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Effect of educational intervention on knowledge about hypertension and factors predicting adherence to drug therapy

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Abstract
The present study was aimed at identifying the degree of knowledge of people with hypertension about the disease, identifying the factors predicting adherence to therapy and administering intervention. It was a quasi-experimental study involving 600 patients selected by multistage sampling technique. Adherence status was assessed using Morisky medication adherence scale8. Knowledge was measured using an eight-item instrument. Educational intervention in form of group discussions was administered. Values of $p \leq 0.05$ were considered statistically significant. BP control was significantly higher in those that adhered to antihypertensive medication compared with non-adhering patients ($\chi 2 = 14.526$; df = 1; p-value = < 0.001). Comorbidity and number of antihypertensive drugs the patients were taking were found to be the predictors of adherence. After intervention, the percentage of respondents with good adherence increased from 41.3% to 48.3% (p = 0.369) in the intervention group. Furthermore educational intervention had a positive effect on knowledge of the respondents [from 64% to 66.3% (p= 0.623)] in the intervention group. The results revealed that the educational intervention had positive impact of knowledge of hypertension and its treatment. Additionally, Comorbidity and number of antihypertensive prescribed were found to be the predictors of adherence to medications

Keywords: Hypertension, intervention adherence

INTRODUCTION

Hypertension (HTN), high or increased blood pressure (the systolic and diastolic level ≥ 140/90 mmHg), is a worldwide public health problem. It contributes to the burden of cardiovascular diseases, stroke, and renal failure leading to early mortality and disability [1]. Hypertension, when not controlled, is a significant medical and social problem in developed and developing countries [2]. Generally, good adherence to medications is an important achievement in disease management, and it is crucial to decrease complications like cardiovascular related morbidity and mortality [3,4]. However, estimates point out that the degree of the non-adherence to the treatments of Chronic Diseases (CD) worldwide ranges from 25% to 50 % [5]. One explanation for the high rate of non-adherence is that many patients do not

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understand the disease and the drug therapy. The asymptomatic course of the disease contributes to this lack of understanding and, as a result, many people believe that the disease is intermittent and can be treated exclusively with non-medication therapies alone, such as stress relief or homemade medication [6].

The relationship between the non-adherence to the hypertension treatment and the patient's knowledge about the disease and therapeutic regimen has been reported [5-7]. However, this relationship requires further evidence [7,8]. Moreover, in order for the healthcare professionals to act more effectively, by proposing and implementing actions that meet the real needs of population, it is necessary to identify the patients who do not adhere to the treatment and their characteristics, and the reasons why this occurs. Based on the above, the present study was aimed at identifying the degree of knowledge of people with hypertension about the disease, identifying the factors associated with the non-adherence to the anti-hypertensive drug therapy and the impact of educational intervention on non-adhering patients.

METHODS

This was a quasi-experimental study involving six public health care facilities selected by multistage sampling technique. List and addresses of all registered health care facilities operating hypertension clinic in the State was obtained from the State Ministry of Health (SMoH). Based on the list, there are fourteen hospital zones across Kano State. These zones were used as stratum. Each of these zones was assigned a unique number and the numbers were then entered into Microsoft Excel and five zones were then chosen according to a computerized random number generated. From the five zones selected, simple random sampling was used again to select hospitals to participate in the study. Where a zone has only one hospital, that hospital was automatically included in the study. Also, the only available teaching hospital was added to make-up the six facilities. Convenience sampling was used to recruit participants in each of the selected hospitals. Aminu Kano Teaching Hospital Research and Ethics Committee as well as Kano State Ministry of Health approved the study.

Included in the study were; hypertensive patients of 18 years old and above, patients on follow up at the hospital, and patients on treatment for over 6 months. Whereas sick patients on the appointment day warranting admission**,** pregnant hypertensive patients**,** individuals who were not capable of hearing and speaking**,** individuals with known mental disorders were excluded from participation.

During the study period, in all the facilities, except the teaching hospital, participants were seen in the same consultation room. Five pharmacy technicians were recruited and trained on the objectives of the study as well as the data collection instruments as research assistants to collect data.

