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Original Research

Adherence to oral anti-diabetic drugs among patients attending a Ghanaian teaching hospital

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ABSTRACT*

Background: The burden of diabetes mellitus, especially Type-2, continues to increase across the world. Medication adherence is considered an integral component in its management. Poor glycaemic controls due to medication nonadherence accelerates the development of long-term complications which consequently leads to increased hospitalization and mortality.

Objective: This study examined the level of adherence to oral antidiabetic drugs among patients who visited the teaching hospital and explored the probable contributory factors to non-adherence.

Methods: A cross-sectional descriptive study using systematic sampling to collect quantitative data was undertaken. Questionnaires were administered to out-patients of the medical department of a teaching hospital in Ghana. Logistic regression was performed with statistical significance determined at $p < 0.05$.

Results: A total of 200 diabetic patients participated in the study. Using the Morisky Medication Adherence scale, the level of adherence determined was 38.5%. There were significant correlations between level of adherence and educational level [(OR)=1.508; (CI 0.805- 2.825), $P=0.019$], and mode of payment [(OR)=1.631; (CI 0.997- 2.669), $P=0.05$].

Conclusion: Adherence in diabetic patients was low among respondents and this can be improved through education, counseling and reinforcement of self-care. There were several possible factors that contributed to the low adherence rate which could benefit from further studies.

Keywords: Medication Adherence; Diabetes Mellitus, Type 2; Risk Factors; Logistic Models; Ghana

INTRODUCTION

Medication adherence is gaining recognition among clinicians, healthcare systems, and governments because of the increasing concerns of the high prevalence rate of non-adherence and its associated adverse outcomes and higher costs of care.

The prevalence of diabetes for all age-group worldwide was estimated to be 2.8% in 2000 and expected to rise to 4.4% by 2030.¹ The cost of managing diabetes as well as the associated complications has a significant impact on the healthcare systems of many countries. In US for example, the direct cost incurred in the management of diabetes include USD31 billion for general medical cost, USD27 billion for the provision of care in the direct treatment of the disease and also USD58 billion for the treatment of diabetes-related complications.²

The World Health Organization in their medication adherence report has quoted the statement by Haynes *et al.*³ 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". The treatment of chronic illnesses like diabetes commonly includes the long-term use of pharmacotherapy. Although these medications are effective in combating the disease, their full benefits are often not realized because approximately 50% of patients do not take their medications as prescribed.⁴ A patient's ability to follow treatment plans to achieve results is frequently compromised.

Factors contributing to poor medication adherence are myriad⁵ and include those that are related to patients (e.g., suboptimal health literacy and lack of involvement in the treatment decision-making process), those that are related to physicians (e.g., prescription of complex drug regimens, communication barriers, ineffective communication of information about adverse effects, and provision of care by multiple physicians), and those that are related to health care systems (e.g., office visit time limitations, limited access to care, and lack of health information technology). Because barriers to medication adherence are complex and varied, solutions to improve adherence must be multifactorial.

Adherence has been defined as the active, voluntary, and collaborative involvement of the patient in a mutually acceptable course of behavior to produce a therapeutic result.⁶

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Table 1. Demographics and relevant characteristics of the respondents (N=200)

Characteristics	Respondents (N=200)	
	n	%
Gender	Female	105
	Male	95
Age(years)	<30	12
	30-39	44
	40-49	52
	50-59	54
	>59	38
Highest level of education	No formal education	34
	Primary	53
	Secondary	65
	Tertiary	48
Occupational status	Unemployed	48
	Trader/artisan	83
	Professional	62
	Others	7
Mode of payment	Self-paying	51
	Health insurance	129
	Family and friends	18
	NGO	1
Average monthly income(USD)*	< 25	59
	25-50	48
	51-75	25
	>75	68

* USD calculated based on 1USD=GHC2

In the premiere teaching hospital in Ghana, diabetes accounted for 6.8% of all adult admissions and also accounted for 7.8% of all adult death.⁷ In 2009, diabetes mellitus also ranked first in the top ten admissions of the hospital. Patients obtain their oral antidiabetic drugs either via the National Health Insurance scheme or by purchasing their own medications. Knowing the level of adherence among oral antidiabetic drug users and identifying the probable factors contributing to their medication adherence have implications for designing strategies to improve adherence. This study therefore sought to determine the level of adherence to antidiabetic drugs by type-2 diabetic patients and explore the contributory factors to non-adherence.

METHODS

This was a cross-sectional descriptive study using systematic sampling to collect quantitative data. Patients attending diabetic clinic at the Medical out-patient department of the of the Korle-bu Teaching Hospital are normally given appointment dates and to which they are expected to come for review. Therefore participants were identified using the list of all the patients attending the clinic on the different clinic days during the study period. The sample size was calculated using the precision method. This was based on the assumption of a minimum estimated adherence rate of 25%⁸ at a 95% confidence interval with 80% statistical power to obtain a sample size of 224. The first patient was randomly selected through a ballot of a set of balls

numbered 1 to 5, and the first number picked then became the first patient. Beginning from the first patient picked as the starting point on the attendance register for the day every 5th person was selected till the total number of patients required for the sample was selected.

