
IMPROVING ADHERENCE TO ANTIHYPERTENSIVE MEDICATIONS WITH EDUCATIONAL INTERVENTION

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ABSTRACT

Hypertension awareness, treatment and control are relatively low in Nigeria, thus its continuous rise in incidence. Adherence to therapy is the mainstay of the success of treatment regimens. Interventions to improve treatment adherence and subsequent positive outcomes are recommended worldwide. An educational intervention study was carried out in two tertiary health facilities (FMC and NDUTH) in Bayelsa State, Nigeria. A convenient sampling technique was adopted. Trained Pharmacist interviewed willing hypertensive patients between 21-80 years of age at the clinic using an adapted modified form of the Morisky Medication Adherence Scale (MMAS-8). Demographic characteristics were also recorded. The responses (425) were analyzed and observed. Interactive health talk to educate patients was then carried out on weekly cardiology clinic days for 6 weeks. The questionnaire was re-administered after two months and responses (297) were analyzed in like manner. The results of post intervention phase were compared with that of pre intervention for possible significant differences. Low but increasing adherence scores (4.74 to 5.21 FMC; 4.87 to 5.67 NDUTH) pre and post intervention were reported in the study. Being married, living with an adult, education above secondary school and being employed were reported to enhance adherence. Goal BP increments (preR² = 0.75, postR² = 0.505 FMC; and preR² = 0.723, postR² = 0.910 NDUTH) were also in tandem with the adherence increments. Educational intervention brought about a modest improvement in adherence, a significant improvement in performance of all psychometric measures of the instrument and a tandem goal BP increment. Marriage, companionship, education and employment were factors that positively impacted adherence.

Key words: Adherence to antihypertensive medications, Bayelsa State, Educational intervention, Nigeria, Tertiary health facilities.

INTRODUCTION

Hypertension (HTN) is ranked first among the preventable cause of death worldwide.¹⁻³ The awareness about HTN, treatment and control are relatively low worldwide, though with significant differences among countries.⁵ Less developed and developing countries continue to experience a steady rise in its incidence.⁴ The disease is characterized most times by absence of symptoms for a long time and its significant side effects may only occur after years. Among its several modes of treatment, drug therapy has been identified as the key method for long-term control of blood pressure with evident restoration of good quality of life.⁶ It is recorded that the timely initiation of pharmacotherapy, taking medications as often as prescribed, and persisting on therapy long-term (optimal adherence) are the recommended best of practice rules for the success of treatment regimens in HTN.⁷ Low antihypertensive medication adherence has been proven to have direct proportional increase in end-organ damage and other adverse outcomes² while optimal adherence have been reported to improve patient quality of life.^{2,7} Several categories of factors including demographic, socioeconomic, concomitant medical-behavioral conditions, therapy-related, healthcare team and system-related factors, and patient factors are associated with non-adherent patient behaviors. Understanding the categories is useful in managing non-adherence. In patients at high risk for major adverse cardiovascular outcomes, electronic and biochemical monitoring are useful for detecting non-adherence and for improving adherence. Increasing the availability and affordability of these more precise measures of adherence represent a future opportunity to realize more of the proven benefits of evidence-based medications.

Though there is no gold-standard method routinely used in clinical practice to accurately assess the different facets of adherence, several methods, direct or indirect, are available for use. The indirect methods include the self-report questionnaires whereas some direct methods are those of the therapeutic drug monitoring (TDM), electronic devices, and pick-up/refill rates. They all have their aim of use as easiness, exact serum measurements, unobtrusiveness and wholesomeness, respectively. Of the questionnaire form, the choice of the instrument depends on the disease state and its applicability.⁸ The questionnaire methods have the propensity of measuring the outcomes of evaluation, either economic, clinical or humanistic. Tools that measure the impact of the pharmacotherapy on the quality of life and the patient's subjective experience and their attitude and adherence to medication are presently in common use. One of the most widely used patient self-report instruments is the validated four-item Morisky, Green, and Levine Self-Reported Medication Taking Scale,⁹ later revised as Morisky Medication Adherence Scale (MMAS-4),^{10,11} which measures non-adherence using 4 items and identified 2 types of non-adherence behavior – unintentional and intentional.¹²⁻¹⁷ The Morisky Medication Adherence Scale (MMAS-8) is an 8-item self-report scale for measuring medication-taking behaviour developed from the previously validated 4-item scale and supplemented with additional items to better capture barriers surrounding adherence behavior.¹⁸⁻²⁰

