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# PREDICTORS OF SELF REPORTED ADHERENCE TO ANTIHYPERTENSIVE MEDICATION IN A NIGERIAN POPULATION

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## ABSTRACT

**Objectives:** Poor adherence to anti-hypertensive medication severely compromises the effectiveness of treatment. The aim of this study was to determine the factors that are associated with poor adherence in a sample of hypertensive patients in Nsukka, Nigeria.

**Methods:** The study employed a cross sectional, household survey to identify cases of hypertension in Nsukka. Adherence to antihypertensive medications was assessed on participants that have been previously detected of hypertension using patient's self report method. Study variables found to be correlated to adherence after adjusting for confounding variables were used in the multiple linear regression. Stepwise method was used to model the effect of predictor variables on adherence.

**Results:** A total of seven hundred and fifty-six (756) participants were screened for hypertension. Prevalence of hypertension in the study population was 21.1%. Detection of high BP among the participants with raised blood pressure was 30%. Mean self reported adherence to hypertension medication(s) was 70.7%  $\pm$  37.9%. Educational status, making medication(s) a habit and experience of side effects were independently correlated to adherence. Multiple linear regression showed that for every increase in educational status, adherence increased by 12.1%. Also making medication a habit increased adherence by 35.1%. However, experience of side-effect decreased adherence by 20.1%.

**Conclusion:** Higher educational status and forming a habit of taking medication regularly increased adherence to hypertension medications while experience of a side-effect decreased adherence to medication. These factors identified as correlates of self reported adherence could be used to design interventions to improve adherence to hypertension medications in Nigeria.

## KEYWORDS:

Adherence, Antihypertensive drugs, Hypertension, Nigeria

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## INTRODUCTION

Hypertension is an overwhelming global challenge which ranks third as a cause of disability in adjusted life years<sup>1</sup>. Although burden of hypertension is currently centered in economically developed countries, developing countries will feel a great impact due to their population proportion. Indeed estimates indicate that up to three quarters of the world's hypertensive population will be

in economically developing countries by the year 2025<sup>2</sup>.

High blood pressure increases the risk of ischaemic heart disease 3- to 4-fold<sup>3</sup> and of overall cardiovascular risk by 2- to 3-fold<sup>4</sup>. The incidence of stroke increases approximately 3-fold in patients with borderline hypertension and approximately 8-fold in those with definite hypertension<sup>5</sup>. It has been estimated that 40% of cases of acute myocardial infarction or stroke are attributable to hypertension<sup>6-8</sup>. Despite the availability of effective treatments, studies have shown that in many countries less than 25% of

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patients treated for hypertension achieve optimum blood pressure control<sup>9</sup>.

Poor adherence to long-term therapies such as antihypertensives severely compromises the effectiveness of treatment making this a critical issue in health of population both from the perspective of quality of life and of health economics. Interventions aimed at improving adherence would provide a significant positive return on investment through primary prevention (of risk factors) and secondary prevention of adverse health outcomes<sup>10</sup>. To design interventions to improve adherence to hypertension medications, there is need to identify predictors of non-adherence to therapy.

Few Nigerian studies have assessed correlates of adherence to antihypertensive medication(s). Specifically, use of daily medication reminder (taking drugs at meal time) and additional measurement of blood pressure in a neighbourhood private hospital or a pharmacy have been reported to improve adherence to antihypertensive drugs<sup>11</sup>. Another study conducted in a Nigerian specialist hospital showed that patients with formal education, higher income, and those on single dose were more compliant to treatment<sup>12</sup>. These studies have assessed level of adherence and factors affecting adherence from samples of hypertensive patients that receive care in a health facility. This group of patients may have greater professional care which would result in greater levels of adherence. No study has assessed level of adherence and predictors of adherence from a household survey in Nigeria. Therefore, the aim of this study was to determine the factors that are associated with adherence in a sample of hypertensive patients identified from a Nigerian population.

## METHODS

This study employed a cross sectional, household survey conducted to identify hypertension cases in Nsukka, a semi-urban city in South-Eastern Nigeria. All procedures were carried out according to a study protocol approved by the Local Ethics Committee of University of Nigeria Teaching Hospital Enugu.

