



Pharmacy Practice

ISSN: 1885-642X

journal@pharmacypractice.org

Centro de investigaciones y  
Publicaciones Farmacéuticas  
España

ADISA, Rasaq; ALUTUNDU, Martins B.; FAKEYE, Titilayo O.  
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Pharmacy Practice, vol. 7, núm. 3, julio-septiembre, 2009, pp. 163-169  
Centro de investigaciones y Publicaciones Farmacéuticas  
Granada, España

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## Original Research

# Factors contributing to nonadherence to oral hypoglycemic medications among ambulatory type 2 diabetes patients in Southwestern Nigeria

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Received (first version): 21-May-2009

Accepted: 30-Aug-2009

### ABSTRACT\*

**Objective:** The overall goal of the study was to evaluate the probable reasons for patients' nonadherence to prescribed oral hypoglycemic medications in an ambulatory care setting in Nigeria with a view to identifying points for necessary intervention to improve adherence and treatment outcomes. Also, the recommended non-drug management options for diabetes patients with emphasis on self monitoring of blood glucose were assessed.

**Methods:** A cross-sectional study was conducted at a 200-bed secondary health care facility in Southwestern Nigeria between 2<sup>nd</sup> April and 31<sup>st</sup> May 2008. Copies of pre-tested questionnaire were administered directly to 121 ambulatory patients with type 2 diabetes at the study site. Information on socio-demographic characteristic, probable barriers that affect adherence to prescribed oral hypoglycemic medications, non-drug treatment options for diabetes, and patients' self management efforts were obtained. Descriptive and chi-square statistics were used to evaluate the distribution of respondents' opinion.

**Results:** The response rate was almost 100%. The commonly cited intentional nonadherence practice included dose omission (70.2%). Almost 50% respondents were fed up with daily ingestion of drugs and 19.8% were inconvenienced with taking medications outside home and gave these as reasons for the dose omission. Forgetfulness (49.6%) and high cost of medication (35.5%) were mentioned as major non-intentional reasons for nonadherence. Aside oral medications, 82.6% and 95.0% of respondents respectively, reported moderate exercise and dietary restrictions as part of the prescribed treatment modalities. More than two third of respondents (81.8%) had never monitored blood glucose by themselves. Significant association exist between sex, occupation and patients' tendencies to forget doses of prescribed oral medications ( $p < 0.05$ ).

**Conclusion:** Nonadherence behaviors among ambulatory patients with type 2 diabetes occur mostly, as omission and forgetfulness of doses of

medication. Efforts are needed to increase the medication adherence and self management practices of these patients in Nigeria so they can realize the full benefits of prescribed therapies.

**Keywords:** Medication Adherence. Diabetes Mellitus, Type 2. Nigeria.

### FACTORES QUE CONTRIBUYEN AL INCUMPLIMIENTO DE HIPOGLUCEMIANTES ORALES ENTRE LOS PACIENTES AMBULATORIALES DIABÉTICOS TIPO 2 EN EL SUROESTE DE NIGERIA

#### RESUMEN

**Objetivo:** El objetivo general de este estudio fue evaluar las razones probables del incumplimiento de los pacientes con los medicamentos hipoglucemiantes orales en régimen ambulatorio de Nigeria, con la intención de identificar elementos para la intervención necesaria que mejore el cumplimiento y los resultados del tratamiento.

También se evaluaron las opciones recomendadas de manejo de la diabetes no medicamentosas con especial énfasis en la auto-medición de la glucosa. **Métodos:** Se realizó un estudio transversal en una clínica de 200 camas del SurOeste de Nigeria entre el 2 de abril y el 31 de mayo de 2008. Se administraron directamente copias de un cuestionario pre-validado a 121 pacientes ambulatoriales con diabetes tipo 2. Se obtuvo la información de las características socio-demográficas, barreras probables que afectan el cumplimiento del hipoglucemiante prescrito, tratamiento no medicamentoso para la diabetes, y esfuerzos de auto-cuidado del paciente. Se utilizó estadística descriptiva y pruebas chi-cuadrado para evaluar la distribución de la opinión de los respondientes.

