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PATTERN AND EXPLANATORY FACTORS FOR MEDICATION ADHERENCE AMONG PATIENTS WITH HYPERTENSION, DIABETES MELLITUS AND THEIR COMORBIDITY IN A NORTH CENTRAL STATE OF NIGERIA

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ABSTRACT

Introduction: Hypertension and diabetes are the two most common non-communicable diseases seen in outpatient clinics in Sub-Saharan Africa. Promoting medication adherence is a major clinical hurdle to be crossed in reducing the premature morbidity and mortality associated with these diseases. This study explored factors that predict medication adherence among hypertensive and diabetic patients in Ilorin, Nigeria.

Methods: This cross-sectional study was carried out among hypertensive and diabetic patients in outpatient clinics of a teaching hospital in Ilorin, Nigeria. Data was collected from 1,203 patients using a validated Morisky 8-item medication adherence questionnaire. Multivariate ordinal logistic regression was used to model the medication adherence explanatory factors with SPSS version 22.

Result: Less than half (43.3%) of the patients were highly adherent to their medication. The relative proportion for high adherence was 42.7%, 35.6% and 49.2% for hypertension, diabetes and both diseases respectively. The odds of medication adherence improving from either low to medium level or from medium to high level was explained by; age, symptoms count, absence of disease complication and absence of drug side effect among the patients. Blood pressure, gender and disease duration did not explain medication adherence among hypertensive and diabetic patients.

Conclusion: It is concluded that the discomfort experienced due to the disease condition and the medication regimen are important explanatory factors for patient's medication adherence in the study setting. This study recommends strategies to reduce multiple drug combinations and promote medication adherence counselling and education among patients.

Keywords: Hypertension, Diabetes, Medication adherence, Explanatory factors

1.0 Introduction

Hypertension and diabetes are the two most common chronic medical conditions seen in outpatient clinics in Sub-Saharan Africa (Bromfield S, 2013). They are both important risk factors for cardiovascular disease and are also leading causes of morbidity and mortality. The prevalence of hypertension could range from 2% to 47% among adult Nigerians (Akinlua, Meakin, Umar, & Freemantle, 2015) while diabetes according to various studies ranged from 1% to 7% (Dahiru, Jibo, Hassan, & Mande, 2008; Nyenwe, Odia, Ihekwaba, Ojule, & Babatunde, 2003; Owoaje EE, Rotimi CN, Kaufman JS, Tracy J, 1997). These scourge are expected to increase tremendously over the next few decades (Zimmet, Magliano, Herman, & Shaw, 2014). Despite availability of effective treatment for both diseases, studies have shown that majority of diabetics and hypertensive patients have poor blood glucose and blood pressure control respectively, mainly due to poor adherence to medication (WHO, 2003). According to the World Health Organization (WHO), medication adherence is the extent to which a person's behaviour- taking medication, following a diet, or making healthy lifestyle changes corresponds with agreed upon recommendation from a health care provider (WHO, 2003).

Patient's non-adherence to chronic diseases like hypertension and diabetes medication regimen is a global health problem. Therefore promoting medication adherence is a major clinical hurdle to be crossed in the treatment protocol. This is important because the two diseases require life-long medication and clinical management regimen. Non-adherence to medication compromises safety and treatment effectiveness leading to increased mortality and morbidity (Kirigia, Sambo, Sambo, & Barry, 2009). There is also concomitant financial loss to the health care system and patients as a result of high rate of hospitalisation (Kirigia et al., 2009; WHO, 2014). Low patient adherence to antihypertensive and anti-diabetic medications had been observed to be the most important modifiable patient-related barrier to achieving blood pressure goals in hypertension and blood glucose control in diabetes (American Diabetic Association, 2011; Borzecki, Oliveria, & Berlowitz, 2005).]