The low awareness about HTN, its treatment and control, as stated above have been suggested to be countered by several means. The above low patterns were also similar to that of the case of diabetes. Educational intervention, among others, has been suggested to be one of such stop-gap methods. The study aims to use an educational intervention to enhance adherence to antihypertensive drugs in Niger Delta University Teaching Hospital (NDUTH) Okolobiri and Federal Medical Center (FMC) Yenagoa, in Bayelsa State, in the Niger Delta region of Nigeria.

METHOD

STUDY AREA, DESIGN, PARTICIPANT SELECTION AND INSTRUMENT ADAPTATION

A prospective cross sectional interventional study with before-and-after design was carried out with the aid of an adapted modified form of the Morisky Medication Adherence Scale (MMAS-8) in FMC Yenagoa and NDUTH Okolobiri, all in Bayelsa state. In the instrument, question number 5 was modified positively for easier understanding of the participants. Demographic data, blood pressure history and other patient baseline characteristics were also included in the instrument. The instrument recorded a 0.735 chronbach's alpha after the pilot study with 42 patients from Diète Memorial Hospital in the same state.

INSTRUMENT ADMINISTRATION AND INTERVENTION

After ethical approval, the study instrument was administered to consenting participants using a convenient sampling technique at NDUTH Okolobiri and FMC Yenagoa. Trained pharmacists interviewed patients aged between 21-80 years on their respective clinic days and responses entered into the study instrument directly. A total of 425 responses (FMC=256, NDUTH=169) were collected and analyzed. The intervention was given as an interactive health talk lasting for 45 minutes minimum with participants on their weekly clinic days in the cardiology clinics for 6 weeks, based on the observed factors of non adherence in the first study. Two months after the intervention, the study instrument was repeated using the same pattern. The valid responses post intervention were 297 (FMC=153, NDUTH=144) were collected and analyzed. The two results were compared and trend analysis was carried out, using necessary statistical tools.

RESULTS

ADHERENCE SCORES PRE- AND POST INTERVENTION

The Modified Morisky Adherence Scale-8 (MMAS8) scores adherence from 0 to 5.9 as low adherence, 6 to 7.9 as medium adherence and 8 as high adherence. The pre-intervention study reveals 4.74 and 4.87 adherence for FMC Yenagoa and NDUTH Okolobiri, respectively, whereas the post-intervention recorded 5.21 and 5.67 adherence for FMC and NDUTH respectively. The improvement observed after the intervention for each facility was not found to be statistically significant. For instance for FMC Yenagoa, the success was the progression of 4.74 to 5.21, whereas in NDUTH Okolobiri was from 4.87 to 5.67. This is as shown in Table 1 below.

TABLE 1: Pre and post intervention antihypertensive drugs adherence levels in FMC Yenagoa and NDUTH Okolobiri, Bayelsa state pre and post intervention

S/n	Question item	Institution				
		FMC		NDUTH		
		Pre(256)	Post(153)	Pre(169)	Post(144)	
1	Do you sometimes forget to take your high blood pressure medications?	178	104	71	98	
2	In the last two weeks was there any day when you did not take your blood high blood pressure medication/s?	120	123	108	107	
3	Have you ever stopped taking your high blood pressure medication/s or decreased (take less of) the dose without first warning (telling) your doctor because you felt worse when you took them?	93	129	131	110	
4	When you travel or leave the house, do you sometimes forget to take your high blood pressure medication/s?	154	87	100	99	
5	Did you forget to take your high blood pressure medication/s yesterday?	204	150	146	111	
6	When you feel your blood pressure is controlled, do you sometimes stop taking your high blood pressure medication/s?	142	74	63	98	
7	Have you felt distressed (worried) for strictly following your high blood pressure treatment?	121	40	90	103	
8	How often do you have difficulty to remember taking all your blood pressure medication?	Never (1)	182(182)	41(41)	49(49)	47(47)
		Almost Never(0.25)	73(18.25)	66(16.5)	43(10.75)	25(6.25)
		Sometimes(0.75)	0(0)	41(30.75)	70(52.5)	29(21.75)
		Frequently(0.75)	0(0)	3(2.25)	5(3.75)	21(15.75)
		Always(0)	0(0)	2(0)	2(0)	22(0)
Adherence		4.74	5.21	4.87	5.67	

