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Managing Diabetes Melitus in the Elderly People with Local Foodstuff in the Diabetic Clinic, Regional Hospital Bamenda

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Abstract

Background: *Diabetes mellitus is a chronic metabolic disorder characterized by high blood glucose levels, either due to insufficient endogenous insulin production by the pancreatic beta cells, known as Type1 Diabetes Mellitus (T1DM) or due to impaired insulin secretion and/or action, known as Type2 Diabetes Mellitus (T2DM). It is a growing public health problem that poses major socio-economic challenges.*

Local context: *For a long time, there has been marginalization and neglect of our African traditional foods in favor of western diets and lifestyle. This has culminated in an increased prevalence of Diabetes Mellitus among Cameroonians in general and North West populations in particular. As at now no scientific research has been carried out to seek solutions to this imminent Non-communicable Disease epidemic.*

Objective: *The general objective of this study was to evaluate the nutritional status, and dietary management of elderly diabetic patients attending the diabetic clinic in the Bamenda Regional Hospital (BRH).*

Purpose: *The purpose was to provide crucial baseline information that could be used in the planning and implementation of the prevention, control and treatment strategies for T2DM in the Bamenda health district Mezam Division.*

Methodology: *The study design was a cross sectional explorative and analytic design and the sample size consisted of all one hundred and forty (140) elderly diabetic patients receiving treatment at Bamenda Regional Hospital (BRH).*

Results: *The results showed that 71% of the participants had no family history of diabetes. Meanwhile anthropometric assessment showed that there was no significant difference ($P<0.05$) in the mean weight of the patients, even though 86% of the females were obese compared to their male counterparts (14%). The Fasting Blood Sugar (FBS) for all the participants was above the normal range of 126mg/dl.*

Keywords: *Diabetes, Nutrition, Food, Blood Glucose, and Anthropometry.*

Introduction

Diabetes mellitus is one of the most serious chronic illnesses in the world due to its prevalence, economic and social effects, and negative impact on the quality of life of the affected people. The diagnosis implies changes in life style especially related to feeding, physical activity, and constant self-care, requiring greater personal autonomy.

Type1 Diabetes mellitus is a chronic metabolic disorder characterized by high blood glucose levels, either as a result of insufficient endogenous insulin production by the pancreatic beta cells (T1DM), or due to impaired insulin secretion and/or action (T2DM) (Mahan et al., 2012). Type2 diabetes mellitus is also called adult-onset diabetes because its onset is almost always in middle and late adulthood. However, more and more children and teens are developing this condition. Type 2 diabetes is much more common than type 1 diabetes, and is really a different disease though it shares with type1 diabetes high blood sugar levels, and the complications of high blood sugar. (WHO 2011) It is a growing public health problem affecting people worldwide both in developed and developing

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countries, posing major socio-economic challenges. (Dahiru et al. 2008; Mbanya et al. 2010) It affects people of all ages from young infants to older adults and is estimated that 27% of adults over the age of 65 have diabetes. (CDC, 2013)

Local context

In Cameroon, people aged over 60 years accounted for 5.2% in 2005 and 9.6% in 2010 (Population Census 2005 and 2010). These elderly (60 and above) are mostly found in rural areas (6.5%) than in urban areas (3.4%). The increased prevalence of diabetes in the elderly is due to the underlying pathophysiologic mechanisms which include an increase in insulin resistance related to weight gain and physical inactivity that is central to the pathophysiology of T2DM and the metabolic syndrome. (Reaven 1988) Furthermore, a progressive failure of insulin production from the pancreatic beta cells either naturally or due to a genetic defect may be a contributing factor in the aging process and incidence of the disease. Recent evidence suggests that poor carbohydrate digestion and absorption may influence the development of type 2 diabetes in the older individuals. The risk factors associated with urbanization include; consumption of refined carbohydrate, consumption of high-fat diets, lack of adequate physical activity, smoking, alcohol consumption and sedentary lifestyles. (Hu, 2011)

Problem statement

Cameroon is experiencing a nutritional transition from traditional local foods to modern and processed food such as rice, bread, pasta, doughnuts, chips, candies, pastries, and carbonated beverages. In urban areas, consumption of fast foods eaten outside the home is becoming more frequent, whereas in rural areas eating traditional foods at home is still common (Mennen et al., 2009). The rapid change in food patterns in Cameroon combined with a sedentary lifestyle has contributed to an increasing prevalence of non-communicable diseases (NCD), in this case, Diabetes Mellitus. With the marginalization and neglect of our African traditional foods the increased prevalence of diabetes mellitus among Cameroonians in general and North West populations in particular is obvious with higher prevalence in the urban than rural populations (Mbnyaet al. 2010). This is due to the increasing trends in population growth, urbanization and risk factors especially increasing rates of obesity and changing dietary patterns.