A mixture of cluster and systematic random technique was employed. Nsukka was grouped into 16 clusters based on geographical locations as established by a map designed by Nsukka Graduates Association. Six sections or clusters were randomly selected from the sixteen clusters using a random sampling technique. In each section, the first house

in each street was identified, followed by systematic sampling of the next three houses. Using "Statcalc" function of EPI INFO (Version 6, Centre for Disease Control, USA), it was determined that a sample size of 400 was adequate to detect prevalence of hypertension of 10% to 40% with 5% precision and 95% confidence. However, a total of 800 persons were met in the exercise after covering the selected clusters.

Participants who agreed to take part were explained the nature and the objectives of the study, and informed consent was formally obtained. The information about participant's identity was not included with the other data and only the principal investigator had access to this information. No reference to the participant's identity was made at any stage during data analysis.

The survey was carried out from April to August of 2009. Adherence to antihypertensive medication was assessed among the sub-set of participants that were previously detected of hypertension using patients' self report<sup>13</sup>. Detection of hypertension was defined as any prior diagnosis of hypertension made by a health professional among the population defined as having hypertension. A questionnaire administered through interview was used for the study. It was made up of 3 sections assessing patient's demographic data, self-reported adherence and hypothesized factors affecting adherence or non-adherence to antihypertensive medications. These hypothesized factors were derived from literature<sup>13</sup>. The study instrument was face validated by some lecturers of the Department of Clinical Pharmacy and Pharmacy Management, and was pre-tested on 5 hypertensive patients in Faculty of Pharmacy to assess the validity of the instrument from the respondents' angle.

Patient's self reported adherence as used in this study involved asking patients non-judgmentally how often they missed their doses in the last 3, 5 and 7 days, respectively. Adoption of this shorter period was to avoid 'recall bias'. Adherence rates were therefore calculated as 'pills taken over a specific period of time, divided by pills prescribed for that specific period of time'. The average adherence score (expressed in percentage) for this 3 recall periods served as the dependent variable while hypothesized factors identified to encourage or discourage antihypertensive drug taking behaviour were the independent variable. These hypothesized factors were derived from literature<sup>13</sup>.

Statistical analyses were performed using SPSS 13 for Windows (Chicago, IL). Mean  $\pm$  standard deviation was computed for all continuous data. Frequencies were calculated for categorical data. Adherence was represented in percentage and was treated as continuous data. Study variables found to be correlated to adherence after adjusting for confounding variables were used in the multiple linear regression. Stepwise method was used to model the effect of predictor variables on adherence. All hypotheses tested were two tailed, with significant values taken at  $p < 0.05$ .

## RESULTS

A total of 860 participants were encountered in their homes during the prevalence study. Out the 860 persons, 756 participants agreed to participate in the study (88% response rate). Prevalence of high blood pressure was 21.1% (159 participants) in the sample of study. Among the participants with high BP (159 participants), 29.6% (47 participants) were detected of BP, 20.8% (33 participants) were on treatment while only 6.9% (11 participants) had their BP controlled. The participants that were detected of high BP were only those used to assess adherence. In this group, their mean age was  $56.5 \pm 14.4$  years. They were 47 persons in all - 30 were males while 17 were females. Majority had tertiary education and was in the middle income class. Participants were mostly diagnosed of hypertension through regular check-up. Hypertension related complications were absent in majority of the patients. Also, majority of the participants pay for their health care out of their pocket. Based on the blood pressure assessment, high blood pressure was poorly controlled in the study population. Only 31.9% of the hypertensive patients had controlled BP. Based on participants report, adherence to antihypertensive medications was  $70.7\% \pm 37.9\%$ . Other details of demographic and clinical characteristics are shown in Table 1.

In the bivariate analysis carried out, educational status, income level, making medications a habit and having medications readily available were all positively correlated to adherence. Experience of side-effects was negatively associated with adherence, (Table 2). After adjusting for confounding variables, only educational status, making medications a habit and experience of side effects were independently correlated to adherence. Multiple

linear regression using the stepwise model was used to determine the effect of these independent factors on level of adherence. It was found that for every increase in educational status, adherence increased by 12.1%, other variables remaining constant. Also making medication a habit increased adherence by 35.09% with other variables remaining constant. However, experience of side-effect decreased adherence by 20.1% while other variables remained constant. The F-value (11.07, DF = 3) had an associated probability level of  $p < 0.001$ , showing that the results were unlikely to have arisen by sampling error. Details of the results are shown in Table 2.