The study setting was a 2000 bed tertiary care facility with an average daily out-patient attendance of 1500 and an average admission rate of about 250 patients per day. Type 2 diagnosed patients between the ages of 18 and 75 who visited the medical out-patient department of the hospital were included in the study.

Data were collected from May to June, 2011 using a self-administered questionnaire. The questionnaire consisted of respondents' demographics such as gender, age, levels of education, occupation, marital status, monthly income and mode of payment of diabetic drugs. It also included questions to test their knowledge and beliefs of diabetes mellitus and the use of oral anti-diabetic drugs. The questionnaire was translated into local languages such as Ga, Twi and Ewe and back into English to ensure uniformity without altering the questions to be communicated to the respondents.

Adherence level was determined with the Morisky Medication Adherence Scale (MMAS).⁹ This is a 4-item inventory used in assessing both unintentional and intentional non-adherence behaviors. Adherence in this study was defined as a "NO" response (or a score of 1) to each of the questions on the scale. Four then became the excellent adherence score. However, in this study, binary variables using categorization of 3 or greater versus <3 representing adherent and non-adherent patients respectively was used. This was based on acceptable adherence rate of 75% as the cut-off point for adherence.⁸

Retrieved copies of the questionnaire were entered into SPSS version 16 for descriptive statistics and inferential statistics. Factor analysis of the 4 questions of the MMAS was undertaken to determine the direction of their measurement. Logistic regression was performed with statistical significance determined at $p < 0.05$. Approval was obtained from the Internal Research Ethics Review Board of the Public Health Unit of the Hospital.

RESULTS

A total of 200 questionnaires were retrieved, crosschecked for accuracy and entered for analysis. This represented a response rate of 89.3%. Many of the respondents (27.1%) were aged 50–59 years. Females were more than males and over a third 65 (32.8%) had at least secondary education. Respondents' demographic characteristics are presented in Table 1.

About 47.5% of the respondent had been diagnosed of type-2 diabetes for between 5-10 years, 31% for less than 5 years, 18% for more than 10years and only 3% did not know. Retinopathy (66.5%) and foot ulcers (73%) were the commonest knowledge of diabetes complications among the respondents.

Table 2. Correlation matrix for 4-items on MMAS

	If you feel worse do you stop taking your medicines	Do you stop taking your medicines when you feel better	Careless at times about taking my medicines	Do you ever forget to take your medicines
If you feel worse do you stop taking your medicines	1.00			
Do you stop taking your medicines when you feel better	0.77	1.00		
Careless at times about taking my medicines	0.85	0.81	1.00	
Do you ever forget to take your medicines	0.71	0.87	0.64	1.00

The others included nephropathy (28%), neuropathy (35%), erectile dysfunction (31%), and 5.5% did not know.

The majority of the respondent (79%) took Metformin as part of their regimen, and then glibenclamide (57.5%), tolbutamide (16%), pioglitazone (10%) and rosiglitazone (1%). The correlation analysis between the 4 questions of the MMAS showed strong correlation among them (see Table 2).

The level of adherence among respondents based on excellent adherence where respondents had a perfect score of 4 was 11%. Moreover with an acceptable score of 75%, 38.5% of the respondents were adherent (Table 3).

There were significant correlations between level of adherence and educational level [(OR)=1.508; (95%CI 0.805 - 2.825), P=0.019], and mode of payment [(OR)=1.631; (95%CI 0.997 - 2.669), P=0.05]. Details of logistic regression analysis are provided in Table 4.

DISCUSSION

Adherence to oral anti-diabetic drugs measured in this study at a cutoff point of 75% or higher was 38.5%. The adherence rate was similar to a study conducted in Egypt in which the adherence rate was 38.9%¹⁰ and Mexico with an adherence rate of 41%.¹¹ However this was lower compared with 60% in a similar study conducted in Southwestern Nigeria¹² and 78.3% in Brazilian study.¹³ Although these reported rates of adherence vary with respect to the previous studies, these serve to confirm the problem of non-optimal adherence among the majority of patients with chronic medical conditions.

The findings showed that there was a positive significant association between the level of education and adherence. This was consistent with other studies.^{10,13} Educated patients are more likely to know the consequences of diabetes and the complications associated with diabetes and as such tend to adhere to their medications.

In addition, patients with no/low educational

backgrounds were unable to read effectively or understand the instruction provided by the health professionals and as such were not able to take their medications optimally. Drug therapy in diabetes is increasingly becoming more complex and as such patients need to understand the regimen prescribed by their health providers to aid adherence and good health outcomes.