According to Awah et al. 2008, while the number of elderly people with diabetes is growing rapidly in Mezam Division. Health systems remain wholly unequal to this challenge, either being poorly organized or very poorly resourced. Even with the meager available resources, medical staff are trained mostly to treat infectious diseases with little or no attention to the nutritional management of chronic diseases such as Diabetes and its complications. Meanwhile, despite numerous studies carried out on Diabetes in Cameroon, none has examined the relationship between nutritional status and dietary management of elderly people with Diabetes Mellitus.

Justification of the study

Currently no literature on the assessment of the nutritional status and dietary management of Type2 Diabetes Mellitus patients exists in Cameroon in general and in the North West Region in particular. In order to bridge this gap, the current study was undertaken to explore the nutritional status and dietary management of elderly patients with Type2 Diabetes Mellitus attending the diabetic clinic in the Bamenda Regional Hospital. **The general objective** was to evaluate the nutritional status and dietary management of elderly diabetic patients attending the diabetic clinic in the Bamenda Regional Hospital.

The specific objectives were to

1. Identify the socio-economic characteristics of the respondents in the study area.
2. Measure anthropometric parameters of the participants.
3. Determine the dietary pattern adopted by respondents based on 24hour recall and food frequency questionnaire.
4. Assess the lifestyle factors of respondents

Research question

What is the nutritional status, and the management strategies of elderly diabetic patients attending the diabetic clinic at the Bamenda Regional Hospital?

Methodology

Study design

It was a cross sectional explorative and analytic design, based on primary data using a set of questionnaires, Anthropometric tools, as well as secondary data from a review of the medical records of the participants.

Sampling and sample size

The study involved an exhaustive sample of 140 elderly patients of both sexes (≥ 60 years) with medical records of Fasting Blood Sugar (FBS) levels ≥ 126mg/dl attending the Diabetic Clinic of Bamenda Regional Hospital (BRH) during the study period. It is worth noting that the total number of elderly diabetic patients attending the clinic during the research period was above 150 patients, reason why we did an exhaustive sampling.

Inclusion criteria

1. All patients of both sexes within the age group ≥60 years.
2. Elderly patients with T2DM residing within Bamenda health district.
3. Patients having Fasting Blood Sugar (FBS) levels ≥126mg/dl or currently on treatment for Diabetes Mellitus.
4. Willingness of the subjects to participate in the study

Exclusion criteria

1. Diabetic patients less ≤ 60 years of age.
2. Adults with Type2 Diabetes Mellitus not residing within Bamenda health district.
3. All those who declined to participate.

Ethical clearance

Authorization to carry out the research was obtained from the Regional Delegation of Public Health for the North West Region. Authorization was also obtained from the hospital management.

Data collection tools

A semi-structured questionnaire was used to collect information on socio- demographic data, economic characteristics and nutritional status of the respondents. A standardized scale, stadiometer and tape were used to collect anthropometric data. With regards to biochemical data, secondary data on Fasting Blood Sugar (FBS) and blood pressure were obtained from patients' medical records. Information regarding dietary intake was obtained by the use of a 24-hour recall and food frequency questionnaire.

Data analysis

A statistical analysis was done using the SPSS version 20 and Excel software. Some of the data were also presented in tabular form. Anthropometric parameters were captured on Excel and the body mass index (BMI) was calculated using the following formula: **BMI = weight (kg)/height (m)^2 =kg/m$^{2.}$** According to WHO (2016), BMI is considered a valid tool to determine overweight and obesity in adults.

Dietary intake

The completed food frequency questionnaire data was keyed into an Excel spread sheet. The Dietary Diversity (DD) was calculated as the overall variety score for a period of seven days. Meanwhile the nine food groups recommended by the FAO were used to classify dietary diversity.

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24-hour recall

A24-Hour Recall questionnaire was also used to determine foods actually consumed by respondents, including portion sizes during the previous 24 hours before interview. The 24-hour recall was analyzed in three dimensions, viz

1. Depending on the number of meals consumed
2. Depending on whether the meals consumed were balanced based on the five food groups.
3. Depending on the energy (in Calories) and macronutrient (in percentages) intake using serving sizes and the food exchange list.

