



Original Research Article

## Medication Non-Adherence in Type 2 Diabetes: Prevalence and Correlates in a Tertiary Healthcare Facility in Southeast Nigeria

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### ABSTRACT

**Background:** Non adherence to diabetes medications leads to frequent relapses, poor treatment outcome, reduced quality of life and significant increases in healthcare cost in a resource poor country and a healthcare system already overburdened by infectious illnesses and other diseases. This study verified the adherence of people with type 2 diabetes mellitus and factors associated with it.

**Objective:** This study was carried out to assess the prevalence of non-adherence to medication, and identify factors associated with it in patients with type 2 diabetes mellitus.

**Study Design:** This was a cross-sectional study conducted on a sample of one hundred and twenty three out-patients, aged over 18 years and diagnosed with type 2 diabetes mellitus and who have been on oral medications for at least a year prior to study entry. Socio-demographic and clinical variables were collected and compared between participants with optimal and suboptimal adherence.

**Results:** The mean ages of participants were  $59.68 \pm 11.8$  and mean duration of illness 7.22

About one-in-four (28%) were poor adherers to their diabetes medications. Variables with significant association with non-adherence include marital status ( $\chi^2=8.73, df=1, p=0.01$ ), educational level ( $\chi^2=6.96, df=f, p=0.01$ ), employment status ( $\chi^2=4.89, df=1, p=0.030$ ), duration of illness ( $\chi^2=3.07, df=1, p=0.08$ ) and patients' living arrangement ( $\chi^2=4.28, df=1, p=0.04$ ). In multivariate analysis, predictors of poor adherence were: lack of treatment supervision (OR 0.032, p-value <0.001), poor attitude to medication (OR 0.015, p<0.001)

**Conclusion:** Medication non-adherence in patients with type 2 diabetes is common. Interventional measures are required to improve adherence behaviour.

**Key words:** Treatment adherence, diabetes mellitus, oral hypoglycaemic agents.

### INTRODUCTION

Diabetes mellitus is a chronic debilitating disease with a higher incidence in the developed countries. [1] The world prevalence of diabetes mellitus among adults (aged 20–79 years) was estimated to be 6.4% in 2010 and will increase to 7.7%

by 2030. It is estimated that between 2010 and 2030 there will be a 69% increase in number of adults with diabetes mellitus in the developing countries and 20% increase in the developed. [2] Diabetes mellitus is a complex disorder that require constant adherence to certain lifestyle measures and

medication to achieve good glycaemic control. [3]

Non adherence to prescribed medication continues to be a major problem the world over. Adherence rates for chronic medical conditions have been reported in literature to be about 50% for medications and much less for lifestyle prescriptions. [4,5] The management of diabetes mellitus requires self monitoring of blood glucose, dietary modifications, exercise, and administration of medication on schedule. [6,7]

The World Health Organization (2003) defines adherence as “the extent to which a person’s behaviour-taking medication, following a diet and/or executing life style changes, corresponds with agreed recommendations from a health care provider.” [8]

Previous studies have found adherence to diabetes treatment to be suboptimal ranging from 23 to 77%. [9,10] When patients with diabetes do not adhere to their drugs, there is a higher risk of acute and chronic complications [11] and it is a major factor in poor glycaemic control. [12] Recent studies have established that lower fasting blood glucose levels are associated with reduced mortality [13] and reduced incidence of complications in patients with type 2 diabetes mellitus.

Three types of factors influencing adherence have been identified: factors related to the patient, factors related to the medication and factors related to social and medical support. Patient’s factors include age, economic status, health beliefs about medication. [12,14] Social and medical support includes among others family help and support, and the patient-healthcare provider relationship. Medication related factors take into account the attitude towards medicines, the complexity of the medication regimen, and the experience of side effects. [15,16]

Medication adherence is believed to be influenced by factors beyond the

traditional demographic and clinical. [17] For example, the extended Self-Regulatory Model, which includes both illness and treatment beliefs, was successful in explaining variations in medication adherence among patients with certain chronic diseases. [18] Diabetes-related knowledge has also been reported to influence both medication adherence and glycemic control. [19] This suggests that there is a complex model of demographic, clinical, knowledge and behavioural factors that affect medication adherence. Ensuring that patients take their prescribed medications and achieve normal or near normal blood glucose control is one of the most common challenges encountered by physicians and other healthcare providers involved in the treatment of patients with diabetes mellitus. [20]