Adherence status was assessed using the Morisky medication adherence scale −8 which is a self-reporting method to determine adherence. It contains eight questions with seven closed dichotomous (yes/no) answers and one liker scale question. Each item measures specific adherence behavior. The degree of adherence was determined according to the score resulting from the sum of all the correct answers [9]. Knowledge on hypertension and its treatment was assessed using eight questions tool adopted from Oliveria *et al* 10]. The questionnaire was translated to Hausa, the local language, and then retranslated to English. Additionally, patient characteristics were captured. Pretesting of questionnaires was carried out at Murtala Muhammad Specialist Hospital Kano, on 25 hypertensive patients who were not

included in the final sample of the study. Necessary adjustments to the questionnaires were made according to the findings of the pilot study to improve on the reliability. The calculated Cronbach's alpha were 0.765 and 0.797 for adherence and the knowledge scales respectively. The data collection technique was a face to face interview using the standardized questionnaire. To avoid the chance of recycling of data, a special mark was placed on each medical card. Educational interventions were administered to patients of the 3 facilities with least number of patients with good knowledge (intervention group) from May to September 2018, (five months).

Group discussions were held with the patients in the intervention group at the facilities where they were seen. Elements of interventions were: importance of adherence to antihypertensive in BP control, meaning of high blood pressure, meaning of controlled hypertension, hypertension as chronic condition, meaning of the two numbers reported for blood pressure, complications of high blood pressure, symptoms of high pressure, things to do to lower blood pressure, dietary recommendations of a low fat, low sodium diet with adequate consumption of fruits, vegetables, and fish was given. Exercise was also recommended to be done for at least 30 minutes per day.

Operational definition of terms

Adherent: respondents who scored ≥ 6 points on the Morisky medication adherence scale - 8 [11].

Controlled hypertension: maintaining the average BP reading less than 140/90 mmHg at the time of data collection irrespective of measurements at other time.

Knowledgeable: respondents who scored 6 points and above (≥ 6) for the knowledge question on hypertension (HTN).

Data processing and analysis. After each clinic day, data collected were entered into an excel spreadsheet where it was cleaned for errors and any other inconsistencies. At the end of data collection, the entire database in excel spreadsheet was exported to a SPSS version 20 which was used for statistical analysis. Descriptive statistic including frequencies, means and standard deviations were calculated. Each variable was first analyzed by using bivariate logistic regression (bivariate analysis) and independent variables having P-value of less than 0.25 were entered in to multivariate logistic regression model for final analysis. Multivariate analysis was done using backward logistic regression method. In multivariate analysis, variables with a P- value of ≤ 0.05 were considered as statistically significant. Adjusted odds ratio (AOR) was computed to see the strength and direction of the association between dependent and independent variables.

The impact of the intervention was assessed by collecting data in each of the facilities under study from October 2018 to March 2019, (six months) using the same instruments as in the pre-intervention study. Pre-intervention and post-intervention parameters of both intervention and control group were expressed as mean ±SD and compared using paired *t*-test.

RESULTS

Two questionnaires had incomplete entries therefore, 598 were analyzed representing a 99.7% response rate. In all the facilities, majority of the study participants were women except in Muhammadu Abdullahi Wase Specialist hospital Kano State where males constituted about 61% of the participants. The mean age of the participant from Murtala Muhammad Specialist hospitals was the highest (61.6 SD ±12.4) among the facilities while that of participants from Kura general hospital was the lowest (44.4 SD ±15.5). Majority of the interviewees in all the facilities stated they were married, followed by widowed, divorced/separated and those who

have never been married. Majority lived in rural areas while the rest lived in urban areas. Those without formal education constituted the majority with 36, 64, 65, 77, 44, and 57 representing Kura General hospital, D/Tofa General hospital, Waziri Gidado, Murtala Muhammad Specialist hospital, Muhammaadu Abdullahi Wase Specialist hospital and Aminu Kano teaching hospital respectively. In Muhammaadu Abdullahi Wase Specialist hospital, 20 participants reached post-secondary school, representing the highest among the facilities under study while Murtala Muhammad Specialist hospital had only 1 participant representing the lowest (table 1).

Three hundred and thirty two (55.5%) out of 598 patients had good adherence, while 266 (45.5%) had poor adherence. Of the 178 patients who had good BP control, 120 (67.5%) had good adherence while 58 (32.5%) had poor adherence. BP control was significantly higher in those that adhered to antihypertensive medication compared with non-adhering patients ($\chi 2 = 14.526$; df = 1; $p = < 0.001$ (Table 2).

Analysis of variance showed statistically significant difference between the facilities under study ($p < 0.001$). Post hoc analysis revealed significant difference existed between MMSH and all other facilities ($p < 0.001$), DTGH Vs MAWSH $p < 0.001$, while other pairs comparison $p > 0.05$ (Table 3).

When knowledge was compared using one-way ANOVA between the facilities under study, statistically significant difference was obtained ($p < 0.001$). Post hoc analysis revealed no significant difference existed between KGH Vs WGGH, DTGH Vs MMSH, AKTH Vs MAWSH (p value $p > 0.05$), DTGH Vs MAWSH $p < 0.001$. However, all other pair's comparison statistically significant ($p < 0.05$) (Table 3).

