ORIGINAL ARTICLE

PATIENTS' KNOWLEDGE ON DIABETES MELLITUS, ITS COMPLICATIONS, MEDICATION, RISK FACTORS AND LIFESTYLE MODIFICATION IN MAIDUGURI - CITY, NIGERIA.

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ABSTRACT

Background: The knowledge, attitude and practices of patients which may influence the treatment outcomes are often given poor attention.

Aim and Objectives: The objectives of the study was to assess gaps in patients' knowledge about diabetes mellitus, the information conveyed to them by health care professionals as well as their compliances to lifestyle modification, medical and medication instructions.

Materials and Method: Cross-sectional and prospective design through questionnaire was adopted for the study. Information regarding demographic data; medical and social history of the patients, the knowledge about diabetes; dietary intake; exercise; diabetic complication; glucose measurement and medication were obtained. Oral interviews were used to enhance information collection in those with low literacy levels.

Results: The proportion of patients with knowledge on diabetes as a disease, benefits of exercise and uncontrolled diabetes mellitus were 78.9%, 70.6% and 68.9% respectively. The knowledge in other areas are high cholesterol levels (22.8%), cigarette smoking(30.6%), alcohol intake (26.1%), ocular complications (42.8%), foot care(38.3%), sugar in urine (45.0%), medication side effects (37.2%), comorbid diseases (46.7%), ocular complications (42.8%) and high blood pressure (43.5%). The ability to recognise signs of hyperglycaemia and hypoglycaemia were 90.6% and 30.0% respectively. Only about 18.3%, 24.4% and 38.3% regularly check their cholesterol, eye and foot respectively. About 86.1%, 92.8%, 91.7% and 75.3% respectively check blood pressure, sugar levels, and compliant with medication and dietary schedules.

Conclusion: The proportions of patients having knowledge in areas of exercise, diabetes as disease and problems of poorly controlled DM were above average while those having knowledge on lifestyle modifications or risk factors (cigarette smoking, alcohol intake, high BP and high cholesterol levels), ocular complication, foot care and sugar in urine were below average. Majority of patients have received information or education on high glucose levels in the blood and urine, medication compliance, exercise, dietary issues and food schedule but information on low sugar levels, shoes to wear/foot care and glucose home monitoring were lacking in majority of patients. The ability to recognise the signs/symptoms of hyperglycaemia, compliances with medication, regular exercise, and dietary compliances were generally high. Many patient-focused areas of care need improvement upon in the care of the diabetes patients.

KEYWORDS: Knowledge, Diabetes Mellitus, Patients, lifestyle modification, Compliance, Information

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INTRODUCTION

Diabetes Mellitus (DM) is one the most common chronic diseases with increasing global incidence. About 2.8% of world population suffer from one form of diabetes or the other[1] with higher incidence in developed countries due to the trend of urbanization and the lifestyle changes contributing to the cause. Several cases of undiagnosed people and those who are pre-diabetic exist in many regions of the world[2].

The disease is associated with ethic and geographical variation[3].

Genetic defect on β-cell function that affect the pro-insulin, insulin gene mutation and insulin receptor mutation are well established causes of DM[4]. The roles of infections like cytomegalovirus and coxsackie virus in influencing the course of the disease are also known particularly in type 1 case.
Exocrine pancreatic disorders such as chronic pancreatitis, pancreatectomy, pancreatic neoplasia, cystic fibrosis and hemochromatosis are reported to be a secondary cause of the ailment but endocrinopathic conditions like acromegaly, cushing syndrome, hyperthyroidism, phaeochromocytoma and glucagonoma have similarly been identified as a cause[4]. Drug induced DM is also known with glucocorticoids, thyroid hormone and β-adrenergic agonists serving as the leading agents. However, several other lifestyles and risk factors like obesity, smoking, alcohol intake and physical inactivity are reported to contribute to the cause of the disease.

One of the foremost goals in the management of DM is to improve the quality of life and prevent disease progression as well as avoiding complications that may arise. Patients' related factors may be essential in achieving these goals. The patients' knowledge of the disease, drug therapy and lifestyle modification as well as their attitudes is essential for the disease management.

