

DIABETES SELF-CARE KNOWLEDGE AMONG TYPE 2 DIABETIC OUTPATIENTS IN SOUTH-EASTERN NIGERIA

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ABSTRACT

Background Isolated reports from some regions of Nigeria have found prevalence rates to range from 0.9–8.3%. In Nigeria, where healthcare services and accessibility are poor, diabetes mellitus is associated with considerable morbidity and mortality. Diabetes is also a major risk factor for cardiovascular disease, stroke, and kidney failure. It is believed that appropriate patients' knowledge of self care is the key to achieving therapeutic goals in ambulatory care.

Objective This study aimed to assess type 2 diabetic patients' knowledge of self-care practices.

Methods A 28-item questionnaire consisting of 5 point response scale was developed for the survey. Factor analysis was performed using principal axis factoring extraction with varimax rotation. Validity and reliability were established. This survey was conducted in five states of south-eastern Nigeria. Health care facilities included four tertiary hospitals and six secondary hospitals.

Results Knowledge of diabetes self-care was associated with sex, age, educational status, and years with diabetes. Female patients, younger patients (18-35 years), patients who were attending or stopped at secondary school and patients who had lived many years with diabetes (>10 years) were more likely to be knowledgeable. When extracted knowledge factor 2 (self care), factor 3 (cardiovascular complications), and factor 4 (non-cardiovascular complications) were correlated with factor 1 (diabetes) their correlation coefficients were 0.90, 0.94, and 0.71 respectively. This implies that knowledge of diabetes self care and knowledge of cardiovascular complications increase as the knowledge of diabetes increases but the increase about knowledge of non-cardiovascular complications is slower with increase about knowledge of diabetes. Following communalities determination, the mean total score was 98.50 ± 21.87 .

Conclusion This study has shown that type 2 diabetic outpatients in south-eastern Nigeria were knowledgeable about diabetes self care practices and that knowledge of diabetes self care is dependent on the knowledge of diabetes.

INTRODUCTION

Diabetes mellitus (DM) is a chronic metabolic disorder that is estimated to affect, 150 million people. A doubling of this

figure is expected in the near future; especially in the African and Asian continents.^{1,2} Gross underreporting of DM occurs

in African countries and may, in part, be due to the absence of research funding and lack of technical expertise.

Nearly a decade ago, the prevalence of DM in Nigeria was 2.2%.³ Isolated reports from some regions of Nigeria have found prevalence rates to range from 0.9–8.3%.^{4,5}

Diabetes mellitus is associated with considerable morbidity and mortality.⁵ In Nigeria, where healthcare services and accessibility are poor, DM is associated with a high disease burden.⁶ Diabetes is also a major risk factor for cardiovascular disease, stroke, and kidney failure.⁷

People with diabetes have been shown to have higher mortality rates than people without diabetes, although mortality rates depend on the location and the specific group reported.⁸ In Africa, DM probably has the highest morbidity and mortality rates of all chronic non infective diseases.⁹ Unfortunately, in Nigeria, communicable diseases remain the priority health condition for the Ministry of Health. The importance of non communicable diseases as a significant contribution to disease burden in Nigeria is highly underscored. Most of the reports on morbidity and mortality rates of diabetes in Nigeria were made in the 1960s and 1970s and therefore may not reflect the current situation.^{4,10,11} Recent study¹² in a tertiary hospital in Nigeria showed that DM admissions accounted for 15% of all medical admissions and 22% of all medical deaths. These facts demonstrate a worsening condition for DM-related admissions and deaths in Nigeria. An earlier study by Ogbera et al¹³ reported cumulative DM admission rates and death rates of 10% and

7.6%, respectively. These figures were obtained from a 10-year survey from 1990–2000. These findings were not surprising because there had been projected worldwide increase in the prevalence of DM, especially in developing countries.^{1,2} With this projected increase in prevalence rates in DM, the morbidity and mortality rates are expected to assume an upward trend especially in regions of the world where healthcare services are sub-optimal for the rapidly expanding populations.

Self care has been emphasized in the recent white papers, ‘Our Health, Our Care, Our Say’.^{14,15}

People with diabetes are now encouraged to take part in structured education programs, which have had positive results on blood glucose and complication rates. This will enable patients with diabetes to become more responsible and successful in self-managing their condition. But this is just one part of self care. Pharmacists and other healthcare team have their role as well, providing advice, services and support to enable people with diabetes to care for themselves and get maximum benefit from their treatment.^{16,17,18}

For patients to stay healthy, they should be active, speak with their doctor, and visit their pharmacists. There are many good reasons to take action towards self management of diabetes because it can improve the patients’ quality of life. In the future, the patients are likely to stay healthy and prevent or delay problems that can involve heart, blood vessels, eyes, kidneys, and nerves.^{14,15}

Reducing hyperglycemia has been shown to be an important factor in the prevention of diabetes-related complications.^{19,}

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Various treatments, pharmacological as well as non-pharmacological have been shown to reduce the glycosylated hemoglobin levels (A1c levels). Type 2 diabetes patients may benefit from all glucose lowering drugs and also from life style changes, such as exercise and diet. In addition to pharmacological treatment, education on self-management of diabetes is considered an integral component of all diabetes care plans.^{21,22} Various strategies of self-management education exist, these strategies included face-to-face delivery, cognitive reframing teaching method, and exercise content were more likely to improve glycaemic control.^{23,24}

