrition, 34(42.5%) were overweight with 30 out of 34 being females. In Zimbabwe, a similar study of this carried out by [15] found that majority of the T2DM patients were overweight.

Based on the BMI, the results showed that 2(2.5%) patients were underweight, 35(43.75%) patients were over weight and 29(36.25%) patients were obese. The BMI showed a positive significant correlation (r =0.729, p<0.01) with the MUAC index. The malnutrition prevalence rates found in this study agrees with previously reported global prevalence of hospital malnutrition, varying between 13 and 78% [16] as well as the recent study in the Eastern Cape (2016) in the same study population. There are wide variations in the weight and BMI of male and female participants, however majority of the participants (80%) were either overweight or obese (90% of all obese clients were

		WC	SBP	DBP	FBG	WHR	BMI	MUAC
WC	Pearson Correlation	1	**.328****	.089	-.123	.407**	**.787****	**.661****
	Sig. (2-tailed)		**.003**	.434	.276	.000	**.000**	**.000**
SBP	Pearson Correlation	.328**	1	.649**	-.002	**.349****	.175	.090
	Sig. (2-tailed)	.003		.000	.983	**.002**	.120	.425
DBP	Pearson Correlation	.089	.649**	1	.132	.163	.040	.058
	Sig. (2-tailed)	.434	.000		.245	.148	.722	.610
FBG	Pearson Correlation	-.123	-.002	.132	1	.095	-.084	-.143
	Sig. (2-tailed)	.276	.983	.245		.404	.456	.207
WHR	Pearson Correlation	.407**	.349**	.163	.095	1	.106	.044
	Sig. (2-tailed)	.000	.002	.148	.404		.351	.697
BMI	Pearson Correlation	.787**	.175	.040	-.084	.106	1	**.729****
	Sig. (2-tailed)	.000	.120	.722	.456	.351		**.000**
MUAC	Pearson Correlation	.661**	.090	.058	-.143	.044	.729**	1
	Sig. (2-tailed)	.000	.425	.610	.207	.697	.000	

**. Correlation is significant at the 0.01 level (2-tailed).

b. Listwise N=80

Table 5.1 : Pearson's correlation coefficient for selected variables.

females). [17] reported similar finding, Obesity was observed in 58% subjects. These results also correlate with those of [18], which showed a 14.3% prevalence of obesity in the general Cameroonian female population as opposed to 4.9% males. Similarly, [19] observed in their study that female diabetic were obese than males counterpart. On the basis of WC based on different values for both men and women, most 21 (67.7%) males were centrally obese, and 48(98%) out of 49 of the females were centrally obese. For the results of WHR 91.8% of the females had WHR >0.85 and 32.2% of the males had WHR >1.0 indicated high comorbidities. Overall 68.8% participants had high risks of comorbidities. This is in agreement with previous studies carried out in Bulawayo district Zimbabwe by [15] where WHR >0.94 for males and >0.84 for women was classified excessive with increased risk of subjects to non-communicable disease comorbidities.

Results from the food frequency showed that people consumed bread and alternatives on a daily regular basis by 49 (61.3%), while 61 (76.3%) reported consuming milk and alternatives once a month or rarely, 41 (51.3%) of the respondents reported consuming meat and alternatives at least once a week, 2 (2.5%) reported consumption of fruits on daily basis, while 10 (12.5%) reported consuming vegetables on a daily basis. Reporting the 24 hour recall bread, grain, cereals and the starchy foods (67.5%) were the highest foods that were consumed as breakfast, lunch, supper and snack, while milk and alternatives were the least consumed foods (4.1%). Most of the dietary habits of diabetics from this study were short of good dietary advice. These findings however differ from the study conducted on dietary practices among patients with T2DM in Riyadh, Saudi Arabia which revealed inadequate dietary practices of respondents [20]. This study shows that vegetable consumption pattern of the respondents is below the minimum recommended consumption of five servings per day [21]. The low intake of fruits and vegetables to diabetes management as vegetables contain fibre, which helps to reduce blood cholesterol thereby controlling blood glucose. This is similar to a report from a cross sectional study in Africa including Nigeria, which indicted low adherence to dietary recommendation for macronutrient intake on fruits and vegetables consumption among diabetics [22]. [23] also reported that diabetics were less devoted to Mediterranean diet, which is rich in vegetables, fruits, fish, cereals and olive oil.

Data on the FBG of the subjects was collected and analyzed. There is no doubt that blood glucose monitoring is considered the cornerstone of improving glycemic control in diabetic patients [24]. The FBG of both male and female diabetics in this study were poorly controlled, that is their FBG was above 130 mg/dl (57.5%) and 2(2.5%) participants had FBG below 70mg/dl. High percentages of poor glycemic control of 66.1 % were reported in a studies done in by [25]. In another study done in Colombia reported a slightly lower poor glycemic control of 52.7% [26]. Also, in this study blood pressure of 58 (72.5%) respondents had poorly controlled systolic blood pressure above 130mmhg or a diastolic blood pressure above 85mmhg. However, the results of these findings were higher than that carried out by [27]. This could be because of non-compliance to the stipulated dietary guidelines for T2DM patients, as the food frequency showed that vegetable intake of the respondents was below dietary goal, this might explain why some respondents were overweight and obese. This is similar to the finding of [19] who reported that FBG was above 120mg/dl and BP above 150/90 mmHg for those above 60 years of age and 140/90mmhg for those below 60 years of age.

Conclusions

The dietary practices of T2DM patients at the BRH are suboptimal and require improvement. The nutritional status of most of the patients was inclined towards overweight and obesity which may put patients at increased risk of comorbidities, especially cardiovascular diseases. Female clients were at high risk due to the high prevalence of obesity among them. These increased risks of comorbidity may also increase the risk of mortality. Education and counseling on diet and lifestyle changes are needed.

Contributors list

All authors contributed equally.

Conflicts of Interest

Authors have declared that no competing interests exist.

Funding

The research did not receive any grant from funding agencies in the public, commercial, or not for profit sectors.

Acknowledgement

The authors would like to acknowledge the former general supervisor of the RHB, Dr. Mrs. Njini Rose for granting authorization to carry out this study in the institution. Thanks goes to all the staff of the diabetic clinic of the RHB especially those who provided us insight to complete this piece of work to the end. Again, we appreciate the opportunity given to us by the College of Technology, University of Bamenda (UBa), to have access to the host institution.

Abbreviations

RHB- Regional Hospital Bamenda

BP – Blood Pressure

CHO –Carbohydrate

DBP – Diastolic Blood Pressure

ER-Endoplasmic Recticulum

FBG- Fasting Blood Glucose

GI- Glycaemic Index

HbA1C- Glycaeted Hemoglobin

HBP-High Blood Pressure

HDL- High Density Lipoproteins

LDL-Low Density Lipoprotein

MAM – Moderate Acute Malnutrition

SAM – Severe Acute Malnutrition

SBP –Systolic Blood Pressure

T2DM-Type 2 Diabetes Mellitus

WHR – Waist Hip Ratio

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