When poorly managed, DM results to acute complications such as diabetic ketoacidosis and hyperosmolar syndrome as well as chronic complications involving coronary artery diseases, cerebrovascular disease, renal and ocular diseases, and disorder of the nerves among others[5,6]. The risk of macro-vascular complication is related to cardiovascular disease and peripheral disease. Hypertension is twice as common amongst patients with diabetes and management of this co-morbid disease is necessary to improve life expectancy[7]. Other complication like peripheral vascular disease (PVD) affects arteries of the legs and causes cramping pain on walking due to reversible muscle ischemia secondary to arteriosclerosis[3]. The micro-vascular diseases like retinopathy lead to blindness and kidney failure in type II diabetes[7]. Nephropathy is the major cause of death in type I diabetes[3]. Diabetes mellitus also can lead to foot problems. The lower limb amputation in people with diabetes is 15times higher than in general population[3].

The management of DM is geared towards the maintenance of blood sugar level to near normal or normal range (euglycemia) as possible through the combinations of both drug therapy and non-drug therapy approach particularly dietary regulation and exercise. However, patients' education or their understanding and participation are vital since they have been reported to improve the outcome of management[8].

Many other health related problems have been identified as prime factors that can accelerate the deleterious effects of diabetes and they include smoking, elevated cholesterol level, obesity, high blood pressure, poor exercise and alcohol intake beyond acceptable limit [8]. The occurrences of obesity with hyperglycaemia are common in majority of Type II diabetes and require weight reduction as the major goal of dietary therapy[9,10,11,12].

Exercise is beneficial in the prevention of the onset of type II diabetes as well as improvement of glucose control as a result of enhanced insulin sensitivity[13,14,15]. It is also important in maintaining the free fatty tissue[16], lowering of blood pressure, serum triglyceride with raises in high density lipoprotein cholesterol levels and improve myocardium performance[15].

Despite the improved health facilities that have enhanced prompt detection and diagnosis and the various available therapeutic options, the growing number of people suffering from diabetes with associated high morbidity rate and complications resulting from this disease is alarming. Also the desired humanistic, economic and clinical outcome of management or treatment which in part depend on patient's knowledge of the disease, the goal of therapy and drugs use in treatment since these factors naturally influence compliance that will minimize or prevent complications may not be fully achieved. With the incidence of DM rapidly increasing and estimated to be doubled by 2030[1], there is the need to strategize to cope with this projected increase by first understanding areas of care-need, particularly those that required patient-focussed attention in pharmaceutical care services.

This present study is a patient-focussed assessment of the knowledge of patients with DM, to evaluate their understanding of the disease condition, and goals of therapy as well as the drug use for their treatment. Compliances to both pharmacological and non-pharmacological modalities which relates to attitude and practice are also studied. It is intended to serve as a preliminary investigation to stimulate the need for pharmaceutical care service delivery.

The objectives of the study were to assess patients' knowledge about diabetes mellitus, the information conveyed to them by health care professionals as well as their compliances to lifestyle modification, medical and medication instructions.

MATERIALS AND METHOD

The study area

The study was carried out at the Diabetic Clinic of the Medical Out-Patient Department (MOPD) of the University of Maiduguri Teaching Hospital (UMTH). UMTH is atertiary institution that runs several other clinics, and lies between latitude 11.5° North and 31.5° East in the Sudan Savannah. The Hospital has over 500 bed capacity and runs several clinics including endocrinology clinic.

The Study Design

Cross-sectional descriptive and prospective design through questionnaire was used for the study. The study population comprised of volunteered diabetic patients on regular clinic attendance. Both freshly diagnosed and previously diagnosed cases were included in the study. There was no bias in patients' selection relative to educational, marital and ethnic background. Informed consents were made, and purpose of the research was clearly stated. A total of 180 patients participated in the study through convenience sampling method. Ethical approval and informed consents were obtained for the study.