Nevertheless, it is now widely accepted that self-management should not be only focused on knowledge and skills, but that self-efficacy and coping skills are equally important to achieve the desired patient outcomes.²⁵ Education or training of type 2 diabetes mellitus patients in self-management is effective in reducing A_{1c} levels, although research into the long-term effects of educational programmes is limited.^{23,26}

Behavioural change focuses on nutrition, physical activity and psychosocial coping skills. Self-monitoring of blood glucose (SMBG) is also considered an important aspect of diabetes self-management.^{22,25} SMBG is a technique that allows patients to measure their own blood glucose value. SMBG has two goals. First, it enables patients to monitor and react to changes in their blood glucose levels, allowing them to integrate their diabetes into the life style they prefer.

Second, it allows physicians to gather data for clinical decision-making. Especially the first goal is relevant, since the SBMG equipment has become much more accurate and user friendly in recent years. Apart from blood sampling using the finger tip method, technical developments have made it possible to sample blood from other sites, reducing patient discomfort.²⁷ Furthermore, improved sensitivity of the analysis has led to a sharp decrease in the sample size needed for SMBG.

The need to improve the global self care knowledge and control of diabetes mellitus has necessitated the stipulation of various treatment guidelines. In recent times, it includes those of Clinical Practice Guideline: Managing Diabetes in the Long Term Care Setting from the American Medical Directors Association (AMDA)²⁸ that offers a systematic approach to diabetes management in the recognition, assessment, management and monitoring of type 2 diabetes in the long-term care resident. Indiana Consensus Guidelines for Diabetes Care²⁹ is a partnership between the patient, family, and the diabetes team, which includes the primary care provider, diabetes educator, nurse, dietician, pharmacist and other specialists. The U.S. Department of Health and Human Services' National Diabetes Education Program³⁰ outlined four-step (Step 1: Learn about diabetes, Step 2: Know your diabetes ABCs, Step 3: Manage your diabetes, and Step 4: Get routine care) action plan that will help patients control diabetes for life.

Despite well-established treatment guidelines, diabetes is often inadequately managed, resulting in diminished health

as well as unnecessary and costly interventions. Individuals with diabetes suffer disproportionately from adverse drug events requiring hospitalization. These undesirable outcomes often result from improper use, overuse, or underuse of diabetic drug therapy, all of which are preventable.³¹

An essential ingredient that has been missing from the health care delivery system in Nigeria is the lack of diabetes self care knowledge by the diabetic patients. Diabetes knowledge is the cornerstone to improving self care practice of the patients. Patients are the key to achieving therapeutic goals in ambulatory care. Research by the American Pharmacists Association (APhA) Foundation³² and the Asheville Project³³⁻³⁵ have shown that when patients are engaged and understand their role, they become much more active and are capable of achieving significant improvements in adherence and other health outcomes.

Diabetes self care knowledge is considered an essential part of clinical management: simply prescribing the correct amount of insulin and oral agents and drawing up meal plan is not always enough to meet blood glucose targets.³⁶ Research does not only indicate the need for self-management in terms of the practical implications of living with diabetes and the pathophysiology of the condition; it has also evidently shown the importance of psychosocial aspects of living with diabetes in diabetes care.²³ Being diagnosed with a chronic illness can cause a wide range of emotional reactions, such as anger, self denial, sadness and anxiety which can negatively affect the adjustment process. Psychosocial adjustment to accept a condition such as

diabetes is necessary owing to the changes in life style required for the successful management of this condition.³⁷

Knowledge of diabetes self care is the provision of diabetic patients with management skills, and motivation to effectively manage their condition together with diabetes knowledge, which is the bed rock of the self care practices.³⁸

Poor patient understanding of diabetes is believed to impede appropriate self-care management, thus accelerating cardiovascular complications, stroke, and kidney failure. Assessment of the level of knowledge in self care among persons with diabetes can assist in targeting public health efforts to reduce complications. Many factors might have contributed to poor diabetes control in Africans, but the patients' knowledge of self care to achieve good diabetes control is yet to be ascertained in south eastern Nigeria to the best of our knowledge.

The above issues informed the aim of this study which is to assess type 2 diabetic patients' knowledge of self-care practices.

METHODS

Instrument Development

A 28-item questionnaire consisting of 5 point response scale (strongly agree = 5, agree = 4, neither agree nor disagree = 3, disagree = 2, and strongly disagree = 1) was developed for the survey. Items included in the instrument covered steps of National Diabetes Education Program,³⁰ some questions from Patient's Diabetes Knowledge Questionnaire (DKQ),³⁹ and additional two questions on self monitoring of blood

glucose. This instrument has questions related to knowledge diabetes mellitus and diabetes complications which are the bed rock of the self care practices.³⁸ Patient with good understanding of diabetes can be of great assistance to their healthcare team to institute and maintain appropriate self-care management, thus reducing cardiovascular complications, stroke, and kidney failure. In addition to questions asked to assess patients' knowledge of self care, the survey included questions on demographic variables such as age, sex, marital status, education level, occupation, income per month, years with diabetes and type of hospital facility.