**Resultados:** La tasa de respuesta fue de casi el 100%. Las prácticas más frecuentemente citadas de incumplimiento voluntario incluían la omisión de una dosis (70,2%). Casi el 50% de los respondientes estaba harto de tomar diariamente medicamentos y el 19,8% estaba disgustado con tomar medicamentos fuera de casa y dieron estas razones como motivo de la omisión de dosis. El olvido (49,6%) y el alto coste de los medicamentos (35,5%) fueron mencionados como causas principales del incumplimiento no voluntario. Además de la medicación oral, el 82,6% y el 95,0% de los respondientes comunicaron ejercicio

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moderado y restricciones dietéticas como parte de los tratamientos. Más de dos tercios de los respondientes (81,8%) nunca se habían medicado la glucosa solos. Existe asociación significativa entre sexo, ocupación y tendencias del paciente con el olvido de las dosis prescritas ( $p < 0,05$ ).

Conclusión: Los comportamientos incumplidores mas frecuentes entre pacientes ambulatoriales con diabetes tipo 2 son omisión y olvido de dosis de medicamentos. Se necesitan esfuerzos para aumentar el cumplimiento de la medicación y las practicas de gestión de estos pacientes en Nigeria, de modo que puedan alcanzar los beneficios completos del tratamiento.

**Palabras clave:** Adherencia a la medicación. Diabetes mellitus tipo 2. Nigeria.

## INTRODUCTION

There has been a progressive increase in the incidence of type 2 diabetes worldwide, with a prevalence of about 2%.<sup>1-3</sup> Nigeria has a national standardized prevalence rate of 2.2%.<sup>3,4</sup> Factors such as uncontrolled diet, sedentary lifestyle, inappropriate therapeutic regimens as well as medication nonadherence have been known to have significant impact on glycemic control and outcome of type 2 diabetes treatment. However, medication nonadherence is a pervasive medical problem that is common among patients with chronic disease generally and type 2 diabetes in particular.<sup>5-7</sup> A systematic review of adherence to medication for diabetes showed that average adherence to oral antidiabetes medications ranged from 36% to 93%.<sup>8</sup> Expectedly, patient nonadherence to prescribed hypoglycemic medications could decrease treatment effectiveness<sup>9,10</sup>, with subsequent manifestation of micro- and macro-vascular complications of diabetes such as retinopathy, nephropathy, neuropathy, peripheral vascular disease<sup>11</sup> and increased healthcare costs.<sup>12,13</sup>

Recent studies have established that lower fasting blood glucose levels are associated with reduced mortality<sup>14</sup> and reduced incidence of complications in patients with type 2 diabetes.<sup>15</sup> However, ensuring that patients take oral hypoglycemic medications as prescribed and achieve normal or near normal blood glucose control is among the most common challenges encountered by physicians and other health care providers involved in the treatment of patients with diabetes.<sup>16</sup> This needs to be addressed during all phases of diabetes treatment<sup>17</sup> which makes it imperative to understand factors affecting patients' adherence to medication in order to identify the areas upon which counseling should be focused as well as assisting in the development of future interventions to improve adherence and outcomes of type 2 diabetes treatment. Though, a few published studies have shown that socio-demographic factors, personality and psychosocial variables, patients' attitude and

beliefs were among the several factors that can affect adherence to diabetes treatment regimen<sup>18-23</sup>, there is a continuing need to routinely assess the likely reasons for nonadherence among patients with type 2 diabetes in clinical practice. This is especially important in developing countries such as Nigeria where economic instability and inadequate access to health care facilities might have led to the increased incidence of medication nonadherence. Botelho et al.<sup>24</sup> and Anderson et al.<sup>25</sup> have shown that socioeconomic factors play a vital role in adherence, as patients who are poor or live on fixed income may be nonadherent because of their inability to afford the cost of prescribed medications. Anderson et al.<sup>25</sup> also showed that patients who have limited access to transportation, live far away from clinics may not likely to adhere to treatment regimens. In Nigeria, changes in lifestyle as a result of increased urbanization and westernization, as well as genetic factors have also contributed to a substantial rise in type 2 diabetes.<sup>3,26-28</sup>

It is in line with this background that this study was carried out to investigate the probable factors contributing to nonadherence to prescribed oral hypoglycemic medications among patients with type 2 diabetes who attend the routine diabetes clinic of Adeoyo Specialist Hospital, a secondary health care facility in Ibadan, Southwestern Nigeria. Information on patients' understanding of diabetes, treatment recommendations and self management efforts were also obtained.