The structured questionnaire was designed consisting of eight sections. Information regarding demographic data; medical and social history of the patients were obtained, while patient knowledge about diabetes; dietary intake; exercise; diabetic complication; glucose measurement and medication were included. Simplified English language along with oral interviews were used to clarify certain areas particularly for patient with low literacy levels. For those who do not understand English, the questions are verbally translated to their best spoken language and their options or responses were made by them.

Data Analysis

The data obtained were analysed using statistical package for social science (SPSS) to perform descriptive and inferential statistics. Proportions and their confidence intervals, risks and odd ratios were determined where appropriate. The leve lof significances existing between variable were determined at $P<0.05$ and 95% confidence intervals using chi-square method of analysis.

RESULTS

The frequency distributions of male, female and both genders are shown in Table 1. The distributions for both male and female subjects are skewed toward low frequency of low age class with the mean and standard deviation of 50.6 ± 11.2 years for the male and 46.7 ± 10.1 years for the female. However, while the diabetic age for the female peak at <50 years, that of the male peaked above 50 years (Table1). The proportion of male and female were 0.43(95% CI of proportion: 0.36-0.50) and 0.57 (95% CI of proportion: 0.50-0.64) respectively. The results further indicated that 78.3% of the study subjects are married while 0.6% and 2.8% are divorcee and widower respectively. About 7.2% of the female population are widows. Subjects who have acquired one form of education or the other were 66.7% compared to their uneducated counterparts (33.3%). Those with tertiary levels of education are 40.6%.

Type-1 DM accounted for 10.0% while 90.0% of the study population constituted Type II DM patients. The number of co-morbid conditions vary from one (8.3%) to four (11.1%) but the highest percentages of comorbidity are people with two co-morbid conditions (41.1%). However, there was no comorbidity in 6.7% patients studied. The proportions of the female patients with two or three co-morbid conditions are equal (being 36.3% each).About 38.9% of patients are diagnosed between 2-5 years while only 2.8% have DM for over 20 years.

About 78.9% reported never smoked cigarette while 20.0% are ex-smokers of cigarette with 1.11% still smoking. In a similar vein, the alcohol intake habit of diabetic patient showed that80.0% do not take alcohol, 17% have quitted the habit while a low proportion (2.2%)still consumed the substance (Table 2).

When the knowledge of patients was assessed (Table 3), about 78.9% indicated having knowledge of what DM is. The knowledge of the problem of poorly controlled DM was similarly high (68.9%). About 43.5% of patients with hypertension as co-morbid factor are aware of the effects of co-morbidity while 45.0% are aware of what glucose in urine meant. The knowledge of diabetic foot care was 38.3% while that of the effects of high cholesterol and the ocular complications of DM are 22.8% and 42.8% respectively

The assessment of information or education received from health care professionals (Table 4) showed that 88.3% are educated of high glucose level while only 36.1% received similar education on low blood levels. About 75.6% and 74.4% of patients were educated on important of exercise and diet respectively. The information on the medication non-compliance was communicated to over 77% patients. Other information like glucose home testing, types of shoes to wear, implication of sugar in urine and effects of poorly controlled DM occurred in 37.2%, 36.1%, 41.1% and 68.9% respectively.

The assessment of patients' compliances to medical instructions (Table 5) showed that checking of blood pressures, cholesterol levels, sugar levels were 86.1%, 18.3% and 92.8% respectively. About 90.6% of the patients indicated having the ability to recognise signs and symptoms of hyperglycaemia compared to the 30.0% with similar ability on hypoglycaemia. Compliances to medication and dietary schedules were reported to exist in 91.7% and 75.3% respectively while that of exercise was 70.0%. However compliances to ocular check-up and foot care were 24.4% and 38.3% respectively.