Factors associated with adherence to antihypertensive medications. Multivariate analysis revealed that number of antihypertensive, educational qualification, employment, marital status, availability of drugs, co-morbidity and hospitalization in the last one year due to complication were significantly associated with adherence to antihypertensive treatment. Accordingly, respondents who were on three antihypertensive medications were 0.42 times (AOR =0.420, 95% CI =0.205, 0.858) less likely to adhere to antihypertensive medications compared to those who were on one or two antihypertensive medications. Moreover, the odds of adherence to antihypertensive medications was four times (AOR = 3.865, 95% CI = 1.52, 9.83) higher in respondents who had post-secondary school education compared to those who had no formal education. Participants who were married were forty times (AOR =40.29, 95% CI = 3.95, 408.93) more likely to adhere to antihypertensive medications than those who had never married. Additionally, the odds of good adherence to antihypertensive medication was 3 times (AOR = 2.8, 95% CI = 1.194, 6.599) higher among respondents who were self-employed compared to those that were formally employed (Table 4).

Study participants who had no co-morbidity were 0.45 times (AOR = 0.454, 95%CI = 0.308, 0.670) less likely to adhere to antihypertensive medications than their counterparts. Finally, the odds of adherence to antihypertensive medications was twenty times (AOR = 20.14, 95%CI =4.72, 85.96) higher in respondents that were hospitalized in the last one year compare to those that were not (Table 4).

Effect of educational intervention on adherence of the respondents. From the findings in Table 4, positive effect on adherence to hypertension medication was observed. After intervention, percentage of respondents with good adherence increased from 41.3% to 48.3% ($p = 0.369$) in the intervention group. However, the effects were not statistically significant. Furthermore, in Table 6 it was observed that educational

intervention had positive effect on knowledge of the respondents. Prior to intervention, 19.7% had good knowledge of hypertension and its treatment. This number increased to 66.3% (p= 0.001).

DISCUSSION

The study established that 55.5% of the respondents were fully adherent to their hypertension medication while 29.8% had their BP controlled. The BP control rate in this study was higher than that reported in Port Harcourt, Rivers State, and south-south Nigeria [12]. However, other studies reported higher BP control [13, 14]. The findings of this study agree with previous reports that adequate BP control rates are low in Nigeria and occur only in less than half of treated hypertensives [12, 13, and 14].

Table 1: Respondents' Demographic Characteristics

Variables		Kura	D/Tofa	Wiziri Gidado	Murtala	Nasarawa	AKTH
Mean Age (±SD)		44.4 (15.5)	52.9 (15.3)	58.7 (14.4)	61.6 (12.4)	54.8 (11.7)	49.0 (13.2)
Gender	Male	31	20	30	23	61	22
	Female	66	77	70	76	38	78
Marital Status	Never Married	0	0	5	1	3	5
	Married	76	67	58	50	75	54
	Divorced/Separated	1	0	5	7	9	7
	Widowed	22	32	32	41	34	34
Address	Rural	37	23	52	12	12	46
	Urban	63	73	48	87	83	54
Employment	Formally employed	18	4	5	4	13	11
	Unemployed	61	39	48	68	52	39
	Self Employed	17	56	34	25	29	38
	Pensioner	1	1	13	2	5	12
Educational Level	No Formal Education	36	64	65	77	44	57
	Primary	19	22	4	18	11	11
	Secondary	24	6	19	3	24	16
	Post-Secondary	18	3	12	1	20	16

Table 2: Adherence and B.P Control

Adherence	Controlled		Not Controlled		Total
	N	%	n	%	
Poor adherence	58	32.5	208	49.5	266
Good adherence	120	67.5	212	50.5	332
Total	178		420		598

$\chi 2=14.526$ df=1, p<0.001

Table 3: Comparison of Adherence, Knowledge to Hypertension Medication in Various Facilities under Study

		Sum of Squares	Df	Mean Square	F	Sig.
Adherence	Between Groups	133.451	5	26.690	19.697	.000[a]
	Within Groups	800.838	591	1.355		
	Totals	934.290	596			
Knowledge	Between Groups	671.700	5	134.340	70.970	.000[b]
	Within Groups	1120.603	592	1.893		
	Totals	1792.303	597			