## METHODS

The study was carried out at a secondary healthcare facility in Ibadan, the largest city in Southwestern Nigeria. The hospital has on its staff enrolment, physicians in different specialties, pharmacists, nurses, laboratory technologists, physiotherapists and other ancillary health workers. It is specially equipped for the treatment and management of cardiovascular and endocrine diseases while some other health conditions are also managed in the hospital. The data available from the hospital record office showed that an average of between twenty and twenty-five ambulatory type 2 diabetes patients used to attend the hospital per diabetes clinic day.

After an ethical approval was obtained from the Ethical Committee of the Oyo State Hospital Management Health Board, a cross-sectional study was conducted between 2nd April and 31st May, 2008 and involved the use of questionnaires administered directly to patients at the study site. Ambulatory type 2 diabetic patients who have been on oral hypoglycemic medications for more than 2 months, who consented to participate in the study and who were attending the diabetes clinic at the hospital were included. The objectives of the study were explained to individual patients and voluntary informed consent of the patients was also taken. They were informed that personal information will not be disclosed to a third party. Excluded from the study were patients who were on insulin therapy alone, who were unconscious and, who were not interested in the study. There is only one diabetes

clinic day within the week in the hospital; Mondays. An average of between twelve and eighteen patients used to fulfill the study inclusion criteria on the clinic days. All the consented one hundred and twenty one ambulatory patients with type 2 diabetes who fulfilled the inclusion criteria within the study period were selected for the study. No patient was repeated. The sample size was computed using an appropriate statistical package<sup>29-31</sup>, and this was based on the estimated population of type 2 diabetes patients who were attending the hospital.

The questionnaire, which was the instrument of the study, was piloted among ten type 2 diabetes patients selected within the hospital. These patients were subsequently excluded from the study. After the pilot testing, some question-items in the questionnaire were modified and reframed to ensure validity of the instrument, and facilitate patients' easy understanding when copies of questionnaire would be finally administered to the eligible patients.

The 36-item questionnaire took an average of 20 minutes to fill and was administered to the respondents at the study site. It consisted of open-and closed-ended questions and was designed to have two sections; the first section elucidate the socio-demographic characteristics of type 2 diabetic patients while the second section contained questions that assessed the likely intentional and unintentional reasons for patients' nonadherence to prescribed oral hypoglycemic medications. Also, questions on recommended non-drug treatment options for diabetes, patients' self management efforts with emphasis on self monitoring of blood glucose as well as patients' understanding of diabetes were asked. Patients were assured of their anonymity. Those who could not speak or read English Language were assisted in filling the questionnaire by two hospital pharmacists to whom the questionnaire had been properly explained.

Data generated were analyzed using SPSS version 11.0 software. Descriptive statistics was used to evaluate the distribution of respondent's opinion while chi square test was used to investigate association between respondents' socio-demographic characteristics and estimates of medication nonadherence such as forgetfulness and omission of medication doses within a certain period. Level of significance was set at  $p < 0.05$

## RESULTS

Of the one hundred and twenty one respondents, 60 (49.6%) were male while 61 (50.4%) were female. Majority, 115 (95.0%) were married while 6 (5.0%) were single. Thirty-six (29.8%) had post secondary education, 41 (33.9%) had secondary education; Thirty (24.8%) had primary education and 14 (11.6%), had no formal education. The occupation section of the responses indicated that 49 (40.5%) were traders, 28 (23.1%) were professional who had tertiary education, and 21 (17.4%), were unemployed. Eighteen (14.9%) and 5 (4.1%) respondents were artisan and public servants respectively. Patients' opinions on the possible

cause(s) of type 2 diabetes revealed that 72 (59.5%) did not know the cause of the disease and 22 (18.2%) believed that type 2 diabetes was inherited from their parents. Nearly all the respondents, 120 (99.2%) were aware that they needed to continue taking their hypoglycemic medications throughout their lifetime.