Table 1: The Background Information of Patients

Parameter	Age range(Yr)	Male (%)	Female (%)	Total (%)	Statistics
Age	0-10	0 (0)	0 (0)	0 (0)	95% CI of proportion = Male:0.36-0.50
	11-20	0 (0)	1 (0.98)	1 (0.6)	
	21-30	5 (0)	2 (1.96)	7 (3.9)	
	31-40	6 (7.7)	18 (17.6)	24 (13.3)	
	41-50	22 (28.2)	46 (45.1)	68 (37.8)	
	51-60	26 (33.3)	21 (20.6)	47 (26.1)	
	61-70	17 (21.8)	12 (11.8)	29 (16.1)	
	>70	2 (2.6)	2 (1.96)	4 (2.2)	
	Total (%)	**78 (100)**	**102 (100)**	**180 (100)**	
Marital Status	single	9 (11.5)	11(10.8)	20 (11.1)	ODDS=0.82
	married	64 (82.1)	77 (75.5)	141 (78.3)	ODDS=0.83
	widow	-	13 (12.7)	13 (7.2)	
	widower	5 (6.4)	0 (0)	5 (2.8)	
	Divorcee	-	1 (0.98)	1 (0.6)	
	Total	**78** (100)	**102** (100)	**180 (100)**	
Level of education	Uneducated	25 (32.1)	35 (34.3)	60 (33.3)	
	Total	**78** (100)	**102** (100)	**180 (100)**	
	Uneducated	25 (32.1)	35 (34.3)	60 (33.3)	ODDS=0.71
	Primary edu.	8 (10.3)	8 (7.8)	16 (8.9)	ODDS=1.0
	Secondary edu.	10 (12.8)	21(20.6)	31 (17.2)	ODDS=0.47
	Tertiary edu.	35 (44.9)	38 (37.3)	73 (40.6)	ODDS=0.92
	Total	**78** (100)	**102** (100)	**180 (100)**	
Diabetes Type	Type I	8 (10.3)	10 (9.8)	18 (10.0)	
	Type II	70 (89.7)	92 (90.2)	162 (90.0)	
	Total	**78** (100)	**102** (100)	**180** (100)	
co-morbid diseases	None	7 (9.0)	5 (4.9)	12 (6.7)	
	One	6 (7.7)	9 (8.8)	15 (8.3)	
	Two	37 (47.4)	37 (36.3)	74 (41.1)	
	Three	22 (28.2)	37 (36.3)	59 (32.8)	
	Four	6 (7.7)	14 (13.7)	20 (11.1)	
	Total	**78** (100)	**102** (100)	**180 (100)**	
Duration of	<3months	3 (3.8)	7 (6.9)	10 (5.6)	
	3months-1year	17 (21.8)	19 (18.6)	36 (20.0)	
	2-5 years	23 (29.5)	47 (46.1)	70 (38.9)	
	6-10 years	20 (25.6)	18 (17.6)	38 (21.1)	
	11-20 years	11 (14.1)	10 (9.8)	21 (11.7)	
	21-30 years	4 (5.1)	1 (0.98)	5 (2.8)	
	>30 years	0 (0)	0 (0)	0 (0)	
	Total	78 (100)	102 (100)	180 (100)	

Key: Odds Ratio

Table 2: Smoking and alcohol intake habit of patients

Habits	Status	Male (%)	Female (%)	Total (%)
Smoking Habit	Non-Smoker	41 (52.6)	101 (99.0)	142 (78.9)
	Ex- smokers	35 (44.9)	1 (0.98)	36 (20.0)
	Active smoker	2 (2.6)	0 (0.0)	2 (1.11)
	TOTAL	**78 (100)**	**102 (100)**	**180 (100)**
Alcohol Intake Habit	Non-Drinker	44 (51.3)	100 (98.0)	144 (80.0)
	Ex-Drinker	30 (38.5)	2 (2.0)	32 (17.8)
	Active Drinker	4 (5.1)	0 (0.0)	4 (2.2)
	TOTAL	**78 (100)**	**102 (100)**	**180 (100)**