One way Anova, Significant at $\alpha < 0.05$ [a]Post hoc analysis (Adherence): KGH Vs WGGH, DTGH Vs MMSH, AKTH Vs MAWSH – p value > 0.05, other pair comparison p value < 0.05 [b]Post hoc analysis (Knowledge): MMSH Vs all other facilities – p value = < 0.001, DTGH Vs MAWSH p = 0.001, other pair comparison p value > 0.05

Table 4: Univariate Analysis of the Socio-demographic and Clinical Factors for Treatment Adherence (n = 598)

Factors		OR (CI)	Adherence level, n (%)		*P*-value
			Good	Poor	
Age					0.144
No. of Antihypertensive	One drug	1.0	42 (77.8)	12 (22.2)	0.017*
	Two drugs	0.67 (.327-1.384)	132 (62.0)	81 (38.0)	0.282
	Three drugs	0.42 (.205-.858)	134 (46.2)	156 (53.8)	0.017*
	More than 3 drugs	0.8 (.319-2.168)	24 (57.1)	18 (42.9)	0.707
Educational qualification	No formal education	1.0	187 (53.7)	161 (46.3)	0.007*
	Primary education	0.9 (.525-1.580)	51 (58.6)	36 (41.4)	0.740
	Secondary education	0.8 (.440-1.347)	47 (50.5)	46 (49.5)	0.359
	Post-Secondary	3.9 (1.519-9.833)	47 (67.1)	23 (32.9)	0.005*
Knowledge	Good		86 (63.2)	50 (36.8)	0.04*
	Poor	0.662 (.811-1.804)	246 (57.7)	216 (42.3)	
Employment	Formally Employed	1.0	33 (60.0)	22 (40.0)	0.034*
	Unemployed	1.8 (.771-4.103)	161 (51.9)	149 (48.1)	0.177
	Self Employed	2.8 (1.194-6.599)	120 (60.3)	79 (39.7)	0.018*
	Pensioner	3.2 (.942-10.928)	18 (52.9)	16 (47.1)	0.062
Monthly Income (Nigerian Naira)	Up to 10, 000	1.0	101 (59.1)	70 (40.9)	0.592
	10,000 to 30, 000	1.3 (.273- 6.191)	45 (52.3)	41 (47.7)	0.741
	30, 000 to30, 50, 000	1.6 (.379 - 6.545)	34 (59.6)	23 (40.4)	0.532
	Above 50,000	2.3 (.591 - 9.654)	12 (40)	18 (60)	0.222
Address	Rural	1.0	152 (62.3)	92 (37.7)	1.000
	Urban	0.6 (.407-.892)	180 (50.4)	174 (49.6)	0.011*
Marital Status	Never Married	1.0	1 (7.1)	13 (92.9)	0.012*
	Married	40.2 (3.95-408.93)	222 (58.1)	160 (41.9)	0.002*
	Divorced/Separated	57.9 (5.22-640.56)	18 (33.9)	11 (62.1)	0.001*
	Widowed	39.3 (3.69-418.74)	91 (52.6)	82 (47.4)	0.002*
Gender	Male		104 (54.5)	87 (45.5)	
	Female	1.200 (0.777-1.854)	228 (56.1)	179 (43.9)	0.411
Counseled by prescriber	Yes				
	No	1.63 (0.71-3.77)			0.247
Availability of drugs	Yes		250 (58.4)	178 (41.6)	
	No	1.54 (1.02-2.31)	82 (48.2)	88 (51.8)	0.036
Comorbidity	Yes		248 (67.4)	120 (32.6)	
	No	0.45 (0.308-0.67)	146 (63.8)	83 (36.2)	0.000*
Hospitalized in the last one year	Yes		33 (52.4)	30 (47.6)	
	No	20.14 (4.72 -85.96)	292 (55.5)	234 (44.5)	0.000*
Average Drug Cost (NGN)	Up 2000	2.18 (1.00- 1.00)	235	140	0.000*
	> 2000		97	126	
Average Transport fare		0.99 (.998 - 1.000)	-	-	0.111
Duration of treatment	1-5 years		209 (59.9)	140 (40.1)	
	6-10 years	1.104(0.210-5.95)	77 (54.6)	64 (45.4)	0.907
	11-15 years	1.841 (0.332-10.216)	21 (44.7)	26 (55.3)	0.485
	16-20 years	0.561 (0.080-3.951)	14 (37.8)	23 (62.2)	0.562
	Above 20 years	0.973 (0.153-6.203)	11 (45.8)	13 (54.2)	0.977
Alcohol	No		332 (55.6)	265(44.4)	
	Yes		0 (0)	1 (100)	
Cigarette	No		326 (56.3)	253 (43.7)	
	Yes		6 (31.6)	13 (68.4)	