Results of the research - key findings

Table 1. Socio-demographic characteristics of study population: n = 140

Variable	Males	Females	Total
Age			
60-65	15(11%)	57(41%)	72(51%)
66-70	11(8%)	38(27%)	49(35%)
71-75	6(4%)	7(5%)	13(9%)
76 and above	0(00%)	6(4%)	6(4%)
Marital status			
Single	0(00%)	7(5%)	7(5%)
Married	28(20%)	63(45%)	91(65%)
Widowed	4(3%)	38(27.1%)	42(30%)
Educational level			
None	4(3%)	49(35%)	53(38%)
Primary	21(15%)	40(29%)	61(44%)
Secondary and above	7(5%)	19(14%)	26(19%)
Area of Residence			
Urban	23(16%)	78(56%)	101(72%)
Rural	9(6%)	30(21%)	39(28%)
Occupation			
Farming	6(4%)	52(37%)	58(41%)
Driving	2(1%)	0(00%)	2(1%)
Trading	5(4%)	29(21%)	34(24%)
Civil servant	2(1%)	2(1%)	4(3%)
Retired	19(14%)	23(17%)	42(30%)
Family Income			
<40000	18(13%)	75(54%)	93(66%)
40000≤70000	10(7%)	31(22%)	41(29%)

Table 1 depicts a sample size of 140 respondents, comprising 32 males (23%) and 108 females (77%). Among them, 29 (51%) were aged between 60-65 years of age, and 91 (65%) of them were married men and women. Though majority of the respondents - 101 (72%) of them were urban dwellers, their level of education was pretty low with 62 (44%) of them having gone through primary education and the rest 78 (56%) of them were subsistence farmers. Meanwhile, 92 (66%) of them had a monthly family income of less than 40,000francs CFA.

Table 2. Mean Anthropometry of the respondents by sex: n = 140 *P<0.05 is significant

Variable	Males (n=32) Mean±SD	Females (n=108) Mean±SD	Total (n=140) Mean±SD	T	p-value
Height(m)	1.67±0.09	1.59±0.06	1.61±0.08	4.32	0.000
Weight(kg)	79.19±13.93	80.34±17.97	79.54±14.88	0.25	0.810
BMI (kg/m^2)	28.79±6.00	31.30±5.26	30.73±5.52	-2.29	0.023
Waist circumference(cm)	91.81±10.91	96.35±11.43	95.31±11.4	-2.05	0.040
Hip circumference(cm)	89.12±10.54	100.79±10.51	98.12±11.57	-5.51	0.000
Waist-hip ratio	0.96±0.09	1.03±0.08	0.98±0.09	4.64	0.000
MUAC (cm)	29.22±3.71	32.11±4.72	31.45±4.66	-3.12	0.002

In Table 2, females had a higher mean weight (80.34±17.97) than males (79.19±13.93) and a higher BMI (31.30±5.26) than males (28.79±6.00).They also had a higher mean MUAC (32.11±4.72) than the males (29.22±3.71) , and a higher waist circumference (96.35±11.43) than the males (91.81±10.91). The mean hip circumference (100.79±10.51) and waist hip ratios (1.03±0.08) of the females were also higher than those of the males (89.12±10.54) and (0.96±0.09) respectively.

Using t-test analysis to compare the mean anthropometry of male and female respondents; there were significant differences in the mean height, BMI, waist circumference, hip circumference, waist hip ratio and mid upper arm circumference of the male and female respondents under study. However, there was no significant difference in the mean weight of the respondents.

Table 3. Fasting blood glucose and blood pressure of the respondents by sex

n = 140 *P<0.05 is significant

	Males (n=32) Mean±SD	Females (n=108) Mean±SD	Total (n=140) Mean±SD	T	p-value
Fasting blood glucose level (mg/dl)	147.09±36.26	147.72±62.14	147.58±57.15	-0.05	0.96
Blood pressure (Systolic)	139.44 ±13.86	141.52±20.393	141.04±19.07	-0.66	0.60
Blood pressure (diastolic)	79.66±7.807	81.08±16.021	80.76±14.54	-0.69	0.50

From Table 3, the mean fasting blood glucose (147.58mg/dl) and blood pressure (systolic) (141.04 mmHg) of both male and female respondents were above normal. However, there was no significant difference in the mean Fasting blood glucose and blood pressures of respondents.