Identifying non-adherent patients in the outpatients' settings is germane to effective control rates of hypertension and diabetes. There are 2 methods to assessing medication adherence; which could be direct and indirect methods. The most simple and inexpensive method to use in the clinical (outpatient) setting is the indirect (subjective) method, which is basically patient oriented self-report (Osterberg & Blaschke, 2005). A numbers of direct patient self-reporting scales have been developed to assess adherence (Al-Qazaz et al., 2010; Korb-Savoldelli et al., 2012). Although there is no gold standard medication adherence scale or questionnaire tool, however the eight item Morisky Medication Adherence Scale (MMAS-8) is one of the commonly used tools that has been deemed reliable and valid (Al-Qazaz et al.,

2010; Korb-Savoldelli et al., 2012).[14,15] The MMAS-8 scores range from 0 to 8 with low adherence defined as MMAS scores less than 6, medium adherence as scores of 6 to less than 8 and high adherence as a score of 8 (Krousel-Wood, Muntner, Islam, Morisky, & Webber, 2009).

The MMAS-8 is an improvement over an initial 4-item Morisky, Green and Levine Adherence Scale which has been found insufficient to explore all the domains measured in medication adherence behaviour (Morisky, Green, & Levine, 1986). A new scale, the MMAS-4-item has been limited to the clinic settings unlike the 8-item MMAS whose usage has included research purposes and medical intervention assessment (Morisky DE, 2011). The MMAS-8 was designed to facilitate the identification of barriers and determinants of medication adherence in chronic illnesses (Morisky et al., 1986; Morisky DE, Ang A, Krousel-Wood M, 2008; Morisky DE, 2011). When compared to direct method of eliciting medication adherence like pharmacy fill rate, it was found to have high concordance rates with pharmacy fill records (Krousel-Wood et al., 2009). The MMAS has been widely validated in many countries and found to be internally consistent (Boima et al., 2015; Fadare, Olamoyegun, & Gbadegesin, 2015; Korb-Savoldelli et al., 2012). Although, some studies have explored factors associated with medication adherence among hypertension and diabetes in Nigeria (Ajayi EA, Adeoti AO, Ajayi IA, Ajayi AO, 2013; Boima et al., 2015; Fadare et al., 2015; Odusola et al., 2014), none was sighted to report on the factor(s) that predict adherence among patients with hypertension and diabetes, either separately or together in the study area. This study was therefore carried out to explore the factors that determine and explain (predict) medication adherence among hypertensive and diabetic patients in Ilorin, Nigeria.

2.0 Materials and Methods

2.1 Study Setting

This study was conducted at the University of Ilorin Teaching Hospital (UITH) located in Ilorin, a city in north-central Nigeria. It is a tertiary hospital and receives referral from public and private primary and secondary hospitals within and outside the state. The catchment area of UITH covers more than 5 states of Nigeria including Kwara State where it is located. The hospital has many clinics that render outpatients care to patients but majority of hypertensive and diabetic patients are attended to at the General Outpatient Department (GOPD) and Medical Outpatient Department (MOPD). On a daily average, close to 90 patients with hypertension and diabetes were attended to in both clinics in 2014. There was 4:1 female to male attendance ratio in the 2 clinics in the same year. Only patients attending the GOPD and the MOPD clinics were included into this study.

2.2 Study Design

The study is a cross-sectional study with comparative analysis of registered patients with hypertension and diabetes who were attending outpatient clinics of UITH Ilorin. The study was carried out on clinic days with the exclusion of public holidays. Patients were recruited proportionate to sizes of hypertension and diabetic ratio (ratio 9:1 from hospital attendance records). Consecutive patients were included in the study until the desired sample size of

1,203 was attained. Patients were included into the study after an informed consent was obtained. The consenting adult patients (of over 18 years of age) were included in this study.

2.3 Informed Consent and Ethics

This study was conducted based on good clinical practice for biomedical researches according to the Collaborative Institutional Training Initiative (CITI) guidelines. All eligible patients had research background information given to them in the language they best understood before seeking their consent for the study. Valid consent was obtained from all the participating patients in written form by either signature or thumb printing. Ethical approval for this study was obtained from the UITH Ethical Review Committee approval no ERC/PAN/2014/07/1332.