* = statistically significant at p< 0.05; ** = statistically significant at p < 0.005

Table 5: Regression analysis of factors associated with treatment adherence in hypertensive patients (n = 598)

Variable		OR (95% CI)	*P*-value
No. of Antihypertensive	One drug	1.0	0.006*
	Two Drugs	2.121 (0.477-9.418)	0.323
	Three drugs	0.994 (0.252-3.919)	0.993
	More than three drugs	0.631 (.162-2.455)	0.506
Comorbidity	Yes	1.0	
	No	2.108 (1.468-3.028)	0.000*

* = statistically significant at p< 0.05*;* ** = statistically significant at p < 0.005; CI=confidence interval, OR=odds ratio,

Table 6: Effect of Educational Intervention on Adherence and Knowledge of the respondents

Variable	Control Group		Intervention Group		*p* value
	Pre	Post	Pre	Post	
Adherence	67.67	65.00	41.33	48.33	0.057[c]
	(11.68)	(10.82)	(12.42)	(4.93)	0.369[i]
Knowledge	35.6.00	40.67	19.67.	66.33	0.784[c]
	(23.26)	(16.04)	(19.00)	(15.63)	0.001[i]

c = control, i = intervention

The low BP control coul probably be due to a number of factors such as poor patients' knowledge of hypertension and its treatment, inadequate healthcare facilities, misconceptions and health beliefs about hypertensive disorder [15].

Good adherence rate of 55.5% in this study was higher than of 45.0% previously reported in some parts of Kano, [14]. The findings of this study showed the importance of adherence in BP control amongst the study population. However, there may be other factors amongst the study population that might contribute to poor BP control despite adherence to medications. Healthcare providers should put more efforts to ensure that their adult hypertensive patients adhere to their antihypertensive medications. This could be through organizing regular lectures on the importance of adherence and educating the patients on hypertension and its treatments. Additionally, getting feedback from the patient about adherence and other factors that can affect the adherence is necessary to achieve target BP. Without regular feedback on medication adherence between healthcare providers and hypertensive patients, a patient with poor BP control may not achieve BP target. This would help the healthcare providers to uncover medication related problems.

Number of hypertensive drugs that the respondents were taking was associated with BP control (p<0.001). Respondents who took two antihypertensive were more adherent than those who took other number of combinations. This was in contrast with the findings of a study carried out in the Eastern part of the country which reported taking three or more drugs was associated with better BP control than any other number of combination in that study [16]. Inkster et al [17] in a study to determine adherence to antihypertensive medication and association with patient and practice factors found no significant association between adherence and number of antihypertensive taken. However, those taking more than three antihypertensive would be more likely to develop adverse effects from the drugs, which would affect compliance to treatment as some patients opt to discontinue the drugs or skip them for a while. Higher number of antihypertensive drugs also mean higher cost for the drugs thus resulting to some patients' inability to purchase the prescribed drugs and consequently poor adherence.

Study participants who had no co- morbidity were 0.45 times less likely to adhere to

antihypertensive medications than their other counterparts. Similar finding was reported in a study carried out in America to establish predictors of first fill adherence for patients with hypertension [18]. A different finding was identified in a study in America where patients with depression were found to be more likely to become non-adherent [19]. Those hypertensive patients with other chronic illnesses, example diabetes mellitus would perceive the combined danger of the two or more diseases and probably become more adherent than those suffering from hypertension only.

Study participants who were reported to have been hospitalized due to hypertension complications in the previous one year were 20 times more likely to be adherent than those who had not been hospitalized. The perceived danger of hypertension following its complication warranting hospitalization and enhanced interaction between the patient and clinicians in the hospital may impact positively on the patient's adherence to medication [20].

There was a statistically significance relationship between adherence to hypertension medication and respondent's knowledge to hypertension and its treatment. A similar study in Ethiopia to establish adherence to antihypertensive treatment and associated factors also identified patient's knowledge to hypertension and its treatment as one of independent predictors of adherence [21]. Patients who are more knowledgeable about hypertension and its treatment would understand better the importance of maintaining optimal BP and therefore would be more compliant to their treatment as compared to those who are less knowledgeable. As better awareness on hypertension is a significant factor in improving treatment adherence, more appropriate health education strategies may be needed for rural hypertensive patients. Health education about hypertension is usually organized by healthcare professionals in hospitals or communities in the urban setting. Therefore, it is necessary for healthcare providers to visit rural areas to convey hypertension knowledge. Furthermore, the society, government, and medical institutions should collaborate to help patients improve their hypertension awareness

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