A pilot study was conducted using 20 patients from hospitals in Enugu (Enugu is a capital city of Enugu state) to ascertain the validity and reliability of the instrument.

Respondents were requested to rate their knowledge levels on the scale of 1 – 5 (lowest to highest: Strongly Disagree to strongly Agree) in the space provided. Their knowledge was expressed in the degree to which they agree or disagree to the questions asked. Since all the items were in one direction, a summation of the scores was assessed to reflect the knowledge of the patients; high score correlating with being knowledgeable and vice versa.

Study area

This investigation was carried out in five states (Enugu State, Anambra State, Abia State, Imo State, and Ebonyi State) of south-eastern Nigeria. South eastern Nigeria is one of six geo-political zones in Nigeria. This zone has the same cultural, religious, social, political and economic

commonality. The zone has a population of about seventeen million people.⁴⁰

Health care facilities included four tertiary health facilities (this is highest level of health care facility in Nigeria with highly trained medical personnel and it is highly equipped, it includes both states' and federal university teaching hospitals and federal medical centers) and six secondary hospitals (this is second level of health facility, it includes general hospitals, some missionary hospitals, and few private hospitals).

Sampling technique

Multi-stage sampling was employed; four tertiary hospitals were randomly selected from eleven (11) tertiary hospitals in the south- eastern zone. One secondary hospital each was randomly selected from four states except Enugu where two secondary hospitals were randomly selected because of its status in South-east. Enugu was the capital of old eastern region from which these five states were created and Enugu has four out of eleven tertiary hospitals in the zone, in addition, it is still serving as headquarters to south eastern Nigeria.

This is a cross sectional study. The hospitals usually have weekly medical clinic for the ambulatory diabetic patients. Patients usually come for their routine medical checkup monthly or as may be given appointment on this clinic day.

Four hundred (400) adult patients that satisfied the inclusion criteria were randomly selected following their consents. Type 2 diabetic patients were eligible if they were aged 18 and above, able to read and write English, and not too ill to complete questionnaire. Investigators briefed the respondents

on the purpose of the study and oral consent was obtained from the respondents. Permission was obtained from appropriate authority of each hospital studied.

The study also involved interview with patients to identify factors affecting knowledge of diabetes self care. Every tenth person in the list of selected respondents was interviewed; if the person declined, the person following him/her would be interviewed. A total of twenty-nine interviewees participated in the exercise. This was conducted by the investigators and other trained interviewers who had participated in several interview oriented researches, they were highly experienced in this regard.

Data Collection

A self-completion questionnaire was administered to the selected ambulatory diabetic patients in the included hospitals by investigators. All respondents were assured of confidentiality and anonymity. They were asked to put the completed questionnaire in the envelope provided and hand it over to the investigators. The time taken by a patient to complete the questionnaire ranged from 15 to 20 minutes while the time taken to interview a patient ranged from 8 to 12 minutes.

Administration and retrieval of questionnaires were continuous for five weeks. Conventionally, all the diabetic patients should visit their hospitals at least once within this period since hospital visit/appointment is usually booked monthly. All the diabetic patients who came to hospital within study period and satisfied the inclusion criteria were included in the random sampling. This approach left out

potential patients who did not come within study period but this was necessary to avoid double sampling of patients.

Non responders were orally interviewed and reasons given for their non participation ranged from lack of time to lack of interest.

Analysis of Data

The completed questionnaires were sorted and entered into Microsoft 2007 Excel and subsequently analyzed with version 14 of Statistical Package for the Social Sciences (SPSS Inc. Chicago). Descriptive statistics on the sample characteristics and questionnaire items were computed, continuous variables results were represented in mean \pm SD and 95% Confidence Interval (CI) and for categorical variables, percentage distributions was used. Relationships between the demographic profile and responses were explored using Student's t-test and one-way ANOVA. Inferential statistics were calculated with the aid of GraphPad Instat 3, which reports exact P-values; hence a P-value of less than 0.05 was interpreted as significant.

A Kaiser-Meyer-Olkin measure of sampling adequacy was calculated to determine the extent to which the variables belonged together and were appropriate for factor analysis. Factor analysis was performed to test the construct validity of the instrument using principal axis factoring extraction with varimax rotation. Listwise deletion was used to handle missing values in the factor analysis. Factors selected for rotation had eigenvalues greater than 1.

The internal consistency of the scales was assessed using Cronbach's α . Interscale correlations of the mean knowledge

scores of extracted factors were also examined. Scale scores were computed by summing the scores for the individual items constituting the scale. On the 5-point scale, “5” represented the highest score while “1” represented the lowest score. And on the 28-item scale the lowest possible mean score would be 28 while the highest possible mean score would be 140. A logical neutral point was assumed to be 84 i.e. midpoint between 28 and 140. This method had been used in some studies⁴¹⁻⁴⁴. Since the summated score correlated with level of self-care knowledge of the patients, scores above 84 were taken as being knowledgeable. The standard deviation was calculated as a measure of item variability from the mean score. Any low standard deviation indicated cluster of responses to the mean while high standard deviation reflected high variability of opinions from the mean.

