

Medication adherence in type 2 diabetes patients: study of patients in Alimosho General Hospital, Igando, Lagos, Nigeria.

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Abstract

Background: Poor adherence is an obstacle in therapeutic control of diabetes. Despite the advances in the treatment of diabetes mellitus over the years, diabetes places an immense burden on the individuals living with the condition, their families and the overall health care system.

Objective: Evaluation of the impact of medication adherence on the clinical outcomes of type 2 diabetes patients at Alimosho general hospital, Igando Lagos state.

Method: The medication adherence study was both descriptive (retrospective) and prospective. The retrospective study assessed the prevalence of medication non-adherence leading to poor glycemic control. This involved the review of case notes of one-hundred and fifty two randomly selected patients. Prospective study was done by counselling and educating the patients on medication adherence and assessing their medication adherence and the impact of medication adherence on glycemic control.

Results: The proportions of females/males with type 2 DM was found to be 69% and 31% respectively. 51.32% of these patients viewed their medications to be unaffordable. 56.6% of the patient population were 61 years and above in age. There was a significant relationship between patient age, gender and adherence to medication. There was however no significant $P \geq 0.05$ association between educational level and adherence. Health education and counselling resulted in adherence rate and clinical parameters improvements.

Conclusion: Non-adherence is a major factor that could lead to morbidity and mortality in diabetic patients. The overall improvement in adherence rate of 86.8% was observed with a decline in non-adherence rate after interventions.

Key words: Diabetes type 2, adherence, glycemic level, health education and counselling.

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Introduction

The incidence and prevalence of diabetes mellitus (DM) have continued to increase globally, despite a great deal of research, with the resulting burden resting more heavily on tropical, developing countries¹⁻². Type 2 DM, which is the more common of two basic types of DM, is increasingly being recognized in relatively young persons, due to the high prevalence of environmental and genetic risk factors².

People living with type 2 DM are more vulnerable to varied forms of both short and long-term complications, which often lead to their premature death. This vulnerability to increased morbidity and mortality is seen in patients with type 2 DM because of the commonness of this type of DM, its insidious onset and late recognition, especially in resource-poor developing countries like Nigeria³⁻⁴.

It is predicted that prevalence of DM in adults will increase in the next two decades and much of the increase will occur in developing countries where the majority of patients are aged between 45 and 64⁵⁻⁶.

With the current trend of transition from communicable to non-communicable diseases, it is projected that the latter will equal or even exceed the former in developing nations, thus culminating in double burden⁷⁻⁸. Type 2 DM is the most prevalent form of diabetes mellitus and accounts for about 90% of cases of diabetes⁹. The WHO 2004 report estimates that 1.7 million peo-

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ple in Nigeria have diabetes, with the projection that the number will triple by 2030⁹.

Although hyperglycaemia often presents with few outward symptoms, tight control of blood glucose is needed to prevent many of the short- and long-term complications of type 2 diabetes. A Blood glucose control goal requires active patient participation in order to master a complex array of self-management skills. These include modifying dietary choices, implementing exercise regimens, monitoring blood glucose, and adhering to often complex medication regimens¹⁰⁻¹¹. "Adherence means the extent to which a person's behaviour taking medication and/or executing lifestyle changes, corresponds with agreed recommendations from a health care provider"¹².

One way in which patients will be better able to manage their illnesses is by adhering to their medication regimens. Many patients, especially patients with a chronic illness, experience difficulties in following treatment recommendations. Adherence to long-term therapy for chronic illnesses averages only 50%¹². As a result of poor adherence, patients do not receive optimal benefit from their drug therapy. Suboptimal treatment can lead to increased use of health care services (acute care and hospitalizations), reduction in patient's quality of life, and increased health care costs (drug costs and medical costs)¹²⁻¹⁴. The reports of World Health Organization have emphasized that "increasing the effectiveness of adherence interventions may have a far greater impact on the health of the population than any improvement in specific medical treatments"¹².