The burden of diabetes mellitus in Nigeria is similar to what has been observed in other parts of sub-Saharan Africa. The prevalence of diabetes mellitus varies between 1% and 8% depending on the area of the country that is surveyed. [21,22] In a resource poor setting that is prevalent in many developing countries like Nigeria, social, cultural and economic factors become important variables to be taken into consideration in management of the illness. Studies [23,24] have reported significant association between economic factors and treatment adherence. Most patients with diabetes mellitus in Nigeria have little or no formal education and are poor with little understanding of the nature of their disease. [25,26] Also, scarcity of health resources, prohibitive cost of drugs and the easy access to traditional and faith healers militate against the optimal management of a chronic disease like diabetes mellitus. [27]

Studies on potential risk factors for treatment non-adherence have generated varied results of factors that predict non-adherence in diabetes care. Socio-demographic and medical factors such as

age, race and education represent largely unmodifiable factors and are often inconsistent predictors of poor adherence to drug therapy. [28] Other factors such as personality and psychosocial variables, patients' attitude and beliefs are among the several variables that can affect adherence to diabetes treatment. [29-32]

Most of these studies were carried out in advanced industrialized countries. Data on the predictors of non adherence in developing countries is scarce as few studies on non adherence have been carried out in this environment. It is not known if some risk factors are more important in this environment compared to the developed countries.

This study was carried out to assess prevalence of non-adherence and identify some potentially modifiable factors associated with it.

## **MATERIALS AND METHODS**

This was a cross sectional study with quantitative methods of data collection.

**Location of study:** Patients for this study were recruited from University of Nigeria teaching Hospital, a federal tertiary health institutions located in Enugu state of Nigeria. Ethical approval for the study was obtained from the University of Nigeria Teaching Hospital Institution Review Committee (UNTH/CSA 329/Vol 6)

The subjects with diabetes mellitus were obtained from the endocrinology unit of the hospital. The inclusion criteria included subjects aged 18 years and above with illness duration of at least one year prior to study and were on oral hypoglycaemic medications alone for at least one year. The exclusion criteria included diabetics who were on insulin therapy and those who were unwilling to partake in study. One hundred and twenty-three participants were recruited into the study.

**Data collection:** Written informed consents were obtained from the participants after explaining the aims and objectives of the study. Structured questionnaires were used to obtain information on patient's demographic characteristics and some risk factors to non-adherence to hypoglycaemic treatment.

Measures evaluated included socio-demographic details (age, gender, and years of formal education, marital status, and employment status). Living arrangements was also assessed as living independently, living with family members, or being homeless. The degree of available medication supervision was assessed as either independently responsible for the administration of his medication or all aspect of medication are managed by a third party.

Non-adherence was assessed using patients self report of how they had been taking their medications in the one week preceding the interview. We defined non-adherence to medication as taking less than 80% of the prescribed treatment. [16,33] They were asked to recall if they missed any doses of medication on day by day bases over a period of one week. A review of patient's medical records yielded information on the doses actually prescribed. The reported number of days of treatment was then divided by 7 and multiplied by 100 to reflect recent percentage of adherence.

Attitude to medication was measured as a discreet variable using a validated questionnaire that consisted of ten questions that were designed to assess different aspects of attitude to medication that affect adherence to medication (side effects, beliefs about damage, wellbeing/discomfort, and doctor-patient relationship). The questionnaire had good face validity and test-retest reliability was established ( $r=0.85$ ).

The extent of medication information given to patients was assessed (in proxy) by

a validated patient's medication knowledge questionnaire. The questionnaire consists of three questions about the ability of the patient to recall the names of his/her medications, dosage and dosage frequency and the responses were rated on five point likert scale with higher scores representing better understanding of drug regimen.

**Statistical Analysis:** Descriptive statistics were used for general description of study participants. Continuous variables were summarized with means and standard deviation (SD) values and categorical variables with frequencies. Univariate analysis was performed between the various independent variables and treatment adherence. Chi square analysis was used to assess the association between attitude towards medication and various socio-demographic and clinical variables. Statistical significance was determined at P-values  $\leq 0.05$ . The results of the study were analyzed using the Statistical Package for social sciences (SPSS 16.0).

## RESULTS

The average age of the participants was  $59 \pm 11$  years and more than half of them were males (67.5%). The majority of the participants were married 112(91.1%). More than half of them 72(58.5%) has primary education as the highest level of education attained. Most of the participants were Christian 113(93.3%) and about 30(24.4%) were employed. The mean duration with diabetes mellitus was  $7.22 \pm 4.7$  years. About 82 (66.7%) of participants lived in an urban setting. All the study participants lived with someone in the same house/ home environment while those who had some form of supervision during medication intake were 81 (65.9%). The mean number of tablets taken by participants was  $3.11 \pm 1.1$ . About 21 (17.1%) took their medications more once a day. About 87 (70.7%) of participants showed optimal adherence to medication. About half of the

participants 62(50.4%) had good knowledge of medications used for treatment (a proxy measure of information available to the patients). Also, more than half 89(72.4%) were described as having positive attitude towards medication. Those in the low income bracket 99(80.5%) and those whose cost of care were borne totally by others 26(21.1) while those bearing cost of treatment mainly by self were 97(78.9%). (Table 1)