**Table 1: Demographic and clinical characteristics of study population (n = 47)**

Respondents' Characteristics	Frequency (%), median [interquartile range] or Mean $\pm$ SD
Age	56.5 $\pm$ 14.4
Gender	
<i>Male</i>	30 (63.8)
<i>Female</i>	17 (36.2)
*Educational status	
<i>Primary</i>	6 (12.8)
<i>Secondary</i>	16 (34.0)
<i>Tertiary</i>	21 (44.7)
Marital status	
<i>Single</i>	2 (4.3)
<i>Married</i>	45 (95.7)
Method of diagnosis	
<i>Regular Checkup</i>	21 (44.7)
<i>Checkup for hypertension related symptoms?</i>	8 (17)
<i>Hypertension is asymptomatic</i>	
<i>Checkup of other causes</i>	12 (25.5)
<i>Detected at Pharmacy/Drug store</i>	2 (4.3)
Hypertension related complication	
<i>Absent</i>	31 (66.0)
<i>Present</i>	4 (8.5)
Time since last visit to hospital (days)	30 [30 – 90]
Who pays for health care	
<i>Self</i>	38 (80.9)
<i>Family</i>	9 (19.9)
Blood Pressure	
<i>Average Systolic BP</i>	147.1 $\pm$ 19.7
<i>Average Diastolic BP</i>	92.2 $\pm$ 11.4
Mean self reported adherence score	70.7% $\pm$ 37.9%

\*Number of participants may not add up to 47 since some did not respond to the question

**Table 2: Association of hypothesized factors with self reported adherence (n = 47)**

Bivariate correlation with self reported adherence	r	p-value
<i>Patient Factors</i>		
Age	-0.05	0.755
Gender	0.282	0.074
Marital Status	0.214	0.180
Educational Status	0.622	< 0.001**
Income per month	0.641	< 0.001**
Family history of hypertension	0.274	0.092
<i>Other Hypothesized Factors</i>		
Understanding the need of medication	0.189	0.255
Availability of support	0.318	0.55
Making medications a habit	0.601	< 0.001**
Ready availability of medication	0.415	0.13*
Good relationship with the doctor	0.319	0.58
Lack of access to medication	-0.219	0.081
Fear of getting used to medication	-0.129	0.459
Cost of medication	-0.370	0.824
Forgetting to take medication	-0.083	0.631
Side effect	-0.370	0.026*
Dissatisfaction with treatment	-0.302	0.087
<b>Predictors of self reported adherence (adjusted)</b>	<b>B (95% CI)</b>	<b>p-value</b>
Educational status	12.05 (2.0 – 17.6)	0.049
Making medication a habit	35.91 (9.8 – 62.0)	0.009
Side effect	-20.09 (-39.3 – -1.1)	0.041

\*Correlation is significant at 0.05 level (2-tailed)

\*\*Correlation is significant at 0.01 level (2-tailed)

## DISCUSSION

This study assessed the average level of self reported adherence in Nsukka, a semi-urban city in Nigeria. The results showed that mean self reported adherence to antihypertensive therapy was lesser than the adherence cut-off value of 80% which has been used by most studies for labeling patients as adherent or non adherent<sup>17-19</sup>. Also, factors that have been reported in the literature as predictors of adherence to hypertensive therapy were explored in our study for possible correlation to adherence. Majority of these hypothesized factors were not correlated to adherence. However, higher educational status

and forming a habit of taking medication regularly increased adherence to hypertension medications while experience of a side-effect decreased adherence to medication. Factors that affect adherence to hypertension therapy established in this study have been reported by other studies conducted in Nigeria. Specifically, forming a habit of taking medications has been reported to improve adherence to antihypertensive medications<sup>11</sup>. Patients with formal education have been reported to be more compliant to treatment<sup>12</sup>. Generally, poor socioeconomic status, illiteracy and unemployment have been identified as important risk factors for poor adherence<sup>20,21</sup>.