Table 3: Assessment of various areas of knowledge of patients

Types of knowledge assessed	Yes (%)	No (%)	NR (%)	Total (%)
Knowledge on the benefits of exercise	127 (70.6)	51 (28.3)	2(1.2)	180 (100)
Knowledge on precaution to take before exercise	54 (30.0)	124 (68.9)	2(1.2)	180 (100)
Knowledge of danger of cigarette smoking	55 (30.6)	125 (69.4)	0 (0)	180 (100)
Knowledge of effects of Co-morbid diseases	84 (46.7)	77 (42.8)	19 (10.6)	180 (100)
Knowledge of effects of alcohol over use	47 (26.1)	133 (73.9)	0 (0)	180 (100)
Knowledge on what diabetes is about	142(78.9)	38 (21.1)	0 (0)	180 (100)
Knowledge on problem of poorly control DM.	124(68.9)	56(31.1)	0 (0)	180 (100)
Knowledge on effect of increase in BP (23)	10 (43.5)	13 (56.5)	0 (0)	180 (100)
Knowledge on effect of high cholesterol	41(22.8)	139 (77.2)	0 (0)	180 (100)
Knowledge on ocular complication of DM	77 (42.8)	103(57.2)	0 (0)	180 (100)
Knowledge on what diabetic foot care is about	69 (38.3)	111(61.7)	0 (0)	180 (100)
Having knowledge of what sugar in urine	81(45.0)	99 (55)	0 (0)	180 (100)
Knowledge of side effects of DM medication	67 (37.2)	113(62.8)	0 (0)	180 (100)
Physician knowledgeof herbal intake (n=37)	1 (2.7)	36 (97.3)	0 (0)	37(100)
Knowledge of effects of herbal/orthodox medicines.	55(30.6)	125 (69.4)	0(0)	180 (100)

Key: NR= No response

Table 4: Assessment ofInformation/Education Received by Patients

Types of Information assessed	Received n (%)	Not Received n (%)	Total N (%)
Information on high glucose level in blood	159(88.3)	21(11.7)	180(100)
Information on low glucose level	65(36.1)	115(63.9)	180(100)
Information on poorly control DM.	124(68.9)	56(31.1)	180(100)
Information on the type of shoes to wear.	65(36.1)	115(63.9)	180(100)
Information on implication of sugar in urine	74(41.1)	106(58.9)	180(100)
Information on home glucose testing	67(37.2)	113(62.8)	180(100)
Information on medication non-compliance	139(77.2)	41(22.8)	180(100)
Information on the importance of exercise	136 (75.6)	44 (24.4)	180 (100)
Information about dietary problem	134 (74.4)	46 (25.6)	180 (100)
Patient placed on daily food schedule	170 (94.4)	10 (5.6)	180 (100)

*Chi square value (x^2) =104; P<0.05

Table 5: Compliance to information/medical or medication instructions

Parameter Assessed	Yes (%)	No (%)	NA (%)	Total(%)
Avoidance/use alternative agent to sugar intake	170(94.4)	10 (5.6)	0(0)	180 (100)
Recognise signs/symptoms of hyperglycaemia*	163(90.6)	17(9.4)	0(0)	180(100)
Recognise signs/symptoms of hypoglycaemia*	54(30.0)	126(70.0)	0(0)	180(100)
Regular checking of blood pressure.	155(86.1)	25(13.9)	0(0)	180(100)
Regular checking of cholesterol level	33 (18.3)	147(81.7)	0(0)	180(100)
Ocular check once in a while	44 (24.4)	136(75.6)	0(0)	180(100)
Regular examination of the feet	69 (38.3)	111(61.7)	0(0)	180(100)
Measured blood and urine sugar level often	167(92.8)	13 (7.2)	0(0)	180(100)
Take medication as recommended.	165(91.7)	15(8.3)	0(0)	180(100)
Engage in regular exercise	126(70.0)	54 (30)	0(0)	180(100)
Patient compliance to diet	128(75.3)	42 (24.7)	0(0)	170(100)
Check sugar contents in drinks often	60 (48.4)	64 (51.6)	(0)	180(100)
Quit taking bottled juices/coloured drinks	56 (31.0)		124(69)	100(100)
Quit cigarette smoking (n=38)	36 (94.7)	2(5.3)	0(0)	38(100)
Quit/moderate alcohol drinking (n=36)	32(88.9)	4(11.0)	0(0)	36(100)

*chi square value (x^2) =137.8; P<0.05

DISCUSSION

Diabetes mellitus cut across several age strata and apart from Type-I DM whose onset is seen in those below 30 years, the onsets of Type-II are often observed in those above 30 years of age. The least cases of DM in this study were observed in those below 20 years. The peaked age of the disease occurred in male patients who are in their fifth decades of life and the females who are in their fourth decades of life. Generally, the peaked age in an unclassified gender population was between 40-50 years (Table 1). There were more female in the study than male. Okolie and associates[17] similarly reported 50 years as the peak age for the preponderance of the disease in one study.