2.4 Data Collection

A Clinical Report Form (CRF) and questionnaire were used for collecting data for this study. Data was collected between October 2014 and April 2015. The CRF collected data on patients' medical information and conditions which were; Blood Pressure (BP), Body Mass Index (BMI), disease history, drug history, complication and co-morbidity history and hospital follow-up history. The Questionnaire was sectioned into 4 parts namely; socio-demography, clinical/drug profile, clinical measurements and medication adherence.

Adherence to treatment by the patients was assessed using the 8-item Morisky Medication Adherence Scale (MMAS 8-scale) (Morisky DE, Ang A, Krousel-Wood M, 2008). This tool contains dichotomous measure and one Lickert measure. All the 8 items in MMAS-8 questionnaire added up to a maximum score of 8. The eight-item compliance scale had an alpha reliability of 0.83 (n= 1367) among patients diagnosed with essential hypertension attending an outpatient clinic of a large teaching hospital (Morisky DE, Ang A, Krousel-Wood M, 2008). Permission to use of the MMAS scales is required. Reproduction and distribution of the MMAS is protected by US copyright laws. License for the use of MMAS was obtained from the Copyright owner.

2.5 Statistical Analysis

Data was analysed using IBM© SPSS version 22. The frequency distribution of socio-demographic, clinical information and drug information were analysed with descriptive statistics. The MMAS-8 was scored and with a range from 0 to 8. The low adherence was defined as MMAS scores less than 6, while medium adherence as scores of 6 to less than 8. The high adherence was a score of 8. Prevalence of medication adherence (low, medium and high) was then analysed. The inferential statistics provided information on how socio-demographic factors, clinical conditions and drug history determined medication adherence. Chi-square test and F-test were used to elicit these associations. Explanatory analysis was performed to study how initially significantly associated factors predicted medication adherence. Age, gender, blood pressure, drug side effect, symptom counts, co-morbidity and disease duration were all the risk factors subjected to the modeling. Both univariate and multivariate Ordinal Logistic Regressions (OLR) models were used to explore the 3 (low /medium/ high) ordinal levels of medication adherence. The OLR model compared adjacent levels which means the odds ratio (OR) corresponded with the odds of medication adherence

in the next higher level. Odd ratios are presented with their 95% confidence interval (95% CI) while statistical significance was set at p-value of < 0.05.

3.0 Result

3.1 Patient Characteristics

The socio-demographic characteristics of the patients studied are presented in Table 1below,

Table 1: Socio-demographic Characteristics (n=1203)

VARIABLES	FREQ	(%)	Mean (SD)
Age			
21-30	18	(1.5)	57.5 (12.3)
31-40	94	(7.8)	
41-50	243	(20.2)	
51-60	385	(32.0)	
61-70	315	(26.2)	
>70	148	(12.3)	
Gender			
Male	319	(26.5)	
Female	884	(73.5)	
Ethnicity			
Yoruba	1111	(92.3)	
Hausa	6	(0.5)	
Igbo	18	(1.5)	
Others	68	(5.7)	
Educational level			
No formal education	449	(37.3)	
Primary	265	(22.1)	
Secondary	194	(16.1)	
Tertiary	295	(24.5)	
Marital status			
Married	899	(74.7)	
Single	17	(1.4)	
Divorced	24	(2.0)	
Widowed	263	(21.9)	
Main job			
No paid job	1116	(92.8)	
Paid job	87	(7.2)	
Poverty level			
< 2 dollars	538	(45.4)	
≥ 2 dollars	648	(54.6)	

The mean age of the patients was 57 years ±12 years with female predominance (73.5%). Over 90% were Yoruba tribe and sizeable proportion (36.9%) of the patients did not have formal education. Though about three-quarters of participants (74.7%) were married, more

than a fifth has lost their spouses. Only 7.2% of the respondents were on paid job and about 45% of the patients lived on less than 2 USD per day.