The summary of the reasons influencing treatment non-adherence to oral hypoglycemic medications among respondents in this study is as shown in Table 1. These were divided into intentional and non-intentional nonadherence. Dose omission which is a form of intentional nonadherence was reported by 85 (70.2%). Patients' dissatisfaction with having to ingest medications on a daily basis 54 (44.6%) and inconveniences of taking medications outside home 24 (19.8%), were some of the main reasons mentioned for omitting doses of prescribed medications. Sixty (49.6%) sometimes, forget to take the prescribed medication(s), out of which 54 (90.0%) said they, usually forget on the average of once in a week and 6 (10.0%) twice weekly. Some of the approaches reported to be adopted, once they remembered included; taking the required dose of medication as soon as remembered 24 (19.8%), doubling the next dose to make up for the forgotten dose 18 (14.9%), and taking the next dose at the right time and at the required quantity 21 (17.4%).

Respondents that always remembered to take their medications as scheduled mentioned some self help measures adopted to remind themselves of the time of medication. These included being reminded by the family members 16 (13.2%), use of alarm clock or mobile phone to alert at the time of medication 30 (24.8%), and planning of meals around the time to take medications 59 (48.8%). Forty-six (80.7%) of the respondents that experienced side effects with some of the oral hypoglycemic medications stopped taking the medications due to the side effects while the remainder tried tolerating the side effects. The high costs of prescribed hypoglycemic medications were mentioned by majority of the respondents, 43 (35.5%) as part of the difficulties encountered during filling and refilling of prescriptions. These were claimed to have prevented the purchase of drugs on regular basis. Other problems encountered by patients during filling of prescribed medications that hindered optimal adherence were as given in Table 1. Opinion of respondents on the self management efforts indicated that more than two-third, 99 (81.8%) did not know about self monitoring of blood glucose (SMBG). Only 22 (18.2%) were aware of SMBG and would check their blood glucose levels irregularly once in a while using the semi-automatic digital glucometer. Responses of patients on the measures they used to take when they experienced symptoms of high or low blood glucose showed that, 76 (81.7%) did not know how to check for the high or low blood glucose levels except when they were in the hospital, 9 (9.7%) consult their doctors, 3 (3.2%) would increased or decreased their carbohydrates intake depending on the level of blood glucose, 3 (3.2%)

would inform their relatives, and 2 (2.2%) said they used to take their medications.

Aerobic exercise was reported to be part of the recommended non-drug management options for 100 (82.6%) of the respondents while 21 (17.4%) were not aware that moderate aerobic exercise may be an essential component of their treatment plans. More than two-thirds, 115 (95.0%) respondents mentioned dietary restriction as part of their treatment recommendations while 6 (5.0%) were not in the habit of restricting their diet.

Investigation of association between respondents' socio-demographic characteristics and estimates of nonadherence, such as omission and forgetfulness of medication doses, showed that sex, marital status and occupation seemed to have statistically significant influence ( $p < 0.05$ ) on respondents' tendencies to forget taking doses of medication (Table 2). These studied socio-demographic variables were not significantly associated with respondents' tendencies to omit doses of medication ( $p > 0.05$ ). However, male respondents (78.3%) seem to omit doses of their medication more often than female counterparts (64.4%), (Odds Ratio=1.99, chi square=2.827,  $p=0.093$ ).

Reasons	Yes N (%)	NO N (%)
Intentional nonadherence		
Dose omission:	85 (70.2)	34 (28.1)
Fear of daily ingestion of medications	54 (44.6)	
Inconvenience of taking medication outside home	24 (19.8)	
Fear of taking too many drugs at a time	10 (8.3)	
Busy work schedule	14 (11.6)	
Unpleasant taste	8 (6.6)	
Problem of side effects	57 (47.1)	62 (51.2)
Non- intentional nonadherence		
Forgetfulness	60 (49.6)	48 (39.7)
Difficulty in filling medications	58 (47.1)	48 (39.7)
Cost of medications too expensive	43 (35.5)	
Inability to get the prescribed medication refill at nearby chemist	11 (9.1)	
Scarcity of the prescribed medications to purchase	11 (9.1)	
N/B: Percentage response may not add up to 100% as all undecided responses have been eliminated. Subjects also gave multiple responses in some situations		