In view of the above, this study intends to evaluate the impact of medication adherence on the clinical outcomes of type 2 diabetes patients at Alimosho general hospital, Igando Lagos State.

Methodology

Study area

The study was carried out in Alimosho general hospital, Igando, Lagos, Nigeria, a 101 bed secondary public health care facility with average hospital attendance at the medical clinic of 240 diabetic patients per month. Government has a free drug policy for patients aged 60 years and above for some drugs and patients are expected to purchase any additional drugs outside the free drug scheme.

Study Design

The study was approved by the hospital research/ethics committee and patients' consents were appropriately sought. The medication adherence study was both descriptive (retrospective) and prospective. The retrospective study assessed the prevalence of medication non-adherence leading to poor glycemic control. This involved the review of case notes of one-hundred and fifty two randomly selected patients that satisfied the inclusion criteria and with high probability of being available for follow up during the prospective study. The retrospective study specifically assessed the fasting blood sugar with at least three consecutive visits to the medical outpatient clinic between January and July 2012 and to find out whether or not their glucose level was on target – (i.e. fasting glucose of less than 7.0 mmol/L or 126 mg/dL) and the presence or absence of complications. Prospective study was done by counselling and educating the selected patients on medication adherence and subsequently assessing the impact of medication adherence on glycemic control.

Parameters assessed at baseline and at end of intervention include: age, gender, presence or absence of co-morbid conditions by objective investigation (such as hypertension, CHF, and dyslipidaemia), fasting blood glucose at first visit, fasting blood glucose after three consecutive visits between two and six weeks interval, level of adherence to therapy and patients knowledge about diabetes.

Inclusion criteria

- Patients 18 years and above diagnosed with Type 2 Diabetes
- Presence of co-morbid conditions like Hypertension, CHF, and dyslipidaemia

Exclusion criteria

- Patients with Type 1 Diabetes
- Patients visiting the health facility for the first time.
- Patients already having cardiovascular complications.
- Patients who could not communicate well with interviewer.

Data analysis

Data generated was analyzed using SPSS 17.0 software. Descriptive statistics were used to analyze the primary outcome and baseline clinical values, means and stand-

ard deviation for the continuous clinical and demographic data.

Results

Tables 1 and 2 were adapted from literature¹⁵⁻¹⁷. The tables contained values for the diagnosis and assessing the risks associated with diabetes.

Table 1. Target Levels of Risk Factors in Patients with Diabetes.

Blood pressure below 130/80 mm Hg
Low-density lipoprotein cholesterol below 100 mg/dl (2.6 mmol/liter)
Triglycerides below 150 mg/dl (1.7 mmol/liter)
High-density lipoprotein cholesterol above 40 mg/dl (1.1 mmol/liter)
Glycosylated hemoglobin below 7 percent

Table 2: Diabetes diagnostic criteria

Condition	2-hour glucose mmol/l(mg/dl)	Fasting glucose mmol/l(mg/dl)	HbA1c %
Normal	<7.8 (<140)	<6.1 (<110)	<6.0
Impaired fasting glycaemia	<7.8 (<140)	≥ 6.1(≥110) &<7.0(<126)	6.0-6.4
Impaired glucose tolerance	≥7.8 (≥140)	<7.0 (<126)	6.0-6.4
Diabetes mellitus	≥11.1 (≥200)	≥7.0 (≥126)	≥6.5

The analysis of one hundred and fifty two (152) case records of patients reviewed revealed that females were found to make up sixty nine percent (69%) of the total number of patients. Patients diagnosed with Type 2 diabetes mellitus only were found to make up twenty-six percent (26%), with the remaining patient population having co-morbid conditions. At baseline assessment,

four percent (4%) of the patients had micro-vascular complications due to poor glycemic control which was linked to non-adherence to medications. Eleven percent (11%) of the patients studied were found to have defaulted with their follow-up appointments. Only eleven percent (11%) of these patients had their glycemic control on target at baseline assessment (Table 3).