3.2 Clinical Data and Medication Use Pattern

Clinical data and medication use pattern of patients presented as Table 2 below,

Table 2: Patients' Clinical Factors (n= 1203)

VARIABLES	FREQ	(%)	Median (IQR)
Methods of payment (n=1203)			
Out of Pocket	611	(50.8)	
Health Insurance	111	(9.2)	
Employer	26	(2.2)	
Relative	455	(37.8)	
Morbidity profile (n = 1203)			
HYPERTENSION	965	(80.2)	
Diabetes	59	(4.9)	
Both	179	(14.9)	
Disease Duration (n = 1188)			
<1year	194	(16.3)	5.2 (8.3)
1-5year	388	(32.7)	
5-10year	254	(21.4)	
>10years	352	(29.6)	
Disease complication (n= 1198)			
Yes	378	(31.6)	
No	820	(68.4)	
Follow-up visits affect daily activity (n = 1200)			
Yes	386	(32.2)	
No	814	(67.8)	
Drug combination (n = 1200)			
One	98	(8.2)	
Two	398	(33.1)	
three	410	(34.2)	
>three	294	(24.5)	
Drug frequency (n = 1200)			
Once	875	(72.9)	
Twice	300	(25.0)	
Thrice	24	(2.0)	
> Thrice	1	(0.1)	
Drug side effect (n = 1200)			
Yes	179	(14.9)	
No	1021	(85.1)	
Symptom count (n=1203)			
No symptom	1046	(86.9)	
1 symptom	97	(8.1)	
2 symptoms	40	(3.3)	
≥ 3 symptoms	20	(1.7)	

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Table 2 shows that about half of the patients paid out of pocket for their medical bill. Four out of every five patients studied have hypertension without diabetes mellitus while only 4.9% have only diabetes mellitus without hypertension. Close to 15% of e patients have both hypertension and diabetes mellitus. More than three-quarter of the patients have had the disease for more than a year and almost a third (29.6%) of them had lived with the disease for more than 10 years. About 15% of them have lived with the complications of these diseases like stroke and congestive heart failure. Follow-up visit affects daily activities in 32.2% of the patients. Over half of the patients take 3 or more drugs for their medical conditions while close to three-quarter (72.9%) of the patients take a daily dose of drug. Close to 15% of the patients experienced drug side effect. The mean symptom count for the patients is 0.19 $\pm$ 0.56.

3.3 Medication Adherence Pattern

Less than half (43.3%) of the patients were highly adherent to their medication. Respondents with medium and low adherence were 30.3% and 26.7% respectively (Tables 3&4). The relative proportions of adherence pattern among the 3 types of disease profile studied are shown in Figure 1.