Variables	Forgetfulness of medication doses N (%)		Chi square	P value
	Yes (nonadherent)	No (adherent)		
Sex				
Male	36 (66.7)	18 (33.3)	5.40	0.02*
Female	24 (44.4)	30 (55.6)		
Marital status				
Single	6 (100.0)	0 (0.0)	5.08	0.024*
Married	54 (52.9)	48 (47.1)		
Occupation				
Civil servant	3 (60.0)	2 (40.0)	14.85	0.005*
Professional	9 (47.4)	10 (52.6)		
Artisan	11 (68.7)	5 (31.3)		
Unemployed	17 (89.5)	2 (10.5)		
Traders	20 (40.8)	29 (59.2)		
Educational qualification				
No formal education	6 (50.0)	6 (50.0)	2.30	0.513
Primary	14 (46.7)	16 (53.3)		
Secondary	21 (56.8)	16 (43.2)		
Tertiary	19 (65.5)	10 (34.5)		
* - Statistically significant      N - Number				

## DISCUSSION

Poor medication adherence seems to be a significant barrier to attainment of positive clinical outcomes among type 2 diabetes patients in both developed and developing countries.<sup>23</sup> Dose omission, an intentional form of nonadherence was the most common practice among respondents. Paes et al.<sup>32</sup> has found that most deviations in medication-taking by patients occur as omission of

doses rather than additions or delays in the timing of doses. Omitting doses of prescribed medications was said to be practiced probably to reduce the inconveniences of daily ingestion and taking of too many medications daily. Fear of daily ingestion of drugs and undue scare of taking multiple drugs at a time especially for patients with multiple diseases have been observed to constitute hindrance to medication adherence among patients with chronic

diseases in general and diabetes patients in particular.<sup>33,34</sup> As a result, patients may deliberately take drug holidays or skip doses of medication(s) without the knowledge of their physician. The implication would be that the physician may attribute the lack of response to drug therapy as therapeutic ineffectiveness rather than medication nonadherence and may take the decision of either increasing the dose of the current medications or add another drug.<sup>16,35</sup>

Busy work schedules, especially for patients in the working population, and inconvenience of taking drugs outside home probably for fear of being 'labelled' with having diabetes by friends and associates were identified in this study as part of the reasons for forgetfulness and omission of doses of prescribed oral medications. These findings are in line with the studies that reported forgetfulness and spontaneous activities<sup>36</sup>, as well as fear of being victimized en route to seeing a physician<sup>2</sup> among the commonly cited reasons for nonadherence in patients with type 2 diabetes. Side effects, as well as the unpleasant taste of some oral hypoglycemic medications were mentioned by respondents as part of the factors contributing to medication nonadherence. This confirmed the findings in literature that reported that side effects of medication may be a significant factor that can affect diabetes patients' long-term adherence to treatment programs.<sup>37,38</sup> In general, providers need to increase patient's understanding and knowledge of diabetes treatment regimens. The more information and understanding that a patient has regarding a disease and pharmacologic therapies, the more they are likely to adhere to those therapies.<sup>39</sup>

Self- thought approaches adopted by some of the respondents who tended to forget taking the prescribed oral hypoglycemic medications include doubling the next dose of the medication or taking the dose as soon as remembered or taking the next dose at the right time. All these are examples of unintentional nonadherence and are very common among patients generally. Doubling drug doses may not only result in drug accumulation but could lead to exaggeration of potential side effects of individual drug while skipping doses may result in suboptimal response to therapeutic regimen. Primary care providers should lay emphasis on the importance of strict adherence to the time, quantity and mode of administration of individual drug during counseling. They could also assist by helping the patient to develop cues to remember time of medication through tying of time of drug administration with patient's daily routines. It is also important that patients are told what to do if they ever miss a dose for any reason.

In this study, statistically significant association between respondents' socio- demographic characteristics such as sex, occupation and the non-intentional nonadherence practice measured by patient's tendency to forget taking doses of medications probably suggest that gender and occupational status of patients appears to have influence on their tendencies to forget medication

doses. Male diabetic patients seemed to have greater tendencies to forget taking medications than their female counterparts (OR =2.5,  $p<0.05$ ). Also, patients who are professionals with tertiary education and respondents who are traders appear to remember taken their medication more often than the unemployed respondents. Linda<sup>40</sup> has reported that socio-demographic variables such as age, gender and race appear to influence the degree of adherence to medication.