Table 3: Patients' Disease Characteristic and Glycemic Control

Characteristics	Frequency (n)	Percentage (%)
Patients Characteristics		
No of type 2 diabetes mellitus female patients	105	69
No of type 2 diabetes mellitus male patients	47	31
Patients having type 2 diabetes mellitus only (male & female)	39	26
Patients having type 2 diabetes mellitus plus other co-morbid conditions	111	74
No of patient having Micro vascular complication due to poor glycemic control	6	4
Good Glycemic Control		
Type 2 Diabetes Only	6	4
Type 2 Diabetes plus other Co-morbid Condition	11	7

The age distribution of the 152 Type 2 diabetes patients interviewed was evaluated. Majority (45.4%) of the patients were found to be between the ages of 61 and 70 years with 72.4% of the patients being females. It was

also observed that most (72.4%) of the patients were married. 36.2% of the patients had no formal education, 37.5% had primary education, 11.8% secondary education and 14.5% post-secondary education (Table 4).

Table 4: Socio-demographic Characteristics of the Patients

Characteristics: Age (years) and Sex	Frequency (n)	Percentage (%)
31 – 40	2	1.3
41 – 50	23	15.1
51 – 60	41	27.0
61 – 70	69	45.4
>70	17	11.2
Male	42	27.6
Female	110	72.4
Educational Level		
No formal education	55	36.2
Primary	57	37.5
Secondary	18	11.8
Post Secondary education	22	14.5
Marital Status		
Single	7	4.6
Married	110	72.4
Separated	4	2.6
Divorced	2	1.3
Widowed	29	19.1

97 respondents (63.8%) believed type 2 diabetes can be controlled using drugs and life style modification. 30 respondents (19.7%) believed type 2 diabetes can be cured permanently. 3 respondents (2.0%) believed they can personally control their blood glucose level without using drugs while 22 respondents (14.5%) had no idea about the disease .

Significant proportions (51.32%) were of the opinion that type 2 diabetes management was not affordable. This was followed by 28.29 % who viewed type 2 diabetes as moderately affordable, 17.76 % were of the view that type 2 diabetes was affordable (Table 5).

Table 5: Assessing Patients view on Diabetes Management

Patients view:	Male n (%)	Female n (%)	Total n (%)
Affordable	10 (6.58)	17 (11.18)	27 (17.76)
Moderately Affordable	8 (5.26)	35(23.03)	43(28.29)
Not Affordable	23 (15.13)	55 (36.19)	78(51.32)
Do not know	1 (0.66)	(1.97)	4(2.63)
Total n(%)	42 (27.63)	110 (72.37)	152 (100)

Fifty-two of the respondents (34.2%) knew all the antidiabetic drugs they are taking by name, 64 of the respondents (42.1%) knew only a few drugs they are taking by name, 23 of the respondents (15.1%) knew most but not all the drugs by name, 10 of the respondents (6.6%) knew some of the drugs by name while 3 respondents (2.0%) did not know the name of the diabetic drugs they were taking.

Results on Table 6 showed that 105 respondents (69.0%) could only buy their drugs in bits due to high cost of medication while 47 respondents (31.0 %) could afford to buy all their drugs at once. Of the respondents that buy their drugs in bit, 53 respondents (50.5 %) don't wait for the drugs to get finished, 19 respondents (18.1 %) stay without drugs between 1– 3 days before refilling, and 33 respondents (31.4 %) stay without drugs between 4 – 7 days before refilling.