0 to 5.9 (low adherence), 6 to 7.9 (medium adherence) and 8 (high adherence)

ADHERENCE AND PATIENT BASELINE CHARACTERISTICS

Pearson chi-square tests and t-tests were also carried out between patient demographic baseline characteristics and adherence to determine any association. Patterns of adherence per patient baseline characteristics in the two facilities were similar in both the pre-intervention and post-intervention studies. For instance, there was no statistically significant difference among the various genders. Analysis of the patient baseline characteristics revealed that female patients were more adherent to antihypertensive medications than male counterparts in FMC Yenagoa in both pre (2.48 against 2.28) and post intervention (2.80 against 2.10), but in NDUTH Okolobiri, female patients were more adherent in the pre intervention (2.59 against 2.29), while in the post intervention, male patients were observed to be more adherent (3.61 against 2.06). Adherence was found to be higher in ages above 60 years in FMC Yenagoa in the pre intervention (1.81) but spread to younger ages after the intervention. For NDUTH, the more adhering age group pre-intervention was the age below 40 (3.89), but there was a wider and more even spread after the intervention. Married patients, patients living with adults, patients with minimum of secondary education and those who are employed in government sectors/retirees in both facilities were also reported to contribute more adherence values among the demographic baseline characteristics studied in the pre and post interventions of the facilities. This is as shown in Table 2 below.

Individual chi-square analysis revealed some level of association between the Modified Morisky Adherence Scale (MMAS) study questions and selected patient demographic factor of the study. The intervention study also revealed a similar pattern of response. Gender was only significantly affected by how often one have difficulty to remember taking all blood pressure medication. It revealed that female patients always remembered to take BP medications more regularly as compared to their male counterpart.

Increase in age was found to be proportional to increase in the rate of forgetfulness, the rate of skipping as well as the rate of stoppage of high blood pressure medication. The experienced distress level, and the rate of having difficulty to remember taking blood pressure medication were also age related. Married persons seem to perform better in all adherence measures compared to their unmarried counterparts. Higher education was seen to positively impact adherence. This was mostly observed after the intervention. Government employed staff were also revealed to perform better in specific adherence measures compared to their counterparts. The details are as indicated in Tables 3 and 4.

Table 2. Adherence and Demographic characteristics (pre and post intervention) for FMC Yenagoa and NDUTH Okolobiri

Item	Response	Institution			
		FMC pre (256)	FMC post (153)	NDUTH pre (169)	NDUTH post (144)
Gender	Male	2.28	2.1	2.29	3.61
	Female	2.48	2.8	2.59	2.06
Age group	<40	0.38	1.5	3.89	1.48
	40-50	1.19	1.2	0.40	0.81
	51-60	1.38	1.5	0.58	1.95
	>60	1.81	0.7	0.00	1.42
Marital status	Married	3.61	3.2	3.89	3.34
	Single	0.36	1.3	0.40	0.91
	Divorced/separated	0.77	0.5	0.58	1.42
	Unclassified	0.01	0	0.00	0.00
Living	Alone	0.64	0.4	0.45	1.44
	With adults	3.88	3.5	3.91	3.10
	With only children <16yrs	0.07	0.5	0.49	1.11
Education	Complex	0.17	0.5	0.02	0.02
	No school	0.39	0.4	0.23	0.18
	Primary	0.81	0.1	0.39	0.80
	Secondary	1.76	1.4	1.41	2.16
Occupation	Tertiary	1.78	3	2.84	2.50
	Government staff/ retired	2.68	3.3	3.19	4.05
	Private sector staff/ retiree	0.26	0.2	0.50	0.29
	Self employed	1.17	1.2	0.51	0.60
	Unemployed	0.51	0.2	0.17	0.54
	Retired from self employment	0.10	0	0.32	0.18
Total ADH		4.74	5.21	4.87	5.67