Table 4. BMI classification of the respondents by sex

	Male	Female	Total	
Normal weight (BMI 18.5 – 24.9 kg/m^2)	11(47.8%)	12(52.1%)	23(16.4%)	X^2=11.22
Over weight (BMI 24.9 – 29.9 kg/m^2)	10(24.3%)	31(75.6%)	41(29.2%)	P=0.004
Obese (BMI 30 kg/m^2 and above)	11(14.4%)	65(85.5%)	76(54.2%)	
Total	32(22.8%)	108(77.1%	140(100%	

From Table 4, BMI classification shows that (76%) of the females were overweight as opposed to the males (24%) and (86%) were obese as against the males (14%). This indicates a significant relationship between BMI of the respondents and sex (p = 0.004) **[Percentages rounded up to the nearest whole number].**

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Table 5. Medical history of respondents: n = 140

Medical history of respondents	Frequency	Percentage
Duration of diabetes (in years)		
1≤5	52	37.1%
6≤10	64	45.7%
>10	24	17.1%
Examination of blood sugar at home		
Yes	38	27.1%
No	102	72.9%
Family history of diabetes		
None	100	71.4%
1st degree relative	40	28.6%
Diabetes related complication		
Eye damage	33	23.6%
Foot complications	20	14.3%
Kidney failure	2	1.4%
None	85	60.7%
Situation since diagnosis		
Improved	89	63.6%
Worsened	4	2.9%
Unstable	47	33.5%

Looking at Table 5, 46% of the patients had been diabetic for more than six years but about 71% had no family history of diabetes. Some 73% of them did not test their blood sugar levels at home, while 61% had no diabetes-related complications. Meanwhile 64% had improved situations since diagnosis. **(Percentages rounded up to the nearest whole number).**

Dietary intake

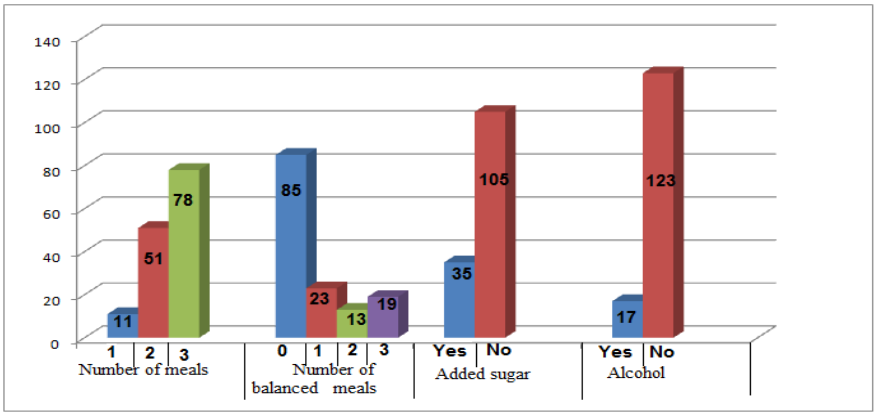

Figure 1. 24-hour Recall: n = 140

In Fig.1 above, with regards to the 24hour meal recall, 78 (56%) of respondents consumed three meals, 51 (36%) consumed two meals while 11 (8%) consumed just one meal per day respectively. The 24Hour Recall also revealed whether the meals consumed were balanced or not, and based on the five food groups made of; bread and cereal group, meat and meat products group, milk and milk substitutes group, fruits group and vegetables group; 13 (9%) had meals from 5 food groups, 23(16%) had meals from 4 food groups, 85(61%) respondents had meals from 3 food groups, and 19(14%) had meals from 2 food groups. Still on the 24-hour recall, 17(12) respondents took alcohol and 123(88%) did not; whereas 35(25%) respondents used sugars and 105(75%) did not. NB: **(Percentages rounded up to the nearest whole number).**

Food frequency

Table 6. Food frequency of respondents (per week): n = 140

Frequency per week in % of sample				
Food groups	**Everyday**	**3-5 times**	**1-2 times**	**Never**
Cereals/bread/starchy	140(100%)	0	0	00(00%)
Meat/fish	38(27%)	49(35%)	53(38%)	00(00%)
Legumes	17(12%)	48(34%)	75(54%)	00(00%)
Fruits	38(27%)	64(46%)	36(26%)	2(1%)
Vegetables	55(39%)	71(51%)	14(10%)	00(00%)
Milk and milk products	38(27%)	17(12%)	76(54%)	9(6%)
Saturated fats	9(6%)	15(11%)	76(54%)	40(29%)
Unsaturated fats	21(15%)	58(41%)	58(41%)	3(2%)
Fried foods	24(17%)	68(49%)	48(34%)	00(00%)
Sugar/honey	25(18%)	10(7%)	68(49%)	37(26%)
Sweet drinks	00(00%)	4(3%)	48(34%)	88(63%)
Alcohol	2(1%)	6(4%)	79(56%)	53(38%)

Percentages to the nearest whole number

Table 6: 140 (100%) of the respondents took foods from the bread/cereal/starchy food group every day.

Legumes were consumed by (12%) respondents every day, (34%) 3-5 times and (54%) once or twice per week respectively.

Meat/fish consumption recorded (27%) respondent every day, (35%)3-5 times, and (38%)1-2 times per week.