The percentage knowledgeable (%KN) was the percentage of respondents that scored above the critical or neutral point on the rating scale in each item.

$$\%KN = \frac{\text{Number of respondents who scored above the neutral point}}{\text{Total number of respondents in each item}} \times 100$$

RESULTS

A total of 314 out of 400 questionnaires distributed were received, yielding a response rate of 78.5%. The majority of the respondents were females (56%) and nearly half (48%) of the patients were aged above 50 years. More than 44% were retired. More than half (51%) of the patients attended secondary school and less than a fifth (19%) of the patients studied were earning more than ten thousand naira monthly.

Nearly half of the patients (47%) was recently diagnosed with more half (51%) of the patients receiving their treatment in secondary hospitals (Table 1).

Factor analysis, after the listwise deletion of missing values, 273 cases remained. The Kaiser-Meyer-Olkin measure of sampling adequacy for the factor analysis was 0.82.

Following determination of communalities (Communalities indicate the amount of variance in each variable that is accounted for, small values indicate variables that do not fit well with the factor solution, and should possibly be dropped from the analysis) three items had values less than 0.4 and were therefore excluded from the summary score. These items were: “A_{1C} shows what my blood sugar has been over last three months”, “HDL or good Cholesterol helps remove cholesterol from my blood vessels”, and “Shaking, confusion, behavioural changes and sweating are signs of low blood sugar” (Table 2).

All the analyses in this study were based on the remaining 25 items whose values were above 0.4 following communalities determination.

Principal axis factoring extraction method using varimax rotation and the criterion of an eigenvalue greater than 1.0, four factors were extracted. However, the scree plot indicated a break after the fifth factors (eigenvalue = 0.63). Chronbach’s alpha for the 25 questionnaire items was found to be 0.79. The first scale consisted of the 10 items with loadings on factor 1. Most of these items related to the dimensions of diabetes and the scale was labelled knowledge of diabetes. The internal consistency of this scale, as

measured by Cronbach's α , was 0.82. The second scale comprised 7 items with loadings on factor 2. Most of these items related to the dimensions of knowledge of diabetes self care practices and the scale was labelled knowledge of diabetes self care practices. The internal consistency of this scale, as measured by Cronbach's α , was 0.74., the third scale and fourth scales had five items and three items with loadings on factor 3 and factor 4 respectively. The internal consistencies of third and fourth scales, as measured by Cronbach's α , were 0.64 and 0.75 respectively. Most of these items in both factor 3 and factor 4 were related to the dimensions of knowledge diabetes complications and were labelled knowledge of cardiovascular complications and knowledge of non cardiovascular complications respectively. A large first scale accounted for 42.4% of the variance while the second, third and fourth scales accounted for 29.4%, 6.3% and 4.3% of the variance respectively.

Inter-scale correlations of the mean knowledge scores of four extracted factors were computed. The correlation coefficients of factor 1, factor 2, factor 3 and factor 4 when compared with overall remaining 25 items knowledge scores were 0.96, 0.92, 0.95 and 0.65 respectively. When factor 2, factor 3, and factor 4 were compared with factor 1 their correlation coefficients were 0.90, 0.94, and 0.71 respectively. This implies that knowledge of diabetes self care and knowledge of cardiovascular complications increase as the knowledge of diabetes increases but the increase about knowledge of non

cardiovascular complications is slower with increase about knowledge of diabetes.

The mean total score was computed to be 98.5 ± 21.87 (range, 25 to 125; midpoint, 75). This showed that the studied patients were knowledgeable about diabetes self care.

This study showed that female patients were significantly knowledgeable in diabetes self-care than their male counterparts ($t = 7.49$; $P < 0.0001$). Knowledge of diabetes self-care was also associated with age ($F = 81.29$; $P < 0.0001$), younger patients (18-35 years) were most likely to be knowledgeable; marital status ($F = 22.12$; $P < 0.0001$), widowed were most likely to be knowledgeable; educational status ($F = 47.15$; $P < 0.0001$), patients who were in or stopped at secondary school were most likely to be knowledgeable; years with diabetes ($F = 20.39$; $P < 0.0001$), patients who had stayed many years with diabetes (> 10 years) were most likely to be knowledgeable; type of hospital ($t = 4.88$; $P < 0.0001$), patients who were receiving treatment in tertiary hospitals were more likely to be knowledgeable. Knowledge of diabetes self-care was not significantly associated with monthly income ($F = 2.17$; $P = 0.10$), but patients in high economic class (monthly income greater than N50,000; \$US 1 = N 146) were most likely to be knowledgeable; also occupation was not significantly associated with knowledge of diabetes self-care ($F = 0.9563$; $P = 0.41$) but patients who were students were most likely to be knowledgeable (Table 1).