0 to 5.9 (low adherence), 6 to 7.9 (medium adherence) and 8 (high adherence)

Table 3: Relationship between adherence and demographic characteristics of hypertensive patients in FMC Yenagoa Pre and Post Intervention

ITEM	RESPONSE LABEL	FMC YENAGOA (PRE) 256											FMC YENAGOA (POST)153														
		M1	M2	M3	M4	M5	M6	M7	M8	M1	M2	M3	M4	M5	M6	M7	M8										
		NO	NO	NO	NO	YES	NO	NO	(1)	(0.2)	(0.75)	(0.75)	(0)	ADH	NO	NO	NO	NO	YES	NO	NO	(1)	(0.25)	(0.75)	(0.75)	(0)	ADH
Gender	Male	82	60	40	73	98	70	59	74	0	26	0	0	2.1	48	54	54	36	61	36	18	11	0.10	0.10	0	0	2.1
	Female	96	60	53	81	106	72	61	77	0	29	0	0	2.8	56	69	75	51	89	38	22	30	0.10	0.10	0	0	2.8
	sig.	0.5010.41 0.2820.9570.7070.4610.5020.576											.068 .165 .690 0.924 0.191 .567 0.288														
AGEGRP	<40	16	9	5	10	18	10	10	17	0	2	0	0	1.5	32	39	35	26	43	19	15	13	0	0.10	0	0	1.5
	40-50	46	31	18	37	56	37	27	39	0	14	0	0	1.2	23	28	34	24	37	15	16	9	0	0	0	0	1.2
	51-60	53	37	26	46	55	40	37	44	0	15	0	0	1.5	37	35	41	25	49	29	7	14	0	0.10	0	0	1.5
	>60	63	43	44	61	75	55	46	51	0	24	0	0	0.7	12	21	19	12	21	11	2	5	0	0	0	0	0.7
	Sig.	0.4850.556.037* 0.1810.8510.6310.4930.378											.335 .009* .507 0.164 0.158.004* 0.238														
MARIT. STAT.	Married	134	92	67	120	157	109	91	114	1	40	0	0	3.2	66	76	85	54	97	52	24	28	0.10	0.10	0	0	3.2
	Single	13	9	7	9	16	13	9	13	0	4	0	0	1.3	29	33	30	25	37	16	15	11	0	0.10	0	0	1.3
	Div/wid/sep	31	19	19	24	30	19	20	24	0	11	0	0	0.5	9	14	14	8	16	6	1	2	0	0	0	0	0.5
	Unclassified	0	0	0	1	1	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Sig.	0.4470.7870.5270.4530.4560.2620.9750.609											0.2230.4620.5190.365 0.373.027* .046*														
EDUCATION	No school	15	12	10	11	13	11	11	13	0	3	0	0	0.4	10	12	9	9	12	8	6	2	0	0	0	0	0.4
	Primary	32	23	19	28	31	21	22	25	0	6	0	0	0.1	2	2	2	1	2	0	1	1	0	0	0	0	0.1
	Secondary	68	46	33	56	73	53	38	59	0	23	0	0	1.4	28	33	39	21	42	22	8	14	0	0	0	0	1.4
	Tertiary	63	39	31	58	85	56	48	53	0	22	0	0	3	64	76	79	56	94	44	25	24	0.10	0.10	0	0	3
	Sig.	0.2250.1440.1270.7180.1820.9260.4360.144											0.9120.6530.1470.688 0.4910.276.000*														
OCCUPATION	Gov. Staff	99	67	50	89	120	81	63	86	0	30	0	0	3.3	73	84	87	59	102	53	32	22	0.10	0.10	0	0	3.3
	Private staff	9	6	4	6	14	7	8	9	0	4	0	0	0.2	3	5	3	2	8	4	0	1	0	0	0	0	0.2
	Self employed	45	30	23	39	48	35	27	38	0	15	0	0	1.2	23	29	34	21	35	17	8	13	0	0	0	0	1.2
	Unemployed	20	15	13	15	17	16	14	15	0	5	0	0	0.2	5	5	5	5	5	0	0	5	0	0	0	0	0.2
	Retired	4	1	3	3	3	3	5	2	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Sig.	0.5920.39 0.3610.37 0.1720.9240.4790.501											0.0990.415.001*0.2410.9430.3370.11 .000*														