Majority of the patients presented with Type-II diabetes (Table 1) while Type-I diabetes was observed in one-tenth of the study population. The study conducted in Port-Harcourt by Unachukwu and colleagues[18] recorded similar pattern but Herther and colleague[19]recorded all patients in one study to be Type-II DM patients. In Durban (South Africa), a little above three-quarter of the studied patients reported type-II DM with the rest accounting for type-I and a few proportions do not know what type of DM is affected them[20]. Although these environmental variations are expected, but generally the incidence of Type-I diabetes are present in about 10% cases while about 90% of diabetes fall into Type-II category[21].The distribution of duration of DM from the time of first diagnosis may have indicated that the incidence of DM in the last decades is on the increase while survival rate may be on the decrease. Some authors however found no significance in the number of years post diagnosis[22]. The duration of diagnosis can have a mark influence in patients' understanding of their diseases, treatment goals and self-care.

Two-third of the study population has formal education while the rest are uneducated. The gender distribution showed a near equal proportion with no significant differences (P>0.05) existing between them. Among the educated patients, tertiary levels of education accounted for the majority of the cases. Higher level of literacy was reported by Okolie and colleagues[17]. William and colleagues[23] similarly reported attainment of tertiary levels of education in majority of the educated patients. High proportion of patients never smoked cigarette while majority of patients with previous positive smoking history have quitted smoking based on medical education although a minor proportion still smokes cigarette. Some authors similarly reported large proportion of patients who never engaged in smoking [24,25,26].Ohieku and Suleiman [26] previously reported that the combined educational efforts of health professionals and the Federal Government's warning of danger of cigarette smoking may have contributed to the high rate of cigarette smoking cessation.

In a similar vein, many patients have quitted alcohol intake but a small proportion reported that they still consume the substance. The result of alcohol assessment obtained in this study is much lower than the 96.5% active alcohol users reported by Oyegbade and associates[25]. The reason for the low cases of users in this study is attributable to socio-religious factors that restrain alcohol intake in the region.

The patients' reported knowledge of lifestyle modification varies among the study population. Although many are non-alcoholics, only a little above one-quarter of the patients are aware of the danger of excessive alcohol intake. Alcohol intake is not likely going to pose problems in the region since there is a religious practice that restricts the substance use. Furthermore, medical awareness appeared to have reduced the substance use as nearly nine-tenth of previous users have quitted the habits while a little above one-tenth of previous users are still active consumers of alcohol (Table 5). Although limiting alcohol intake is desirable,

but the calorie contents must be watched. Besides this, it must be noted that ***many medications can interact with alcohol, thereby altering the metabolism or effects of alcohol and/or the medication. Some of these interactions, which are pharmacokinetic or pharmacodynamics in nature can occur even at moderate drinking levels and may result in adverse health effects for the drinker and also interferes with the metabolism of the medication***[27]**.**In particular, side effects of flushing have been reported with certain ant-diabetic medication with alcohol. The substance can also lead to risk of a significantly lowered blood glucose level[28]leading to complications.

Although the overall knowledge of danger of cigarette smoking was low, but patients who are cigarette smokers appeared to have been adequately informed on smoking cessation as judged by a high compliance rate of smoking cessation (Table 5). Apart from its effect on medications, smoking is also a major cardiovascular risk factor that requires aggressive lifestyle modification so as to improve the quality of life of patients[29]. This modification will be necessary for the minority of the patients who still engaged in active smoking in this study.