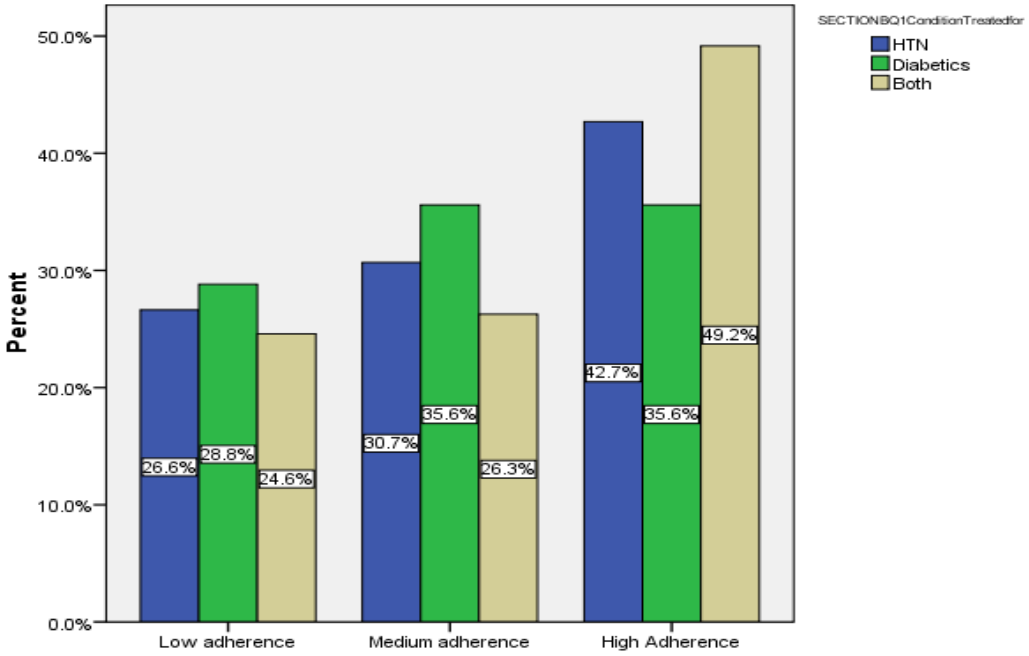

Figure 1: Medication Adherence Pattern among Patients

Patients with hypertension had 42.7%, 30.7% and 26.6% for high, medium and low medication adherence respectively while those with diabetes had 35.6%, 35.6% and 28.8% for high, medium and low adherence, respectively. The patients with the comorbidity of hypertension and diabetes had 49.2%, 26.3% and 24.6% for high, medium and low adherences respectively (Figure 1).

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3.4 Factors Associated with Medication Adherence

Age (p<0.001), educational status (p=0.018) and poverty level (p=0.005) were significantly associated with medication adherence (Table 3). Specifically, on post hoc analysis there was significant difference between ages of those with high (p=0.009) and medium (p=0.005) adherence compared to those with low adherence. Those patients of high and medium adherence have higher mean age (58.17 and 56.21 years respectively) compared with those of low adherence (55.41 years).

Table 3: Socio-demographic Factors Associated with Medication Adherence

Variables	Low adherence (0 - <6) N=318 (26.4)	Medium Adherence (6 - <8) N= 364 (30.3)	High Adherence (8) N=521 (43.3)
Age*[a^]			
Mean (S.D)	55.41(11.4)	56.21(12.9)	58.17 (12.2)
Gender[b]			
Male	77 (24.2)	107 (33.5)	135 (42.3)
Female	241 (27.3)	257 (29.0)	386 (43.7)
Ethnicity[b]			
Yoruba	291 (26.2)	331 (29.8)	489 (44.0)
Others	27 (29.3)	33 (35.9)	32 (34.8)
Educational Level*[b]			
No formal education	96 (21.4)	132 (29.4)	221 (49.2)
Primary	76 (28.7)	82 (30.9)	107 (40.4)
Secondary	65 (33.5)	55 (28.4)	74 (38.1)
Tertiary	81 (27.5)	95 (32.2)	119 (40.3)
Main Job[b]			
No paid job	300 (26.9)	340 (30.5)	476 (42.6)
Paid job	18 (20.7)	24 (27.6)	45 (51.7)
Poverty level*[b]			
< 2 dollars	132 (24.5)	145 (27.0)	261 (48.5)
≥ 2 dollars	183 (28.2)	211 (32.6)	254 (39.2)

a = F-test, b= chi-square test * = significant (p-value < 0.05),
^ = Equal variance assumed, # = Equal variance un-assumed

The clinical and drug related variables that were significantly associated with medication adherence were (Table 4); mode of payment for medical bill (p=0.03), disease complication (p<0.001), drug combination (p=0.001), drug side effect (p<0.001) and symptom counts (p<0.001). Those patients with high medication adherence had higher symptom counts than those with medium (p<0.001). The BP control was not found to be significantly associated with medication adherence (p>0.05)