Occupational status was not associated with level of adherence. This was also similar to studies from Uganda¹⁴ and Malaysia¹⁵ where the nature of work of diabetes patients did not have any association with adherence to oral antidiabetic drugs. The ability to obtain medications by health insurance scheme holders contributed to adherence. Regular income earners who did not use health insurance in acquiring their medications could make regular purchases.

There was an inverse but significant correlation between the total number of oral anti-diabetic drugs taken daily and adherence. Adherence rates decrease as the pill burden increases as with the study by Dailey *et al.*^{16,17} An earlier work had also concluded that patients became more adherent when they received fixed-dose combination therapy which reduced pill burden instead of the combination therapies.¹⁸

Although duration since diagnosis¹⁹ had been shown to be associated with increased adherence, this study found otherwise. For example, a study conducted in Mexico showed that newly diagnosed patients had poorer adherence to their medications.²⁰ In chronic diseases such as type 2 diabetes mellitus, the attitude of patients in denying the disease is reduced as patients accept treatment after years of suffering from the disease.

Patients who receive information about their disease and medication from healthcare providers are more adherent^{21,22} but like in a previous study this was not the case.¹⁰

Limitations

This study was conducted in a tertiary setting where most diabetic patients across the country with

Table 3. Respondents' beliefs and motivation for adherence

Item	Positive response n (%)
Do you feel that your diabetes and complication is getting worse?	72 (36)
Does complication pose severe problem to your health	162 (81)
Does medication effectively reduce your blood sugar level	175 (87.5)
Are you reminded to take drugs as scheduled by family members and friends?	91 (45.5)
Are you sure you will be able to follow all the advice given to you by your health professional?	177 (88.5)

Table 4. Logistic regression analysis			
Variable	Odd ratio	95% Confidence interval	p-value
Age	0.826	(0.605 - 1.127)	0.229
Highest level of education	1.508	(0.805 - 2.825)	0.019
Occupation	0.274	(0.119 - 0.633)	0.002
Level of income	1.516	(0.982 - 2.340)	0.060
Mode of payment	1.631	(0.997 - 2.669)	0.050
Number of drugs taken per day	1.241	(1.005 - 1.532)	0.045
Duration since diagnosis	1.174	(0.721 - 1.910)	0.915

uncontrolled sugar levels and complications are referred for management. Participants' frequent interactions with physicians may affect their attitudes and perceptions about medication adherence during the study period. Another important limitation is that patients could be giving wrong estimates of their adherence levels when using a self-reporting method. Also the number of factors contributing to adherence explored in this study might not have been comprehensive.

CONCLUSIONS

Adherence in diabetic patients was low among respondents and this can be improved through education, counseling and reinforcement of self-care. It is also recommended that prescribing regimen with fixed-dose combinations which tend to reduce both the frequency of intake as well as the pill burden can contribute to adherence.

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CONFLICT OF INTEREST

Authors have no conflict of interest to declare with this work.

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ADHERENCIA A ANTIDIABÉTICOS ORALES ENTRE PACIENTES QUE VISITAN UN HOSPITAL UNIVERSITARIO EN GANA

RESUMEN

Antecedentes: La carga de la diabetes mellitus, especialmente de la tipo 2, continúa creciendo en todo el mundo. La adherencia a la medicación se considera un componente integral de su manejo. El mal control de la glicemia debido a la no adherencia a la medicación acelera el desarrollo de complicaciones a largo plazo lo que lleva consecuentemente a aumento de hospitalización y mortalidad.

Objetivo: Este estudio examinó los niveles de adherencia a los antidiabéticos orales entre pacientes que visitaron el hospital universitario y exploró los factores probablemente contribuyentes a la no adherencia.

Métodos: Se realizó un estudio transversal descriptivo usando una muestra sistemática para recoger datos cualitativos. Se administraron cuestionarios a pacientes ambulatorios del departamento médico de un hospital universitario de Gana. Se realizó una regresión logística con significación estadística en $p < 0,05$.

Resultados: Un total de 200 pacientes diabéticos participaron en el estudio. Usando la escala de adherencia de medicación de Morisky, el nivel de adherencias determinado fue del 38,5%. Hubo correlación significativa entre el nivel de adherencia y el nivel educativo [(OR)=1,508; (95%CI 0,805 - 2,825), $P=0,019$), y el modo de pago [(OR)=1,631; (95%CI 0,997 - 2,669), $P=0,05$).

Conclusión: La adherencia en pacientes diabéticos fue baja entre los respondentes y esto puede mejorarse mediante educación, consejo y refuerzo de los autocuidados. Había varios posibles factores que contribuyeron a la baja adherencia que podrían beneficiarse de estudios posteriores.

Palabras clave: Cumplimiento de la Medicación; Diabetes Mellitus Tipo 2; Factores de Riesgo; Modelos Logísticos; Gana

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