The high costs of the prescribed oral hypoglycemic medications especially the relatively newer agents, scarcity of prescribed brands of medications to purchase outside hospital pharmacy and far distance of the nearest pharmacy outlet to residence of individuals were mentioned as some of the problems encountered during filling and re-filling of prescribed medications that hindered optimal adherence. Financial variables especially the direct and indirect costs associated with a prescribed regimen and restricted access to therapy have been found by several studies to influence patients' commitment to medication adherence in developing countries.<sup>40,41</sup> The implication of these findings would be that many patients would have 'drug- free period' till they are able to purchase their medications or the next appointment with their physician. Since this would not be to the patient's advantage, the physician should always ensure that antidiabetes medications that will be cost-effective and beneficial are prescribed for patients.

Self management behaviours with emphasis on self monitoring of blood glucose (SMBG) was found to be extremely low as more than two-third of the respondents were not aware of SMBG for regular and prompt detection of fluctuations in their blood glucose levels. This finding was in conformity with the report of a study in US where many diabetes patients in US were reported never to have monitored their blood glucose levels.<sup>42</sup> The absence of established guidelines on SMBG and lack of its perceived importance by patients, as well as, the cost of the blood glucose monitoring device especially in developing countries like Nigeria, may have accounted for the low level of awareness among respondents. Though practice of SMBG does not necessarily mean that patient is compliant with prescribed treatment recommendations but it may be an indication of active commitment of patient to his/her diabetes management.

Moderate exercise and dietary restriction were reported to be part of the treatment recommendations for respondents in this study, but many of them do not understand the relevance of these non-drug therapies in the management of type 2 diabetes. This probably implied that many patients would not adhere to dietary and lifestyle modifications recommended by their health care providers. A random survey study has also reported that adherence to diet and exercise regimen is often suboptimal in people with type 2 diabetes.<sup>16</sup> Thus, providers should as a matter of necessity, educate patients with type 2 diabetes at every visit on the importance of SMBG and lifestyle modification.

The results of this study should however be considered in line with some limitations which include; the use of self report measures such as forgetfulness and omission of medication doses as the only estimate of patients' nonadherence, may be subjective and might underestimate patients' nonadherence status when compared to other conventional objective methods such as pill counts, prescription claims or biological assays.<sup>43,44</sup> Morisky et al.<sup>45</sup> has shown that self report approach by way of questioning patients may makes most patients to feel comfortable in telling the truth and may probably facilitates the identification of poor adherence.

Also, the patient recruitment procedure may suggest no scientific basis for patient selection, thus there may be bias towards certain type 2 diabetic populace. Only patients from a secondary health care facility were studied limiting the geographical diversity and implying difficulty in generalizing findings to the Nigeria diabetes populace. In addition, we did not back translate the information provided by about five patients who could not read or write English after the translation. The effect of this on the study findings would be minimal, since the question-items in the questionnaire have been pre-tested before the commencement of the study and modification done to some questions to ensure easy understanding of the contents, this coupled with the small percentage of respondents involved. . Nonetheless, the study findings provides valuable information suggesting the need to routinely probe,

during clinical practice for the likely reasons for medication nonadherence among type 2 diabetes patients.

## CONCLUSIONS

This study showed that several factors ranging from dose omission, forgetfulness, high cost and fear of side effects of some oral hypoglycemic medications, to an array of difficulties encountered during filling and ingestion of prescribed medications constitute barriers to medication adherence among patients with type 2 diabetes. Thus, efficacy, side effects, dosing frequency, monitoring requirements, quality of life implication and cost should always be considered in selecting therapeutic agents for these patients. Health care providers should also seek to accomplish blood glucose control with agents that intrude as little as possible on life style, personal and professional activities and individual preferences. Future studies should considered the use of larger sample sizes, more representation of diverse population of patients characteristics and utilizing more objective measures, and less reliance on self-report to measure adherence.

## CONFLICT OF INTEREST

We declare that there is no conflict of interest on this research study. This research study did not receive fund or support from any source.

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