Dietary regulation is one of the key non-drug components in the management of DM patients. In this study, a little above one-quarter of the patients never received education on dietary problems. Despite a very high proportion of the patients placed on daily diabetic food schedule, more than 20% of those on such schedules never knew the purpose leading to non-compliance rate with the affected patients (Table 3 and 5). This result is lower than what Mashige and colleague[20] reported where 82% of the patients had good knowledge on dietary intake with recorded higher compliance rates.

Another area of interest is that several patients have adopted measures to prevent high sugar contents in their blood. For instance, many patients stopped taking juices and coloured drinks (perceived to have high sugar content) after diagnosis following education on lifestyle modification. Nearly half of the patients preferred honey as their sweetening agents while good numbers have stopped using sweeteners. A minority of the patients still use refined sugar as sweetening agents. This observation is attributed to education received on the danger or effects of uncontrolled and refined sugar to glycaemic control.

The patients' knowledge on comorbid diseases showed that only less than half of the patients are aware of effects of comorbid disease conditions and that this knowledge is independent of the educational status of the patients. The proportion of patients with knowledge of comorbidity in this study is a little higher than the 42% patients reported to have similar knowledge in the work ofsome authors[23,30].Several patients will need educational programmes on their comorbid diseases since these diseases increase cardiovascular risk.

The number of patients educated on the benefits of exercise and compliance to this lifestyle modification are nearly in equal proportion suggesting that patients' knowledge may influence their compliance ability. However, nearly one-quarter of patients never received such information and close to one-third are non-compliant to exercise approach in diabetes management. This result is in agreement with the work of Mashige and colleagues[20]who reported that 70% had good knowledge on the value of exercise.

Majority of the patients are well informed about what diabetes mellitus is about. This observed pattern was expected since most of the patients are literate. The result is a little higher than reported cases in Enugu (Nigeria)[31]

but was slightly lower than the report of Okolie and associates[17]. William and colleagues[23]reported results that are much lower than obtained in this present study. However, more than one-fifth of patients in this study reported lacking the knowledge of what DM is.

A very high proportion of the patients received information on high glucose levels in the blood(Table 4) and as such can recognise the signs and symptoms (Table 5). On the contrary, close to two-third of patients have not been educated on low glucose levels (Table 4) and therefore, cannot recognise its signs and symptoms (Table 5). Some authors have observed that inappropriate response to hypoglycaemia was somewhat more common than inappropriate response to hyperglycaemia[32,33]. In another study elsewhere, the ability to recognise the signs and symptoms of hypoglycaemia is only 31.5%[33]. The report by Ali[34] on the knowledge on hyperglycaemia and hypoglycaemia signs respectively was much lower than this.

A significance difference exist (P<0.05 each) when the patients' levels of awareness and recognition of the signs/symptoms of hyperglycaemia was compared to that of hypoglycaemia suggesting that health care attention was only focussed on high blood sugar level only. Hypoglycaemia is one of the major problems among the diabetes patients since many of them often use several herbal agents in addition to their prescribed medications. One of the cardinal goals in DM management is to achieve euglycaemic levels and to prevent hypoglycaemia while still maintaining adequate calorie intake for normal body function; and patients need to be educated on how best to achieve this goal.

Majority of the patients have the awareness of problem associated with poorly controlled diabetes since they have received adequate information (Table 4). Although patients knowledge of effects of increased blood pressure was low, but luckily enough, a very high proportion indicated that their BP are regularly checked possibly because it is a component of vital signs evaluation for the continuity of patient's care. This result is in contrast to the findings of Line and associates[35]where high proportion of patients showed good basic knowledge on hypertension. Majority of the health care subjects are aware of the fact that tight blood glucose control reduces the risk of complication when diabetes coexists with hypertension[36], but similar knowledge should be communicated to non-health worker patients with comorbid diseases conditions. In our previous publications, we strongly recommended that a counselling and education units be established in most of our hospitals with the view to adequately educate patients on their disease condition since combining these responsibility along with disease management may not be feasible due to crowd of patients waiting and limited health manpower personnel[26].