**Table 1: Socio-demographic and clinical characteristics of respondents**

Characteristics	Participants N (%)
Mean age	59.68
Age in years	
>40years	122(99.2)
Sex	
male	83(67.5)
female	40(32.5)
Marital status	
Single	7(5.7)
Married	112(91.1)
Widowed	4(3.3)
Educational status	
Nil formal	15(12.2)
Primary	67(54.5)
Secondary	13(10.6)
Tertiary	28(22.8)
Employment status	
Employed	30(24.4)
Unemployed	93(75.6)
Income status	
High	24(19.5)
Low	99(80.5)
Payment for treatment	
Self	97(78.9)
Others	26(21.1)
Living arrangement (with someone)	123(100)
Treatment supervision	
Supervised	81(65.9)
Not supervised	42(34.1)
Mean duration of illness (years)	7.22
Duration of illness in years	
$\leq 10$ years	89(72.4)
$> 10$ years	34(27.6)
Tablets taken per day	
$\leq 3$ tablets	81(65.9)
$> 3$ tablets	42(34.1)
Dosage frequency (more than once per day)	21(17.1)
Rating scales	
Adherence to medication (optimal)	87(70.7)
Attitude to treatment (positive)	89(72.4)
Understanding drug regimen (good)	62(50.4)

The point prevalence of treatment non-adherence among the respondents was 49.3% (n=74). The treatment adherent

participants were more likely to be married, employed, have their treatment supervised better informed about prescribed medications.

Overall, there is a high level of positive attitude 87(70.7%) towards medication among subjects with type 2 diabetes mellitus. Adherent subjects had greater positive attitude to medication compared to those with suboptimal adherence. It is observed also that the subjects with optimal adherence had better understanding of medication regimen.

Income status was a significant factor in adherence behaviour. About 87.5 %

of those in the high income bracket were adherent compared to 63.6% of those in the low income bracket. Financial variable becomes important when view against the fact only 24.4% of the subjects are employed and also 78.9% of the subjects bear cost of treatment by self.

The significant variables were then entered into regression analysis to determine predictors of treatment adherence. The result of regression analysis (Table 3) shows that the education of respondents, employment status and the degree of available supervision were statistical predictors of adherence behaviour.

**Table 2 Univariate analysis of socio-demographic and clinical variables affecting Treatment adherence**

Variables	Optimal adherence (n%)	Suboptimal adherence (n%)	statistic X <sup>2</sup>	P-value
Age (>40years)	86(70.5)	6(29.5)	0.417	0.52
Sex(male)	62(74.7)	21(25.3)	1.94	0.16
Marital status (married)	69(65.7)	36(34.3)	8.73	0.01
Educational level				
<=6years	57(64.0)	32(36.0)	6.95	0.01
Employment status				
(employed)	26(86.7)	4(13.3)	4.87	0.03
Tablets taken per day				
<=3tablets	56(69.1)	25(30.9)	0.29	0.58
Dosage frequency (more than once daily)	77(75.5)	25(24.5)	6.54	0.11
Living arrangement (with someone)	71(53.8%)	61(46.2)	4.287	0.04
Income status (High)	21(87.5)	3(12.5)	5.08	0.02
Payment for treatment (By self)	71(73.2)	26(26.8)	1.35	0.25
Duration of illness				
<=10 years	59(66.3)	30(33.7)	3.07	0.08
Supervision of treatment (supervised)	75(92.6)	6(7.4)	54.76	<0.001
Understanding drug				
Regimen (good)	48(77.4)	14(22.6)	2.7	0.1
Attitude to medication (positive)	82(92.1)	7(7.92)	16.17	<0.001

**Table 3 Predictors of adherence by logistic regression analysis**

Variables	OR	95% C.I	P-value
Duration of illness	2.37	0.886-6.36	0.09
Attitude towards medication	0.015	0.004-0.050	<0.001
Supervision	0.032	0.011-0.093	<0.001
Education	3.66	1.03-12.85	0.04
Employment	0.293	0.094-0.91	0.03

## DISCUSSION

The level of non-adherence found in this study implied that one in every four participants was not adhering to diabetes treatment. This level of non-adherence is similar to rates reported by other researchers [27] which have used patients' self report to

estimate adherence behaviour. It is however in disagreement with others [28,35] which has reported much higher rates of treatment non-adherence. Other researchers assessing non-adherence to diabetes treatment using other methods reported non-adherence prevalence rates ranging from 23% to 77%. [3,7,8] The variations in the result between these studies are due partly to differences in the methods used in estimating adherence. It is also partly due to some peculiar/specific participants characteristics in these studies. The level of non-adherence found in this study will invariably lead to poor treatment



outcomes and increased complications of diabetes mellitus. These complications may significantly increase the cost of healthcare and may also be associated with decrease productivity of the affected persons. [27]

Background characteristics of the participants had varying impact on adherence behaviour.