Table 1: Comparison of Knowledge Ratings Based on the Demographic Characteristics

Characteristics	Frequency	Percentage	Mean score	S.D	95% CI
Age (Years) (n = 314)	F= 81.293; P< 0.0001				
18-35	45	14.3	3.12	1.07	2.798-3.442
36-50	116	36.9	4.23	0.71	4.099-4.361
> 50	153	48.7	2.84	0.97	2.686-2.994
Sex (n = 314)	t = 7.485; P< 0.0001				
Female	178	56.7	3.98	1.01	3.832-4.128
Male	136	43.3	3.13	0.89	2.965-3.295
Marital Status (n = 310*)	F = 22.118; P< 0.0001				
Single	32	10.32	3.22	1.10	2.823-3.617
Married	124	40.00	3.54	0.94	3.375-3.705
Widowed	137	44.19	4.31	1.00	4.143-4.477
Divorced	17	5.48	3.07	0.85	2.633-3.507
Monthly income (N) (n = 301*)	\$US 1 = N 146	F= 2.169; P= 0.0918			
Less than 10,000	101	33.55	3.86	0.96	3.670-4.050
More than 10,000 to 30,000	43	14.29	3.98	0.87	3.712-4.248
More than 30,000 to 50,000	98	32.56	3.74	0.92	3.555-3.925
More than 50,000	59	19.60	4.11	0.88	3.881-4.339
Occupation (n = 307*)	F= 0.9563; P= 0.4137				
Student	11	3.58	4.24	1.04	3.541-4.939
Self-Employed	99	32.25	3.96	0.81	3.798-4.122
Employee	59	18.57	4.18	0.99	3.922-4.433
Retired	138	44.95	4.07	0.86	3.927-4.213
Educational Status (n = 314)	F= 47.150; P<0.0001				
Primary Education	94	29.94	3.12	0.74	2.968-3.272
Secondary Education	163	51.91	4.31	1.09	4.143-4.477
Tertiary Education	57	18.15	3.98	0.81	3.765-4.195

Years with diabetes (n = 299*)	F= 20.394; P<0.0001				
Recently (less than 1 year)	141	47.12	2.95	0.91	2.800-3.100
1-5 years	59	19.73	3.63	0.99	3.372-3.888
6-10 years	71	23.75	3.39	0.73	3.217-3.563
More than 10 years	28	9.36	4.25	1.03	3.851-3.649
Type of Hospital (n = 314)	t= 4.879; P< 0.0001				
Secondary	161	51.27	3.75	0.67	3.647-3.853
Tertiary	153	48.73	4.13	0.71	4.017-4.243

*Number reporting may be < 314 due to non-response to an item

Table 2: Patients' knowledge of diabetes and diabetes self care (Mean score), Standard Deviation (S.D), Loading and % knowledgeable (%KN)

Factor 1: Knowledge of diabetes Items (n=10)	Mean	S.D	Loadings	%KN
Cuts and wounds on person suffering diabetes heal more slowly.	4.56	0.58	0.628	75.48
Diabetes means that my blood glucose (blood sugar) is too high.	4.37	0.75	0.674	75.16
Diabetes is a serious disease but I can learn how to manage it.	4.34	0.56	0.823	78.03
I AM the most important member of the health care team* because I can help my healthcare team to make a diabetic care plan that will work for me.	4.13	0.80	0.639	64.42
[†] HDL or "good" Cholesterol helps remove bad cholesterol from my blood vessels.	4.12 [†]	1.08	0.573	63.38
Diabetes can cause loss of feeling in my hands, fingers and feet and it can cause some people lose a foot or a leg.	3.97	0.76	0.649	57.00
Prevention, control and drugs for diabetes are for life.	3.76	1.09	0.535	42.68
[†] A _{1C} shows what my blood sugar has been over last three months.	3.59 [†]	1.13	0.458	33.98
The main types of diabetes are type 1 and type 2.	3.56	0.98	0.478	54.79
If I am suffering diabetes, my children have a higher chance of being diabetic.	3.47	0.76	0.623	54.78
The usual cause of diabetes is lack of effective insulin in the body.	3.43	1.08	0.586	46.15
Diabetes cannot be cured.	2.96	1.30	0.724	41.72

Factor 2: Self care practices Items (n=7)	Mean	S.D	Loadings	%KN
I should always keep my appointment even when I am feeling well.	4.32	0.82	0.745	75.80
Taking low dose Aspirin (Vasoprin [®] , Emprin [®]) tablet every day decreases my risk of having heart attack and stroke.	4.29	0.93	0.640	73.57
Self monitoring of blood glucose (SMBG) allows doctor and other healthcare team to gather data for clinical decision-making.	4.12	0.54	0.785	76.75
Since I am diabetic, I need to make healthy food choices, stay at a healthy weight, and stay physically active every day.	4.09	1.20	0.649	61.66
Self monitoring of blood glucose (SMBG) enables me to monitor and react to changes in my blood glucose levels; it allows me to integrate my diabetes into the life style I want to live.	3.94	0.85	0.695	51.44
Diet and exercise are as important as my drugs in controlling my diabetes.	3.34	1.16	0.423	45.51
Regular exercise can reduce my need for insulin or other diabetic drugs.	3.23	0.91	0.751	48.55
Factor 3: Knowledge of diabetes cardiovascular complications Items (n=5)	Mean	S.D	Loadings	%KN
Unmanaged diabetes can cause heart attack and stroke.	4.41	0.68	0.843	83.12
High Blood pressure makes my heart work too hard and this can make me have heart attack, stroke, and kidney disease.	4.41	0.63	0.726	88.85
If my blood sugar is close to normal I am likely to have more energy; feel less tired and thirsty, urinate less often; have less skin or bladder infection; have fewer problems with your eyesight, feet, and gum.	4.37	0.75	0.643	77.39
LDL or "bad" Cholesterol can build up and clog or block my blood vessels and it can cause heart attack or a stroke.	4.09	0.95	0.568	72.90
Uncontrolled blood sugar level can cause kidney problems.	3.38	1.19	0.749	51.92
Factor 4: Knowledge of diabetes non cardiovascular complications Items (n=3)	Mean	S.D	Loadings	%KN
Cigarette smoking and excessive Alcohol intake can worsen my diabetes.	4.45	0.87	0.812	82.48
High blood sugar level can cause eye problem or even blindness.	4.28	0.79	0.643	71.34
Uncontrolled blood sugar level can cause gum disease and loss of a teeth.	3.23	0.94	0.489	42.68