From the study, a very high proportion of patients who never checked their cholesterol levels were observed (Table 5) because a much higher proportion of patients lacked the knowledge of the effects of high cholesterol (Table 3). The level of cholesterol amidst DM greatly increases the cardiovascular risks. Patients should be made to understand that the evaluation of cholesterol levels and follow-up monitoring of the parameter is a component of the comprehensive assessment of patients to reduce incidence of cardiovascular events so as to achieve high compliance levels.

There was similarly poor compliance to regular ocular examination (Table 5) since more than half of the patients do not know the effects of uncontrolled diabetes to the eye. This result is contrary to the findings of other researchers where majority of patients are aware of ocular complications in diabetes[20,33].

Uncontrolled DM or undiagnosed diabetic retinopathy can lead to vision loss and blindness[37,38]. High prevalence of glaucoma in diabetic sufferers has been reported in some quarters[39], and the second leading cause of blindness in South Africa[40]. All these underscore the need to adequately educate patients on the ocular complication of DM.

The patients' understanding of diabetes self-care is generally reported low in most studies. For instance, Matwa and associates[41]reported poor foot hygiene amidst patients in the Transkei, leading to limb amputation while Pollock and associates[42] reported mean knowledge score regarding foot care in Middles Borough, South Tee (UK) that is not too impressive. In this present study, close to two-third of patients lacked the knowledge of foot care of the diabetics leading to similar low level of patients who regularly examine their feet (Table 3 and 5). Values much higher than this were reported in Moodley and colleagues' findings[33]. These results may have demonstrated that attentions were focussed majorly on glycaemic control and low attentions were paid to patients' education on foot care. Patients must be adequately educated to avoid complications that will lead to amputation.

Diabetic home care is a key approach for the achievement of good glycaemic control. More than half of the study population do not know what high urine sugar level meant (Table 3) because the number of patients who received information on such implication was below average (Table 4). Although this poses no serious clinical problems to regular clinics attendant since a very high proportion (Table 5) always have their sugar levels measured for evaluation and continuity of care. However, patients who missed appointments and are non-compliant to clinic visits may be difficult to monitor. The result obtained by Unachukwu and associates[18]is higher than obtained in this study while that of Okolie and associates is lower[17].

There is the need to encourage patients on self-care and monitoring of their disease conditions and making early report of anomalies when discovered.

Drug therapy is one of the main-stay in diabetes management in both type I and type II patients. Most causes of complication occurred as a result of non-compliance to medication. In this study, a high proportion of patients reported compliance to medications as recommended since most of them have received education on this. It is a common practice for many patients to self-medicate with herbal drugs in addition to their orthodox medicines. This practice has been reported by many authors[19,33]. About one-fifth of patients in this present study fall in that category and virtually all these lots never informed their physicians of such combined use of agents (Table 3). These results are worrisome and have several implications. Firstly, health care professionals may be deceived to believe that the patient has been stabilized on the medication. The presence or otherwise of drug interactions and other clinical outcomes cannot be ascertain and lastly, patients may be prone to hypoglycaemia easily.

The result of the knowledge on the side effects of diabetic medication showed that a vast number of the patients are unknowledgeable on the side effects of medication, although they take their medication as recommended. According to Bardel and associates[43], patients who experienced side effects are more likely to be non-compliant. Virtually all the patients visit their doctors for check-up (Table 5) but the regularity varies with less than half reported missing clinic appointments sometimes. The result may have indicated that patients who visit diabetic clinic regularly are concerned about their disease condition and are easily monitored with the achievements of management outcomes.

CONCLUSION

The proportion of patients with knowledge in area of exercise, diabetes as a disease and problems of poorly controlled DM are above average while the proportion of patients with knowledge on effect on major lifestyle modifications or risk factors (cigarette smoking, alcohol intake, high BP and high cholesterol levels), ocular complication, foot care and implication of sugar in urine are below average. However, a vast majority of patients have received information or education on high glucose levels in the blood and urine, medication compliance, exercise, dietary issues and food schedule but information on low sugar levels, shoes to wear/foot care and glucose home monitoring are not widely disseminated to majority of patients. The proportion of patients having the ability to recognise the signs/symptoms of hyperglycaemia, compliances with medication, regular exercise, and dietary compliances were generally high.

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