Table 4: Clinical Factors Associated with Medication Adherence

Variables	Low adherence (0 - <6) N=318 (26.4)	Medium Adherence (6 - <8) N= 364 (30.3)	High Adherence (8) N=521 (43.3)
Methods of payment for Follow-up care*[b]			
Out of pocket	173 (28.3)	168 (27.5)	370 (44.2)
Health Insurance	40 (36.0)	39 (35.1)	32 (28.9)
Employer	03 (11.5)	11 (42.3)	12 (46.2)
Relative	102 (22.4)	146 (32.1)	207 (45.5)
Morbidity profile[b]			
Hypertension	257 (26.6)	296 (30.7)	412 (42.7)
Diabetes	17 (28.8)	21 (35.6)	21 (35.6)
Both	44 (24.6)	47 (26.2)	88 (49.2)
Disease duration[a]			
Mean (S.D)	7.8 (6.9)	6.9 (5.9)	7.4 (6.2)
Complication*[b]			
Yes	120 (31.7)	130 (34.4)	128 (33.9)
No	196 (23.9)	232 (28.3)	392 (47.8)
Drug Combination*[b]			
One	29 (29.6)	32 (32.7)	37 (37.7)
Two	127 (31.9)	113 (28.4)	158 (39.7)
≥Three	162 (22.9)	219 (31.0)	326 (46.1)
Drug side effect*[b]			
Yes	81 (45.3)	44 (24.6)	54 (30.1)
No	234 (23.1)	320 (31.3)	467 (45.6)
Symptoms count*[a#]			
Mean (S.D)	0.15 (0.51)	0.14 (0.50)	0.35 (0.72)
BP control[b]			
Controlled	248 (25.9)	292 (30.5)	416 (43.6)
Uncontrolled	70 (28.3)	72 (29.1)	105 (42.5)

a = F-test, b= chi-square test * = significant (p-value < 0.05),.
^ = Equal variance assumed, # = Equal variance un-assumed

3.5 Explanatory Factors of Medication Adherence

The principle underlining the OLR that was used for the explanatory analysis in this study inferred that the odds of medication adherence will improve from either low to medium level or from medium to high level of adherence.

Table 5: Predictors of Medication Adherence (OLR)

Variables	Non-adjusted OR (95% CI)[a]	p-value[b]	Adjusted OR (95% CI)[a]	p-value
Age	1.12 (1.00, 1,23)[b]	0.006*	1.12 (1.00, 1.02)[c]	0.013*
Drug side effect	1.28 (1.00, 1.63)[b]	0.05*	1.26 (0.99, 1.62)[c]	0.063
No Complication	1.65 (1.32, 2.06)[b]	0.000*	1.57 (1,24, 1.99)[c]	0.000*
Symptom counts	0.65 (0,54, 0.78)[b]	0.000*	0.69 (0.57, 0.84)[c]	0.000*
Uncontrolled BP	-0.087 (-0.30, 0.12)[b]	0.419		
Gender (Male)	0.97, (0.77, 1.23)[b]	0.827		
Disease duration	0.99, (0.98, 1.01)[b]	0.637		

OR = Odd Ration, CI = Confidence Interval.
[a] = the odds of having medication adherence in the next level
[b] = from univariate ordinal logistic regression
[c] = from multivariate ordinal logistic regression
* = statistically significant

In univariate OLR analysis, Age (OR=1.12, 95%CI=1.00, 1,23), patients without disease complication (OR=1.65, 95%CI=1.32, 2.06), drug side effect (OR =1.28, 95%CI =1.00, 1.63) and symptoms counts (OR=0.65, 95%CI=0,54, 0.78) significantly explained medication adherence. This result means that medication adherence among the patients in this study increased by: i) 1.12 fold with one year increase in patients' age, ii) Reduced by 0.69 fold with one unit increase in symptom counts, iii) increased by 1.28 fold if patients had drug side effect and iv) by 1.65 fold with patients without disease complication. Blood Pressure (BP), gender and disease duration did not predict medication adherence in this study. On multivariate ordinal regression modelling, age (Adjusted OR=1.12), absence of complication (Adjusted OR=1.57) and symptom counts (Adjusted OR=0.69) fit in to model significantly to explain medication adherence. Though patients with uncontrolled BP had reduced odd of 0.087 to attain medication adherence (Table 5), this was not found to be statistically significant (CI= -0.30, 0.12),