Table 4: Relationship between adherence and demographic characteristics of hypertensive patients in NDUTH Okolobiri Pre and Post Intervention

ITEM	RESPONSE LABEL	NDUTH OKOLOBIRI (PRE) 169										NDUTH OKOLOBIRI (POST) 144															
		M1	M2	M3	M4	M5	M6	M7	M8	M1	M2	M3	M4	M5	M6	M7	M8										
		NO	NO	NO	NO	YES	NO	NO	(1)	(0.2)	(0.75)	(0.75)	(0)	ADH	NO	NO	NO	NO	YES	NO	NO	(1)	(0.25)	(0.75)	(0.75)	(0)	ADH
Gender	Male	37	49	60	46	66	26	47	24	4.8	26	1.5	0	2.3	39	51	44	52	53	46	55	21	0	0.1	0.1	0	2.5
	Female	34	59	71	54	80	36	43	25	6	27	2.3	0	2.6	29	35	35	33	42	31	33	19	0	0.1	0	0	1.8
	sig.	0.4960.55 0.7470.2240.3620.1750.984										.345 0.475.115 .966 .056 .702 .000*															
AGEGRP	<40	59	87	104	83	111	49	75	40	7.5	41	2.3	0	3.9	24	24	24	22	23	22	28	13	0	0.1	0	0	1.3
	40-50	5	8	10	7	16	4	6	5	2	4.5	0.8	0	0.4	6	9	10	13	14	7	10	3	0	0	0	0	0.5
	51-60	7	13	17	10	19	9	9	4	1.3	7.5	0.8	0	0.6	13	29	23	32	36	26	32	9	0	0	0	0	1.4
	>60	0	0	0	0	0	0	0	0	0	0	0	0	0	25	24	22	18	22	22	18	15	0	0	0	0	1.2
	Sig.	0.059.005*.027*.03690.479.047*.0746										.000*.017*.160 .646 .239 .562 .003*															
MARIT. STAT.	Married	59	87	104	83	111	49	75	40	7.5	41	2.3	0	3.9	39	50	52	53	46	47	53	25	0	0.1	0	0	2.6
	Single	5	8	10	7	16	4	6	5	2	4.5	0.8	0	0.4	12	14	10	14	13	15	19	2	0	0	0	0	0.7
	Div/wid/sep	7	13	17	10	19	9	9	4	1.3	7.5	0.8	0	0.6	17	22	17	18	36	15	16	13	0	0	0	0	1.1
	Unclassified	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Sig.	0.059.005*.027*.03690.479.047*.0746										0.6020.318.003*.018*.001* .002*.000*															
EDUCATION	No school	6	6	5	5	7	4	3	2	0.8	0.8	0	0	0.2	0	2	2	3	3	2	2	2	0	0	0	0	0.1
	Primary	5	7	12	8	10	5	10	4	0.8	4.5	0	0	0.4	16	14	14	12	14	12	8	16	0	0	0	0	0.7
	Secondary	18	35	42	24	41	14	27	15	1.8	20	1.5	0	1.4	13	26	24	31	42	24	32	9	0	0.1	0.1	0	1.4
	Tertiary	42	60	72	63	88	39	50	28	7.5	28	2.3	0	2.8	39	44	39	39	36	39	46	13	0	0.1	0	0	2.1
	Sig.	0.4220.3360.13 0.2650.4930.33 0.069										.000*.003*.008 0.2420.269 .007*.000*															
OCCUPATION	Gov. Staff	47	70	85	65	96	38	57	35	6.5	37	2.3	0	3.2	49	63	61	64	72	57	65	31	0	0.1	0.1	0	3.3
	Private sector staff/ retiree	5	11	14	10	17	6	11	4	1	5.3	0.8	0	0.5	3	3	2	3	6	3	5	0	0	0	0	0	0.2
	Self employed	7	11	16	9	15	7	9	3	1.8	6	0.8	0	0.5	5	7	8	8	10	7	10	5	0	0	0	0	0.4
	Unemployed	3	4	4	4	5	2	3	2	1	0	0	0	0.2	8	10	6	6	4	8	8	2	0	0	0	0	0.4
	Retired	6	8	7	8	8	4	5	5	0.3	2.3	0	0	0.3	3	3	2	4	3	2	0	2	0	0	0	0	0.1
	Sig.	0.5730.8650.3340.5360.3570.84 0.138										0.1230.13 0.1 .042*.008*0.2510.053.000*															