Fruits were eaten by (27%) respondents everyday (46%) 3-5times, (26%) 1-2 times and (1%) respondents took no fruit at all for the week.

Vegetables were consumed by (39%) respondents every day, (51%) 3-5 times and (10%) 1-2 times. Milk and milk substitutes were consumed by (27%) respondents every day, (12%) 3-5times, (54%) 1-2 times and (6%) reported not to consume milk at all.

Saturated fats such as palm oil were consumed by (6%) respondents every day, (11%) 3-5 times per week, (54%) 1-2 times and (29%) never used saturated fats.

Of the 140 respondents (15%) consumed unsaturated fats such as oilio every day, (41%) 3-5 times, (41%) 1-2 times and (2%) never used unsaturated fats. Fried foods were consumed by (17%) respondents every day, (49%) 3-5 times and (34%) 1-2 times per week.

Meanwhile (26%) respondents reported not taking sugar/honey at all, (18%) took it every day, (7%) 3-5 times and (49%) 1-2 times per week.

Of the 140 respondents (63%) reported not taking sweet drinks at all (00%) every day, (3%) 3-5 times and (34%) 1-2 times per week.Alcohol registered (1%) consumption every day, (4%) 3-5 times, (56%) 1-2 times while (38%) did not take alcohol at all.

Table 7. Dietary practices of respondents: n = 140

	Frequency	**%**
Meal frequency per day		
One	15	11
Two	97	69
Three	28	20
Skip meals		
Yes	116	83
No	24	17
Type of meal skipped		
Breakfast	81	58

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Lunch	17	12
Dinner	18	13
No response	24	17
Number of snacks per day		
One	121	86
Two	19	14

Table 7 shows dietary practices of respondents of which majority (69.3%) had two regular meals, (83%) skip meals, (58%) regularly skipped breakfast, while (86%) had just one snack per day.

Table 8. Glycemic control: n = 140

Question / Response	Frequency	%
Are you following a diabetic diet?		
Yes	99	71
No	41	29
Who prescribed the diet?		
Medical Doctor	75	54
Nurse	20	14
Dietician	4	3
No response	41	29
How often do you follow the diet?		
Always	17	12
Sometimes	80	57
Never	2	1
No response	41	29
How regular is your medical visit?		
Weekly	11	8
Monthly	129	92
How often do you comply with the visit?		
Always	56	40
Sometimes	84	60

Table 8: Majority (71%) of patients followed their diet though only sometimes (57) Medical Doctors (54%) were reported to be the best source of advice regarding diet, and (60%) comply to medical visit though sometimes

Table 9. Consumption of risk related substances: n = 140

Do you consume the following?	Frequency	%
Smoke cigarettes		
Yes	9	6
No	131	94
Consumption of alcohol		
Yes	87	62
No	53	38
Reduction of salt intake		
Yes	140	100

From Table 9, of the 140 respondents, 6% smoke while 94% do not. Also, 62% consume alcohol and 38% do not. 100% respondents reported haven reduce salt intake.

Table 10. Physical exercise: n = 140

Question / Response	Frequency	%
Do you do exercise		
Yes	129	92
No	11	8
How many days per week do you exercise		
Everyday	24	17
1-2	68	49
3-5	37	26
No response	11	8
Duration of each session		
15minutes	9	6
15-30minutes	31	22
31-60minutes	29	21
More than 60 minutes	60	43
No response	11	8

Table 10 illustrates that (92%) respondents do exercise, (49%) exercise for 1-2 days per week while (43%) exercise for more than sixth minutes during each session.

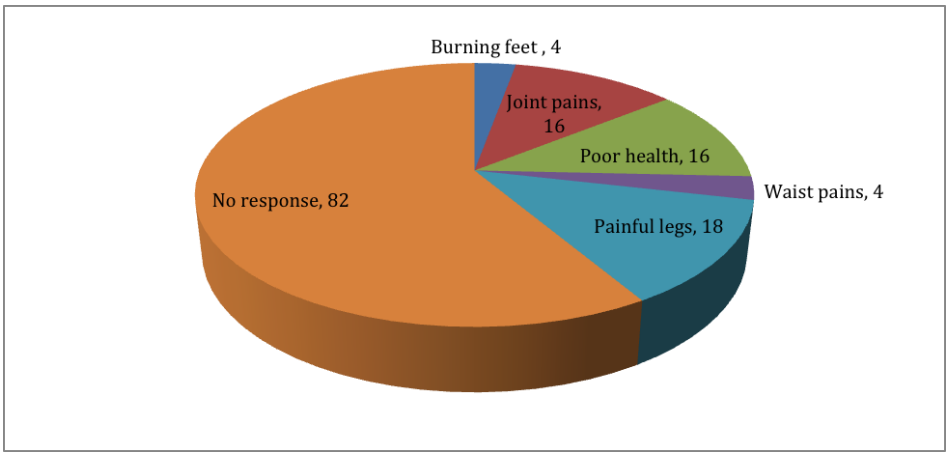

Figure. 2. Physical challenges that limit exercise: n = 140

Fig.2 below show the type of physical exercise and various challenges to exercise. It is seen that majority (58%), of respondents are involved in walking others complain of painful legs (3%) as a barrier to exercise, whereas most (59%) respondents do not exercise and have no tangible reason.