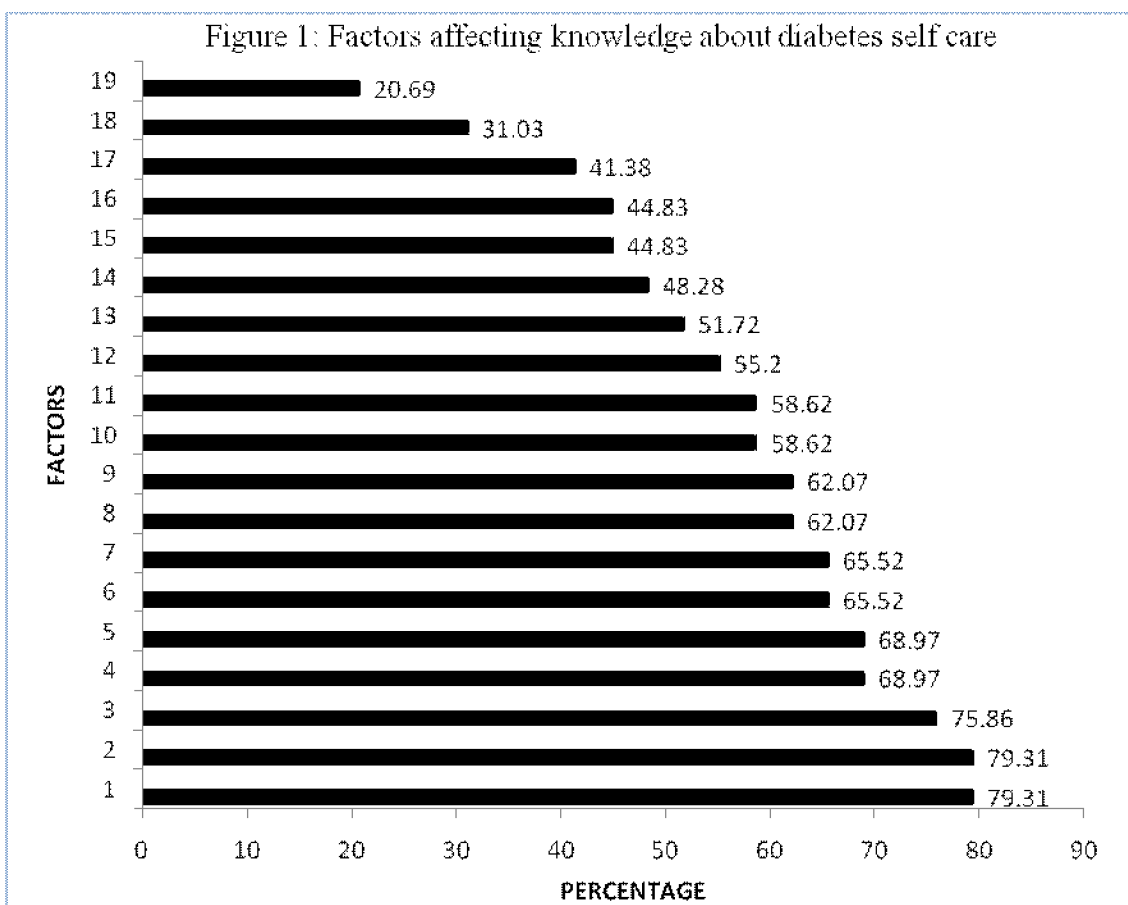
[¶]Shaking, confusion, behavioural changes and sweating are signs of low blood sugar. 2.97[¶] 1.21 0.729 31.02

sugar.

Mean total score **98.50** **21.87**

* Members of health care team are Doctors, Pharmacists, Foot Doctors, Eye Doctors, Nurses, Dentists, Dietitians, Diabetes Educators, Mental Health Counselors, Social Workers, Friends and Family.

[¶] Excluded Items.



Factors affection knowledge of self care in descending order of their contributions:

1. Educational Background
2. Distance to the centre
3. Being over 65 years of age
4. Socioeconomic class
5. Having fewer diabetes symptoms
6. Attitude of health care personnel
7. Number of Years the patient has lived with diabetes
8. Apathy towards diabetes education

9. Low perceived seriousness of diabetes
10. Working full or part-time
11. Forgetfulness
12. Having family members, relatives or friends with diabetes
13. Conflict between patients' work schedules and the centre's hours of operation
14. Regular physician consultation
15. Living environment such as Living alone, Live with immediate family, and Live with other family/friends
16. Patients' confidence in their own knowledge and ability when managing their diabetes
17. Having a regular primary care physician
18. Sex of patient
19. Lack of familiarity with the centre and its services

From interview, the factors affecting knowledge of self care were shown below in descending order of their contributions which ranged from 79.3% to 20.7% (Figure 1).