Table 6: Effect of Cost and Number of Drugs on Adherence

Characteristics	Frequency (n)	Percentage (%)
Drug Purchase Methods		
At once	47	30.9
In Refills	105	69.1
Number of Days of Out of Stock		
0 day	53	50.05
1 – 3 days	19	18.1
4 – 7 days		
No of medication per prescription		
No Response	3	2.0
2	23	15.1
3	72	47.4
4	33	21.7
5	21	13.8

Twenty-three respondents (15.1%) take two medications per day, 72 respondents (47.4%) take three medications per day, 33 respondents (21.7%) take four medications per day, 21 respondents (13.8 %) take five medications per day, and while 3 respondents (2.0 %) could not state the number of medication they take per day. Furthermore, 78 respondents (51.3 %) had never used herbal medicine to treat their ailment alongside their medications, 53 respondents (34.9 %) agreed that they treat diabetes occasionally with herbal remedies, while 21 respondents (13.8 %) agreed they always treat their ailment with herbal remedies and their medication concurrently. 17 respondents (11.2%) are reminded of taking their medication by family members, 9 respondents (6.0%) set alarms to remind themselves of their drugs, 78 respondents (51.3%) are reminded of taking their medication by putting it in a conspicuous place,

37 respondents (24.3%) use their drugs the same time of the day, and 11 (7.2%) are reminded by other undisclosed ways.

Two respondents (0.9 %) measured their blood glucose daily, 29 respondents (19.1%) measured it weekly, 69 respondents (45.4 %) measured it monthly, 7 respondents (4.6 %) measured at no regular interval and 45 respondents (29.6 %) had no response.

Table 7 showed that after intervention only 22% of patients had plasma glucose above 7 mmol/L as against 59% before intervention, 7% had blood pressure above 130/80 mm/Hg as against 44 % before intervention, 9% had LDL above 100 mg/dl against 13 % before intervention, while 9% had total cholesterol above 130 mg/dl as against 25 % before intervention.

Table 7: Patients Characteristics

Base Line Characteristics	Frequency (n)	Percentage (%)
Fasting plasma Glucose >7mmol/L or 126mg/dl	89	59
Blood Pressure > 130/80 mmHg	67	44
LDL > 100mg/dL	36	24
HDL < 40mg/dl	19	13
Total cholesterol > 130mg/dl	38	25
Characteristics After Education & Counselling		
Fasting plasma glucose ≥ 7mmol/L or 126 mg/dl	34	22
Blood pressure >130/80mmHg	11	7
LDL > 100mg/dL	14	9
HDL < 40mg/dl	5	3
Total cholesterol > 130mg/dl	14	9

Table 8 results showed a significant $P \leq 0.05$ association between age, gender and adherence. However, there is

no significant $P \geq 0.05$ association between educational level and adherence.

Table 8: Association between Age, Gender and Adherence

Age (Years)	Adherence N (%)	Non –Adherence N (%)	Total N (%)
31 – 40	0 (.0%)	2 (100%)	2 (100%)
41 – 50	18 (78.3%)	5(21.7%)	23 (100%)
51 – 60	37 (90.2%)	4 (9.8%)	41 (100%)
61 – 70	62(89.9%)	7(10.1%)	69(100%)
>70	15(88.2%)	2(11.8%)	17(100%)
Total	132 (86.8%)	20 (13.2%)	152 (100%)
Gender (Years)			
Male	35 (83.3%)	7 (16.7%)	42 (100%)
Female	97 (88.2%)	13 (11.8%)	110 (100%)
Total	132 (88.6%)	20 (13.2%)	152 (100%)

P ≤ 0.05**Discussion**

The debilitating effects that usually occur from clinical complications of diabetes mellitus in affected patients make it imperative for clinicians and other healthcare professionals to ensure adequate glycemic control in a bid to reduce or prevent associated morbidity and mortality. Uncontrolled hyperglycemia, which is the clinical manifestation of diabetes, usually results in micro- and macro-vascular complications such as retinopathy, nephropathy, neuropathy and associated cardiovascular diseases. One factor that contributes to achieving good glycemic control is treatment with anti-diabetic medications as well as strict medication adherence.