Table 11. Regression coefficients: n = 140, p<0.05 is significant

	B	S.E.	Wald	*df*	*p*-value	Exp (B)	95% C.I. for EXP (B)	
							Lower	Upper
Occupation			1.252	4	.869			
Occupation (1)	.183	.663	.076	1	.782	1.201	.327	4.409
Occupation (2)	1.159	1.060	1.197	1	.274	3.188	.400	25.442
Occupation (3)	.143	.849	.029	1	.866	1.154	.219	6.089
Occupation (4)	-19.091	28420.722	.000	1	.999	.000	.000	.
Educational level			5.519	2	.043			
Educational level (1)	1.356	.629	4.652	1	.031	3.882	1.132	13.318
Educational level (2)	1.935	.909	4.536	1	.033	6.924	1.167	41.088
AREA (1)	.087	.480	.033	1	.857	1.091	.426	2.793
Family income			.748	2	.688			
Family income (1)	-.540	.631	.731	1	.393	.583	.169	2.009

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Family income (2)	-.525	1.215	.187	1	.666	.592	.055	6.399
Sex (1)	1.726	.638	7.328	1	.007	5.619	1.610	19.607
Constant	-2.929	.757	14.969	1	.000	.053		

Table 11 represents the Binary Logistic Regression Model.

To verify the relationship between the socio-demographic data and glycemic control, the binary logistic regression model was used with the help of IBM SPSS version 20.0 to obtain the effect of the predictor variables (occupation, educational level, family income, area of residence, sex) on the dependent variable (glycemic control). The model was used to predict the glycemic control of persons living with diabetes. From table 19, level of education and sex were shown to significantly affect glycemic control of people living with diabetes. Sex has a significant effect on glycemic control; females are 5.619 times more likely to have good glycemic control than males. It also shows that patients with primary level of education are 3.882 times more likely to have good glycemic control than illiterates and patients with secondary education and above are 6.924 times more likely to have good glycemic control than illiterates. The other variables; occupation, area of residence and family income had no effect on glycemic control.

Discussion

Diabetes Mellitus is a chronic disease requiring pharmaceutical and lifestyle adjustments, of which nutritional intervention is an integral component in the management plan. Dietary intake appears to be one of the most important factors related to diabetes. Cooking and eating practices are influenced by deeply rooted cultural beliefs and values, which may pose difficulty for patients' adherence to dietary guidelines (Yannakoulia, 2006).

The socio-demographic factors for this study included age, gender, residential area, marital status, level of education, occupation, and income level. This study revealed that almost half of the participants had had diabetes for more than six years at the time of the study (Table 13).

This corroborates with the assertion of Ling and Groop (2009) which states that during aging there is a decrease in glucokinase activity leading to increased insulin resistance in the liver; a common problem in patients with diabetes. The IDF (2013b) states that T2DM is common between the ages of 40 to 69 years worldwide and predicted that the same age group will still comprise the largest number of people with diabetes, by the year 2035.

Although the participants were exhaustively selected using the convenience sampling method, as indicated in chapter 2, the final study group comprised of 77.1% females and 22.8% males (representing a female to male ratio of about 3:1). This concurs with the findings of Makinga and Beke (2013), who also found a ratio of 3:1 (75.5% females: 24.5% males) in Lesotho. In contrast in developed countries such as China and USA, more males were found to have diabetes than females (Tuomi et al., 2013).Although it is possible in the current study that the higher number of females with T2DM that visited the clinics may have been be due to bias, for instance that females may be somehow more compliant to adhere to their appointments than males; the fact that the results are supported by many studies in developing countries, including Lesotho and South Africa, suggest increased susceptibility among females in developing countries.

From the current study, most participants (72.1%) who attended the outpatient clinics resided in the urban area. This is supported by the fact that urbanization is a recognized risk factor for T2DM (IDF, 2013b; Tcheugui and Kengne 2011).