DISCUSSION

The result of this research found that the studied population was knowledgeable. The total mean knowledge score was 98.5 ± 21.87 (range, 25 to 125; logical midpoint, 75). This level of knowledge might be attributed to inherent patients' characteristics such as being younger, educated, and having stayed more than ten year with diabetes which significantly associated to knowledge of self care. These characteristics were supported by the top ten factors affecting knowledge of self care as reported by the interviewees (Figure 1).

Considering Interscale correlation coefficients of the extracted factors, this study revealed that knowledge of diabetes self care and cardiovascular complications of diabetes increase as knowledge of diabetes increases, but the increase about knowledge of non cardiovascular complications is slower with increase about knowledge of diabetes knowledge. Due to this interdependence of these factors, there is need for a holistic approach while organizing educational program for diabetic patients since

knowledge of one aspect could improve knowledge of another. Identifying this commonality will help health care personnel to articulate health care plans that will have positive impact on diabetes patients. Diabetes educators can also use this common ground to contribute to self care management of patients by developing structures and schedules of educational curricula that will improve the quality of life of diabetic patients. These activities will consequently enhance patients' skills and knowledge of diabetes self care.

Regular assessment of patients' skills and knowledge is critical.^{45,46} The importance of self-management skills in diabetes care has been stressed by the American Diabetes Association (ADA) and the Veterans Health Administration (VHA). Patients' ability to understand and carry out their individual treatment regimens is critical to the control of diabetes mellitus. ADA recommends that patients' knowledge of the self-care responsibility be assessed annually. VHA recommends reassessing patient knowledge of diabetes at least three months after an

educational intervention.^{47,48} Dental hygienists in a survey demonstrated a need for enhancing knowledge of diabetes self care as it applies to clinical patient care.⁴⁹ A Swedish study⁵⁰ congruently concluded that teaching type 2 diabetes patients about their disease and self care responsibilities results in greater decreases in the hemoglobin A1c test than many drugs. However, some researchers showed that knowledge of diabetes has little or no effect on the Outcomes.⁵¹

In our study, we found out that age, sex, marital status, educational status, years with diabetes and types of hospitals were associated with the patients' knowledge of diabetes and its self-care. Previous data had suggested that age, years with diabetes, and education had significant impact on patients' diabetes knowledge.⁵²

Older persons with diabetes tend to have less education, worse cognitive function, and more barriers to practicing appropriate self care than their younger counterparts with diabetes.⁵³⁻⁵⁶ This study is in line with aforementioned previous findings, the younger patients (18-35 years) were most likely to retain what they were thought and majority of them were of school age, they remember and recall faster than older groups. As a result, our future educational interventions would be designed to meet the needs of those patients.

This study corroborated some researchers who indicated that men with diabetes were less knowledgeable than their woman counterpart.⁵⁷ This might be attributed to some reasons. Many women in south eastern Nigeria are mainly

house wives, this allows them time to concentrate and take better care of themselves unlike their male counterpart who are mainly the bread winners their home, they are busier during the day and come back home at night tired and weak and there is little or no time to self care.

Surprisingly, patients whose spouse had died (widowed) were most likely to be knowledgeable in self care than single married and divorcees despite the psychosocial effects of being widowed. More researches are needed to determine the underlining reasons behind this. Although this might be attributed to high proportion (44%) of this group respondents and a majority of them might be women who had shown to be more knowledgeable. The divorced group was least likely to be knowledgeable and this might be associated psychosocial traumas that are usually associated with divorce and psychosocial aspects of living with diabetes in diabetes care³⁷.

This study revealed that occupation and economic status were not associated to self care knowledge, though patients who were student and those earning more than N50,000.00 per month were most likely to be knowledgeable (\$US 1 = N 146). Those students were likely to be younger and they were in a better position to understand and recall faster. The patients earning above N50,000.00 per month might be more educated, thus they were in a better position to access and afford better services. Mere having knowledge of self care without practical application of this knowledge can be unfruitful. Despite the fact that people in high socioeconomic class were more likely to be knowledgeable

as found by this study, Zimmet⁵⁸ found that diabetes was more common in the upper-class families in the developing Nations of the world.

Educational status was associated with diabetes self care knowledge, patients who attended primary school were least likely to be knowledgeable, though, the trend is not continuous as patients who were attending or who attended secondary school were most likely to be knowledgeable than their university colleagues. This might be due to the fact that a majority of the patients were attending or attended secondary school.

A majority of the Patients had been with their diabetes for less than one year, and this group of patients was the least likely to be knowledgeable while patients who had been with diabetes for more than ten years were most likely to be knowledgeable. This might be associated to insidious nature of diabetes, patients with fewer years might not see the need to self care until the symptoms are manifested, unlike patients who had lived with the disease for many years, whose symptoms have manifested and they go around seeking for treatments. This group of patients is most likely to self care to relieve themselves of the debilities and discomforts associated with diabetes. There is need to intensify self care trainings for newly diagnosed patients and also for asymptomatic patients to prevent and reduce the development and progression of diabetes complications.