The present study has shown that majority of the patients visiting the clinic with cases of type 2 Diabetes Mellitus were females. Only 26 % of these patients were diagnosed with diabetes mellitus only, others had co-morbid conditions. According to the data collected 11 % of these patients were found to have poor follow up visits in the clinic and analysis revealed significant ($P \leq 0.05$) correlation between sex and adherence to medication.

The cost of medication has been found to be a militating factor affecting patients' adherence to their medications. According to a study carried out by Mojtabai & Olfson¹⁸, 7% of patients were unable to adhere to their prescription medications due to cost. The result obtained from our study revealed that more than half of the patients (51.32 %) viewed their drugs as being unaffordable with the majority of them being women. Women within the locality of this study are largely unemployed with most of them engaging in petty trade. There is therefore the possibility of non-adherence to medications since these patients cannot afford most of their medications. Also, the vast majority (69.0 %) of patients visiting the clinics stated that they buy their drugs in bits due to high cost. This, however, could warrant missed doses when the medications are not obtained early enough. There is also the possibility of sub-optimal drug therapy as a result of brand differences since the medications could be obtained from differing sources with unguaranteed bioequivalence.

About 85.5 % of the patients have no education beyond secondary school. This indicates a low level of

literacy in the studied population. Also, for a country like Nigeria, the possibility of obtaining employment that will ensure substantial income with such qualifications is low. The implication of the lower income is the probable inability to sustain the cost of medications for a chronic ailment like type 2 diabetes mellitus. However, besides the possible implication on affordability, there was no significant ($P \geq 0.05$) relationship between educational level and adherence.

A high proportion (56.6 %) of patients in this study were 61 years and above. These groups of patients are classified as the senior class citizens or the elderly. According to earlier studies¹⁹⁻²⁰ in the elderly, the frequency of the elderly being admitted for non-adherence to their prescribed medications is about 19 -45% which was found to be higher than the figure obtained in the younger population. The results of this study showed a significant ($P \leq 0.05$) relationship between ages of patients and their adherence to medication. The disparity found can be as a result of the free health scheme for the elderly. This scheme makes it possible for elderly patients to obtain free drugs (even though in limited quantities), which has an overall effect of enhancing medication adherence. It is also important to note that the social support system amongst the families in Nigeria to take full responsibility for routine medications for the elderly is contributory to good medication adherence.

In further assessing the factors that affect glycemic control in these patients, the study discovered that patients who occasionally or always use herbal medication alongside with their anti-diabetic medications were 48.7 %. Herbal medications have been discovered to cause interactions with conventional medications; these interactions can either be beneficial or harmful depending on the agent implicated. A study of Rai et al²¹ showed that the use of herbal medications and glibenclamide gave differing effect on glycemic control. Some herbal medications were found to have either synergistic effects or antagonistic effects while others had no evidence of efficacy. It is therefore important for patients to confirm with their healthcare providers on the safety of herbal medications before using it with oral hypoglycemic agents.

According to Barclay et al²², dietary modification is required for type 2 diabetes mellitus patients. This includes diet low in saturated fat, sodium and carbohy-

drate, and high fibre contents. This is because majority of patients with this condition are usually overweight and obese. In agreement with the aforementioned, the studied patients have adequate knowledge of dietary lifestyle modification to ensure proper glycemic control.

After intervention through health education and counselling, the patients' clinical outcomes were found to have improved significantly. The results of the study also revealed an improvement in the adherence rate to 86.8 %. This complies with worldwide data of adherence rate of 36- 93 % in patients with diabetes²³.

Conclusion

Non-adherence is a major factor that could lead to increased morbidity and mortality in diabetic patients. Overall improvement in adherence rate of 86.8 % was observed with a decline of non-adherence rate after interventions were made. Strategies to be employed during intervention that will ensure improvement in adherence should be centred on patient related issues, medication related issues, prescriber related issues and pharmacist related factors.

Conflict of Interest:

There is no conflict of interest in this research

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