4.0 Discussion

This study reports medication adherence pattern and explanatory factors (predictors) among patients with hypertension and diabetes mellitus attending outpatient clinics in a north-central state of Nigeria. The mean age of the patients studied was 57 year which is close to retirement age of 60 years in civil service in Nigeria (Ugwu, S. C., & Eme, 2011). This could possibly explains why majority of patients studied were not on any paid job and while close to half of them lived on less than 2 USD per day. This fact is reinforced by low literacy level observed among the study group. Despite the low earning capacity of these patients, more than half of them paid out of pocket for their hospital care; which is possibly due to lack of social security for Nigerian retirees (Ugwu, S. C., & Eme, 2011). However, the chronicity and life-long nature of the 2 diseases requires financial access to care. Close to 80% of patients studied have hypertension without diabetes, less than 5% have diabetes without hypertension, while close to 15% have both hypertension and diabetes mellitus. The two diseases are the most

common non-communicable chronic conditions seen in outpatient clinics in sub-Saharan Africa (Bromfield S, 2013). The observed proportion in this study conforms with other studies that have reported higher prevalence of hypertension compared to diabetes (Nyenwe et al., 2003; Owoaje EE, Rotimi CN, Kaufman JS, Tracy J, 1997). Our finding is in agreement to previous finding which documented that people living with diabetes mellitus are at higher risk of hypertension (Long AN & Dagogo-Jack S., 2011). The comorbidity of hypertension and diabetes increases risk of both macrovascular and microvascular complications in the patients (Long AN & Dagogo-Jack S., 2011).

Medication adherence pattern revealed that less than half of the patients were adherent to medication across the 3 disease profiles. The patients with both co-morbidity of hypertension and diabetes had fairly average medication adherence level. However, less than average of hypertensive patients and diabetic patients were adherent to their medication; a finding comparable to findings from that of USA (Morisky DE, Ang A, Krousel-Wood M, 2008), and Nigeria (Adisa, R., Fakeye, T. O., & Fasanmade, 2011; Odusola et al., 2014). These studies were carried out among patients attending Outpatients clinics using the MMAS. Similarly, our finding was comparable with majority of the centers studied in a multi-center adherence study carried out in Nigeria and Ghana (Boima et al., 2015). It is noteworthy to state that results of adherence studies that used the MMAS-8 scale have reported varying results among different populations (Al-Qazaz et al., 2010; Korb-Savoldelli et al., 2012; Krousel-Wood, M., Islam, T., Webber, L. S., Re, R., Morisky, D. E., & Muntner, n.d.; Morisky DE, Ang A, Krousel-Wood M, 2008).

Medication adherence amongst diabetic patients in our study is similar to the earlier studies from Nigeria (Fadare et al., 2015) and Malaysia (Al-Qazaz et al., 2010). Among Nigeria studies Fadare et al (2016) which used MMAS-8, and Adisa et al (2011) which employed MMAS-4 reported over 40% and 60% adherence respectively. The observed difference in our result and that of Adisa et al (2011) is probably due to the use of MMAS-4 tool as against MMAS-8 used in our study. Part of the advantages of the MMAS-8 over the MMAS-4 is its high reliability (Krousel-Wood, M., Islam, T., Webber, L. S., Re, R., Morisky, D. E., & Muntner, n.d.).

We found a higher medication adherence level amongst patients with hypertension and diabetes as co-morbidity. This is an important scenario because; in clinical setting, it is common to see patients with stand-alone hypertension and diabetes. It is also common to find those with both diseases as comorbidity. Studies in Nigeria have shown that hypertension is an extremely common comorbidity amongst persons with diabetes mellitus and is said to be twice as prevalent in diabetics than in non-diabetic individuals (Chinenye et al., 2012). Thus, hypertension and diabetes are common, intertwined conditions that share a significant overlap in underlying risk factors and as potent risk factors for Cardiovascular diseases (Chinenye et al., 2012; Long AN & Dagogo-Jack S., 2011). It has been reported that patients with the comorbidity usually have poor clinical outcome more than those with one of the diseases (Chinenye et al., 2012). Both diseases increases mortality by 20 times in the affected person compared to age- and- sex matched healthy individual (Akintunde & Akintunde, 2015; Unadike, Eregie, & Ohwovoriole, 2011). Up till the time of writing this article, no evidence is sighted in the literature in Nigeria regarding medication adherence pattern among patients with hypertension and diabetes comorbidity.