Most participants (65%) in the current study were married (45% of the females and 20% of the males). Similar findings were reported by Makinga and Beke (2013) in 2004/2005 among patients with T2DM in South Africa (68.2% of the participants in their study were married). According to Lee (2010) marital status is not necessarily a risk factor for chronic diseases, but marital functions (for example stress and parity) have been suggested to be significant factors that influence mental and physical health of married females. Hence, marital status has been shown to influence the risk for comorbid conditions associated with T2DM.

The main socio-demographic factor affecting glycemic control was educational level. A lower educational level could be a barrier to effective dietician–patient communication, knowledge transfer and retention. This calls for the identification of suitable new strategies from health care providers to

improve communication in this subgroup. Previous studies have reported a relationship between low level of education and older subjects with poor diabetes-related dietary practices.

In the current study, level of education was classified into secondary school and above, primary and none (no education). Majority (43.6%) of participants had only primary education which concurs with IDF (2013b) reports that there is a positive relationship between educational level and the incidence of diabetes in low-and-middle income countries. These findings were also supported by the SADHS, which found that the prevalence of chronic diseases were highest among the general population of South Africans with a low socio-economic status (low education and low income).

For the purpose of this study nutritional status was assessed based on anthropometric measurements, dietary intake and lifestyle factors. In this study, based on BMI, more than half (54.2%) of the participants were obese, with a further 29.2% being overweight; thus 83.4% of participants had an above normal BMI, putting them at risk of cardiovascular complications of diabetes, as well as other chronic diseases. This was more evident among the females: 85.5% of the females were classified as obese and 75.6% as overweight; thus 88.8% of the females had a BMI above the normal cut-off value. Among the males, 14.4% of males were classified as obese and 24.3% as overweight; thus 38.7% of the males had a BMI above the normal cut-off value. Our findings could be because of low level of physical activities among the diabetics especially females, with a corresponding increased consumption of fast foods as is a common phenomenon in urban dwellers. The risk of diabetes increases with high BMI and decreases with weight loss, which can be achieved through a proper nutrition and increased physical activities.

These findings are similar to those of two a previous study among patients with T2DM in Lesotho. (Beke, 2013) found out that the overall prevalence of obesity among the participants with T2DM in Maseru was 67.7%, and also confirmed that obesity was more prevalent among the females (73.1%) than the males (51.1%).

The IDF however recommends the use of ethnic-specific cut-off points for central obesity, which in Sub-Sahara Africa is WC of $\geq$ 94 cm in males and $\geq$ 80 cm in females (Amod et al., 2012). From the present study, females had mean WC of (96. 35)higher than IDF recommended cut-off points thus at higher risk than males. Findings from this study indicated that majority of patients with T2DM are at increased risk of developing complications, particularly cardiovascular diseases and associated risk factors such as hypertension, dyslipidaemia, and atherosclerosis as a result of a high prevalence of obesity. In the present study, the mean energy intake of respondents was 1801.137Kcal. The intakes for fats (37.7%) and carbohydrates (74.2%) were higher than the recommendations (reason why the majority of participants were obese and overweight), while protein (17.3%), was within the recommended range.

Fruits and vegetables are important component of a healthy diet and their sufficient daily consumption could help prevent and manage major diseases such as cardiovascular diseases, diabetes mellitus and certain cancers. This study shows that the recommendation for increased consumption of dietary fibre appeared to be substantially ignored by participants. This study also showed that diabetics have an unfavorable attitude towards fruits and vegetables consumption. The consumption pattern of the respondents was below the minimum recommended consumption of five serving per day as majority consume fruits and vegetables 3-5 times per week while few of the respondents consumed fruits once per day and majority consumed foods rich in carbohydrates and fats. The low intake of fruits and vegetables among the diabetics could be because of low level of awareness on the importance of fruits and vegetables to diabetes management as vegetables contain fiber, which helps reduce cholesterol thereby controlling blood glucose. This is similar to a report from a cross-sectional study in Nigeria, which indicated low adherence to dietary recommendation for macronutrient intake on fruits and vegetables consumption among diabetics. Also, a lower educational level could be a barrier to nutritional knowledge which is acquired nowadays through television programmes and written materials such as journals and leaflets, which assumes a level of understanding which is not achieved by everyone. Only people who are better educated are better able to understand and make use of this information.