Low socioeconomic status and low education have been associated with lower regimen adherence. [36] A high proportion of participants (72%) were observed to have had less than six years of education implying that most diabetic patients from this part of the country are from the uninformed/ignorant population. Similar finding have been reported in studies from the south-western part of Nigeria. [37] A large proportion of these patients (80.5%) are from a low socioeconomic background comprising retired workers, farmers and the unemployed. This implies that limited financial resources are available to fund medicare especially as funding for healthcare is mainly out-of-pocket in the absence of comprehensive health insurance scheme in a resource poor setting like ours. Employment status of the patients was a predictor of non-adherence behaviour. This finding is in agreement with studies which have reported significant association between socioeconomic variables and adherence behaviour. Botelho et al [23] and Anderson et al [24] have shown that socioeconomic factors play a vital role in adherence, as patients who are poor or live on fixed income may be non adherent because of their inability to pay for the cost of prescribed medications. In another study in south-western Nigeria, [37] the cost of medication was cited as the commonest reason for treatment non-adherence. In view of the cost burden of care, Morris opined that 'Probably the simplest and single most important action that healthcare providers can take to improve adherence is to select medications that permit the lowest daily

dose frequency'. [38] In this study however, dosage frequency and the number of tablets taken in a day was not a significant statistical predictor of treatment adherence. It may be a contributor to non-adherence since it is observed that more of the compliant subjects were taking less number of tablets per day compared to the non compliant subjects. There is need to reduce the cost burden of medications to patients through increased prescription of drugs in their generic names and rational drug prescription without reducing treatment. [37] Financial variables especially the direct and indirect costs associated with a prescribed regimen have been found by several studies to influence patients' commitment to medication adherence in developing. [39,40]

In this study, residential status of the participants had significant association with adherence behaviour. Also, as per the previous studies, marital status is significantly related with compliance and we found that married participants are more likely to be compliant compared to the unmarried participants. The availability of supervised treatment is a significant predictor of treatment adherence. Similar findings have been reported in other studies [41,42] that found that family's members non-supportive behaviours were associated with being less compliant with one's diabetes regimen. Greater levels of social support, particularly diabetes related support from spouses and other family members are associated with better regimen adherence. [43] This implies that interventional strategies that increase family members' participation in treatment can improve compliance behaviour in patients. However, this adherence enhancing role of family social support is not supported by a study [44] which did not find such association.

Overall, we found a high positive attitude towards diabetes medication among subjects with type 2 diabetes however, Patients with optimal medication adherence

had significantly more positive attitude to treatment compared to those with suboptimal adherence. Also, more of the participants with optimal adherence had better understanding of medication regimen. This is similar to the finding by Anderson et al. [45] The attitude scores represent an indirect representation of compliance [46] the medication compliance in patients with diabetes had been predicted by the patient's subjective response to treatment and attitudes towards diabetes medication. [47] Among other factors that affect attitude towards medications and adherence are beliefs about medicines and illness related knowledge which are different among different cultures. This has been highlighted in a recent study. [48] A good number of patients in the developing countries patronise traditional and alternative medicine because of beliefs in spiritual causation of illness. This may affect attitude towards orthodox medications and treatment adherence behaviour. Studies have shown that traditional and alternative medicine continues to be patronised by many people not because of its efficacy, but because it is affordable and readily available. [49] Nigeria, like many African cultures is full of beliefs about supernatural deities. Even among the highly educated, almost all illnesses are attributable to ancestors, evil spirits or witchcrafts. [50] There is the need to dispel these beliefs and primitive perceptions if treatment compliance must improve through sustained and continued health education.

Our study has some limitations. The reliance on self report of subjects to estimate adherence among the participants can be faulted as this method of assessing adherence is reported to overestimate their adherence. [5,8] They may have recall bias and recall difficulties. Also, the cross sectional nature of the study does not allow for a good reflection of adherence behaviour which may fluctuate with time.

## CONCLUSION

In conclusion, we have shown from this study that non-adherence to medication continues to be a challenge among ambulatory outpatients with type 2 diabetes mellitus. Intervention strategies to improve attitude to medication is required to further enhance adherence level in these patients.

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