Age, educational status and poverty level were identified as socio-demographic factors that influenced medication adherence among patients in our study. The clinical and disease factors that affected adherence pattern included; mode of payment, presence of complication, drug combination and drug side effect. In the same vein, our results showed that older age was associated with better adherence. There have been diverse results from studies that have explored factors associated with medication adherence using MMAS-8. Older age group, higher educational status , lower number of medications per day and higher monthly incomes have been documented to facilitate adherence (Boima et al., 2015; Odusola et al., 2014). Factors reported to have negatively impacted on adherence to medication included; poor knowledge of hypertension, depression, concerns about medications, and use of herbal preparation (Odusola et al., 2014). One consistent finding from the majority of the earlier works is that older age group have a higher adherence compared to the younger age group (Boima et al., 2015; Krousel-Wood, M., Islam, T., Webber, L. S., Re, R., Morisky, D. E., & Muntner, n.d.). These has been adduced to the older people probably having more regard for their health, more prone to complications and hence feel more inclined to use medications. Previous studies have also documented significant relationships between blood pressure, blood glucose control and adherence to medication (Al-Qazaz et al., 2010; Krousel-Wood et al., 2009). However, these factors were not significantly associated with adherence in our study. Although, the cost of medication had been reported to be a barrier to adherence amongst patients with diabetes mellitus in western Nigeria (Boima et al., 2015), again our study did not find this to significantly influence adherence amongst the patients.

This study carried out modeling using OLR to explore explanatory (predictive) factors for medication adherence. Individually, age (OR= 1.12), presence of drug side effect (OR= 1.28), absence of complication (OR= 1.65) and symptom counts (OR= 0.6) predicted medication adherence. When combined in a model, only 3 factors significantly predicted medication adherence namely; age (adjusted OR =1.12), absence of complication (adjusted OR=1.57) and symptom counts (adjusted OR= 0.65) was found to significantly predict medication adherence. The BP control, duration of the disease and gender did not predict medication adherence in this study. The implication of these findings is that among patients with hypertension and diabetes mellitus attending out-patients clinic in UITH Ilorin, for every year increase in age, there are 1.12 times chances of becoming highly adherent from medium adherence. Similarly, there are 1.57 times chances that patients that did not report any complication will become highly adherent from medium adherence. However, we are mindful that our study may not be able to explain the temporality sequence between absence of disease complication and medication adherence. But by biological plausibility those patients with high adherence are less likely to have medical complications like stroke and congestive heart failure. Similarly, we found that with a unit increase in symptom counts, there is reduced chance of 0.69 to be highly adherent from medium adherence. Again, there could also be some temporality question in this finding. The reduction in symptoms experienced by patients could also be as a result of high medication adherence.

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5.0 Conclusion

The medication adherence among patients with hypertension and diabetes in Ilorin was poor. Patients with comorbidity of hypertension and diabetes were more adherent to medication than those with hypertension and diabetes alone. Patients with no complications had 1.6 chances of being adherent to medication. Furthermore the older a patient is, the more experienced and adherent he/she is likely to be with drugs while patients suffering from disease symptoms are less likely to be adherent with medication. This study recommends strategies to reduce multiple drug combinations and promote medication adherence counseling and education among patients.

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Authors' contributions

- Bolarinwa OA – Conceive the research idea, involved in research proposal, data collection, data analysis and manuscript writing
- Bamgbola OA - Involved in data collection and presented the manuscript at a conference
- Sanya EO - Involved in research proposal, data collection and manuscript writing
- Kolo PM - Involved in research proposal, data collection and manuscript writing
- Ameen HA - Involved in research proposal, data analysis and manuscript writing
- Durowade KA - Involved in research proposal, data analysis and manuscript writing
- Uthman MMB - Involved in research proposal, data analysis and manuscript writing
- Ogunmodede JA - Involved in research proposal, data collection and manuscript writing
- Biliaminu SA - Involved in research proposal, data collection and manuscript writing
- Odeigah LO - Involved in research proposal, data collection and reviewed the manuscript
- Akande TM - Involved in research proposal, data collection and reviewed the manuscript
- Morisky DE – Reviewed the manuscript

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