However, since this study is one of such few studies conducted in South-Eastern part of the country, these identified correlates of adherence could be used in designing health interventions for hypertensive patients living in this region. It is important that health care providers are aware that of these problems. Such information should be used in practice to improve control of hypertension. Specifically, health care providers in the South-Eastern Nigeria should monitor their patients to ensure that they form the habit of medication taking. They should ensure that therapeutic regimen fits with patient's life style. It is important that health providers also ensure that patients agree with indications received from them. Taking care of such details could help patients to form the habit of taking their hypertension medications.

Higher educational status was also identified as a predictor of adherence in this study. This highlights the importance of giving more attention to hypertensive patients of lower educational training when indications are being giving or during patient's counseling. Health providers practicing in the South-Eastern part of the country should use different feedback techniques to assess how much their patients understand the suggestions they receive.

This study also highlighted the need of patient's education and counseling. Patients that experienced a side-effect were less likely to adhere to medication. Hypertensive patients will adhere more to therapy if they have a pre-knowledge of the possible side-effects that could result from treatment. A possible intervention to take care of adverse effects is to involve patients on self management of adverse effects i.e. to teach them how to identify adverse events and what to do when they occur<sup>22-24</sup>.

The major limitation of this study was that self-reported adherence was assessed once and not



longitudinally. One point measurement of adherence may not reflect true adherence to medication(s) since antihypertensive drugs are taken chronically. Another important point to consider when interpreting the result obtained in this study is that self-reported adherence was used. Patient's self-report may not be factual. Further studies should explore the use of multiple adherence assessment method like provider's report, Morisky Medication Adherence Scale (MMAS) etc which could be compared and aggregated to get a single adherence estimate.

Non response (missing value) bias was a limitation. Also, interviewer bias was another potential limitation due to differences in interviewers' attitude, though we believe that this effect should be minimal as all of them were trained before the study and they were highly experienced in this regard.

## CONCLUSION

Higher educational status and forming a habit of taking medication regularly increased adherence to hypertension medications while experience of a side-effect decreased self-reported adherence to medication. These factors identified as correlates of adherence to anti-hypertensive drugs in the study population could be used to design interventions to improve adherence to hypertension medications in Nigeria. However, there is need for a larger study targeted at identifying other factors that could affect adherence to long term hypertensive therapy in Nigerians with high blood pressure.

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## APPENDIX – Questionnaire

PARTICIPANT'S NO \_\_\_\_\_

LOCATION \_\_\_\_\_

SECTION B – Characteristics of participants (Please tick)					
Age _____	Gender M ___ F ___	Marital status Single ___ Married ___ Divorced ___			
Education status None _____	Primary/below _____	Intermediary/Secondary _____	Graduate/above _____		
Income/month _____	Family Hx of Hypertension Yes ___ No ___				
Co-morbidities _____					
1st Measurement SBP _____ DBP _____	2nd Measurement SBP _____ DBP _____				
SECTION B – Characteristics of hypertension and anti-hypertensive treatment (Please tick)					
1	Method of Initial diagnosis	Regular checkup _____	Checkup for HTN related symptoms _____	Checkup of other Causes _____	
2	Hypertension related complication	Please state _____			
3	Time since the last hospital visit (months)	_____			
4	Who pays for medication?	Self ___	NHIS ___	Family ___ Welfare/Charity ___ Employer ___	
SECTION C – Hypertension Medication					
5	Drug (Generic Name)	Strength	Frequency	Duration	
SECTION D – Adherence Measure					
6	How many times did you take your medication in the last	3 days or	5 days or	7 days	
SECTION D – Factors that encourage/discourage drug taking behavior					
7	Which of the following helps you to take your medications regularly			YES	NO
	Understanding the need of medication				
	Understanding the effectiveness of medication				
	Availability of Support System				
	Making medications a habit				
	Ready Availability of medication				
	Good relationship with the doctor				
	Keeping medication in sight				
	Others, please record below				
	Which of the following discourages you from taking your medication			YES	NO
	Lack of access to medication				
	Fear of getting used to medication				
	Cost of Medication				
Forgetting					
Side effects					
Dissatisfaction with treatment					
Others, please record below					