The differences that existed between the tertiary and secondary hospital might be attributed to the following

features. Firstly, the tertiary hospitals in the south eastern Nigeria were reported to have higher number of qualified medical staff. Secondly, majority of patients visiting tertiary facilities are highly educated and high salaried earners. Their demand for best services and drug products might be the driving force for higher quality of services, unlike secondary hospitals that is mostly visited by the less educated and lower income earners who know little or nothing about their illnesses and do not make any meaningful contribution to the services rendered to them by the inexperienced staff.⁵⁹ Also most of the secondary hospital studied did not have fixed day for weekly medical clinic for diabetic, therefore, most of the patients came any day they feel unwell or were given appointment. The researchers were visiting the health facilities on weekly bases and many potential patients were not included. This situation is common in most African and Asian countries. In addition to identifying specific patient characteristics related to knowledge mean score, we noted other areas of knowledge that needed to be reinforced. Such areas are knowledge of incurability of diabetes, knowledge of glycosylated haemoglobin and the need for healthy dieting and regular exercise.

The top ten factors most likely to affect knowledge of self care were educational background, distance to the centre, being over 65 years of age, socioeconomic class, having fewer diabetes symptoms, attitude of health care personnel, number of years the patient has lived with diabetes, apathy

towards diabetes education, low perceived seriousness of diabetes, and working full or part-time.

However, knowledge of diabetes self care is an ongoing process and is affected by many different factors. Enza Gucciard et al⁶⁰ noted that many factors that could contribute to low knowledge of diabetes self management were rooted in how the services were structured and delivered. Also working full and part-time, being over 65 years of age, having a regular primary care physician or fewer diabetes symptoms had been attributed to be contributing factors. They further added that conflict between patients' work schedules and the centre's hours of operation, patients' confidence in their own knowledge and ability when managing their diabetes, apathy towards diabetes education, distance to the centre, forgetfulness, regular physician consultation, low perceived seriousness of diabetes, and lack of familiarity with the centre and its services are other reasons given by patients for non participation in diabetes self management education (DSME) program.

Diabetes self management education (DSME) through pharmaceutical care programs could provide the solution to the knowledge gaps identified in this study. The impacts of pharmacist delivered self management programs in diabetes through pharmaceutical care had been reported.^{16,17,18} The Asheville Project^{33-35,61} provided pharmaceutical care services for employees of the City of Asheville for 8 years and employees of that city's Mission Hospitals for 6 years. These services were provided by a

network of pharmacists who coached patients on how to self-manage their diabetes. Successes recorded in this program were improved self care knowledge, improvement in glycosylated haemoglobin (A1C) concentrations, increased patient satisfaction, and decreased costs of medical care for patients with diabetes.

The role of a pharmacist as part of the health care team is expanding and includes more direct patient care and clinical activities.^{62,63} The responsibilities of the pharmacists working under treatment protocols with physicians included a variety of roles, such as patient education, and medication review.⁶⁴

Collaborative drug therapy management by pharmacists is defined as "a collaborative practice agreement between one or more physicians and pharmacists wherein qualified pharmacists working within the context of a defined protocol are permitted to assume professional responsibility for performing patient assessments, ordering drug therapy-related laboratory tests, administering drugs; and selecting, initiating, monitoring, continuing, and adjusting drug regimens."⁶⁵

Limitations

The following limitations in addition to those mentioned in the text were inherent in the study and the results were interpreted in this light.

Data about diabetes and self care knowledge were self-reported; however, self-reported data about diabetes status have been established to be both valid and reliable.⁶⁶⁻⁶⁸

The sample size was small but representative.

The study period might be short but all the diabetic patients who came to hospital within study period and satisfied the inclusion criteria were included in the random sampling. This approach was rationale to avoid double sampling of patients though some potential patients who did not come within study period were left out.

Non response (missing value) bias was a limitation. The remaining cases after listwise deletion might not be the true representative of the responses if there was no missing value. In addition, exclusion of three items following communalities determination because they did not fit well with the factor solution might have affected the results. The effect should be minimal since the items were basically on knowledge of diabetes not knowledge of self care. Also interviewer bias was another potential limitation due to differences in interviewers' attitude, though we believe that this effect should be minimal as all of them were trained before the study and they were highly experienced in this regard.

The findings of this study could be helpful to all diabetic patients, diabetes researchers and diabetes healthcare team, especially those in developing countries like African and Asian continents which have comparable health care system and diabetes data to that of Nigeria.^{1,2,69}

CONCLUSION

This study has shown that type 2 diabetic outpatients in south-eastern Nigeria were knowledgeable about diabetes self care practices and that knowledge of diabetes self care is dependent on the knowledge of diabetes. Improving

patients' knowledge of self-care practices would allow them to contribute meaningfully to their care. A comprehensive pharmaceutical care programme should be routinely organized for the patient with diabetes mellitus. These routine programmes should consider diabetic patients' set goals to optimize blood glucose control and protocols to screen for, prevent, or manage micro vascular and macro vascular complications.

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