Furthermore, the present study results indicated that only 55.7% of the patients ate three regular meals, 13.6% ate at most two snacks per day, and 82.9% usually or sometimes skipped meals with the

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most frequently skipped meal being breakfast. Recent studies indicated that frequent meals tend to reduce post-prandial insulin secretion and enhance insulin sensitivity in diabetic patients (Al-Kaabi et al., 2008). These deviations from recommended levels may be due to non- compliance with healthy dietary practices among diabetic patients. Most of the dietary habits of diabetics violated good dietary advice. Overall, glucose control among type 2 diabetic patients within Mezam Division is poor. It was unclear whether this was due to non-compliance or non-adherence, or a lack of clear, comprehensible resources and guidelines. Sill in this study, visiting a doctor/dietician was not a priority for patients, as only about 40 % of patients complied with appointments always. These adverse practices may also be attributed to deficiencies in the structure and process of the health education programmes directed toward diabetic patients in Mezam Division. Studies show that the regular inculcation of health education, making the patient aware of the disease and encouraging self-care management during treatment will reduce health care burden and help achieve optimal control of the disease with minimal long-term complications (Azimah et al., 2010).

Physical activity refers to all movements that the patients incur in their everyday lives, which include work, recreation, exercise and sporting activities. The CDC (2011) indicated that physical activity is associated with important health outcomes, including reducing the risk for cardiovascular disease and T2DM. For patients with T2DM physical activity may contribute to improved glycemic control, decreased insulin resistance, improved blood pressure, maintenance of weight loss, reduced abdominal and overall fat percentage, improved well-being and decreased stress and anxiety (ADA, 2013a).In the current study physical activities ranged from household duties, farming, driving, dancing, stretching and walking ; and results show that majority (57.9%) of diabetic patients in Mezam Division were involved in slow and not brisk walking in less than 30 minutes, which is far below ADA recommendation. Others (2.9%) complain of painful legs as a barrier to exercise, whereas (58.6%) respondents do not exercise at all and have no tangible reason.

In the current study physical exercise was poor among diabetic patients in Mezam Division with most respondents living a sedentary life, which according to WHO, (2004) is a well-recognized, worldwide risk factor for chronic diseases including cardiovascular diseases. This could be due to several reasons including the availability of varied means of transportation which include taxis and bikes whose existence has instilled laziness in people not to cover the least distance on foot as was the case before where people use to trek miles. Also, with the advancement in technology today, routine manual jobs have been substantially reduced and house hold chores simplified by the use of all kinds of machines that reduce physical activity thus enhancing sedentary lifestyles which has obvious negative health implications such as obesity especially in urban dwellers.

These results raise the possibility to encourage patients, particularly the females, to keep vegetable gardens which they should farm themselves. While this may help to raise physical activity level, it may also increase their vegetable intakes. It was found out that (45%) of participants are alcohol drinkers and mostly males. This is similar to Echouffo-Tcheugui and Kengne (2011) who reported that alcohol consumption is high in Cameroon, with the percentage of life-time abstainers estimated at only 18% in females and 11% in males, in 2008.

Adults with T2DM who choose to take alcohol are advised to limit their intake to one serving or less per day for females and two servings or less per day for males. At this moderate level of intake alcohol have been shown to somewhat improve glycemic control, cardiovascular risk and mortality in patients with T2DM. Moderate alcohol consumption with food also does not contribute to acute hyperglycemia or hypoglycemia, while excessive amounts of alcohol (>3 drinks per day) consumed on a consistent basis may contribute to hyperglycemia (Evert et al., 2013). In the current study 45% of participants reported being drinkers are mostly males. Therefore, awareness of the risks associated with excessive alcohol intake with regard to blood glucose control and weight management need to be raised among these patients, particularly among the men. Smoking is specifically discouraged for patients with diabetes as several studies demonstrated that smoking increases the risk of cardiovascular complications including hypertension in patients with diabetes (Glass et al., 2009).

Conclusion

1. Elderly diabetics in BHD are at a high risk of cardiovascular diseases such as hypertension, and other diabetes-related complications.
2. Majority of them do not adhere to lifestyle modifications, especially dietary intake.
3. Provision of regular and sustainable individualized nutritional counseling by dieticians and/or nutritionists and health educationists still remains a great challenge to be addressed.

Recommendations

1. The MOH should develop realistic national policies and guidelines for prevention, care, and treatment of Elderly diabetics.
2. Government should put in place a more robust health promotion and health education system for the prevention, treatment, and control of Diabetes.
3. The Ministry of Agriculture should encourage the production and consumption of local foodstuffs in a bid to curb the perpetual importation and consumption of fast foods.
4. Government should put in place a multidisciplinary team to support the management of diabetes in the BHD. This should include clinicians, nurses, diabetes educators, dietitians and/or nutritionists, psychologists, pharmacists. Dieticians and/or nutritionists should enhance individualized nutrition counseling.
5. Outreach programs should be improved and strengthened, in which health care workers will move out into the community to benefit the rural populations.

Recommended further research work

1. A comprehensive study of the Unmet Needs of Diabetic Patients in the North West Region of Cameroon.
2. KAP Study of Elderly Diabetic Patients in the Bamenda Health District.

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