ADHERENCE AND GOAL BP

The study reveals an increase in the percentage of patients that reached goal BP (less than 140/90 mmHg) after the intervention, which is consistent with reported improvement in medication adherence. This trend was observed from the first to the third months of study for both facilities after extrapolation. There was divergent trend observed in FMC after the intervention was carried out (pre-intervention $R^2 = 0.75$; post-intervention $R^2 = 0.505$). This depicts decreased rate of improvement in adherence after the intervention. For NDUTH, convergent trends were observed ($R^2 = 0.723$ for pre-intervention and $R^2 = 0.910$ for post-intervention), depicting increment in rate improvement in antihypertensive medication adherence. This is as shown in figure 1 below.

DISCUSSION

Low but increasing adherence scores (4.74 to 5.21 FMC Yenagoa and 4.87 to 5.67 NDUTH Okolobiri) were reported in the study. Sociodemographic factors such as marriage, patients living with adults, post secondary education and employment in government sectors were reported as factors favoring adherence. Goal BP increments were also reported to be in tandem with increase in adherence.

A six month cross-sectional descriptive comparative study was carried out by Sivanandy and Sumathy, 2009, on intervention to improve patient adherence with Antihypertensive Medications, in the USA, This study reported 95.4% improvement ($p < 0.05$) from pre-intervention (0.0%) to final intervention, and 95.35% goal BP improvement ($p < 0.05$).

In the study carried out by Gruesser, Hartmann, Schlottmann, Lohmann, Sawiki, Joergens, 1997, in Germany, a structured treatment and teaching programme for out-patients with hypertension was done. Results reported 22 weeks after educational intervention include reduction of body weight (2 kg, $P < 0.001$) and blood pressure (from systolic 158 \pm 18 to 148 \pm 17 mm Hg, $P < 0.001$; diastolic 91 \pm 9 to 86 \pm 9, $P < 0.001$).

Magadza, Radloff, and Srinivas, in 2009, while working on the effect of an educational intervention on patients' knowledge about hypertension, beliefs about medicines, and adherence reported significant increases in levels of knowledge about hypertension and its therapy ($P < .0001$) but not for adherence [24].

Literature has it that modification of behavioral change may need a very long period [27 – 29]. This may explain the insignificant increase in the adherence after the intervention of this report. For this very study, the post-intervention measurements were performed 8 weeks after the entire educational intervention had been completed. This might not have been sufficient time for adequate behavior changes to occur. Gruesser et al 1997, in their study, reported improvements in adherence levels and health-related parameters 23-27 weeks after an educational intervention was performed [23].

This research work draws its strength from the all-encompassing approach and the use of two different facilities. This work stands to be one of first of its kind in providing succinct and needed information of the effect of educational intervention on adherence in the Niger Delta region of Nigeria.

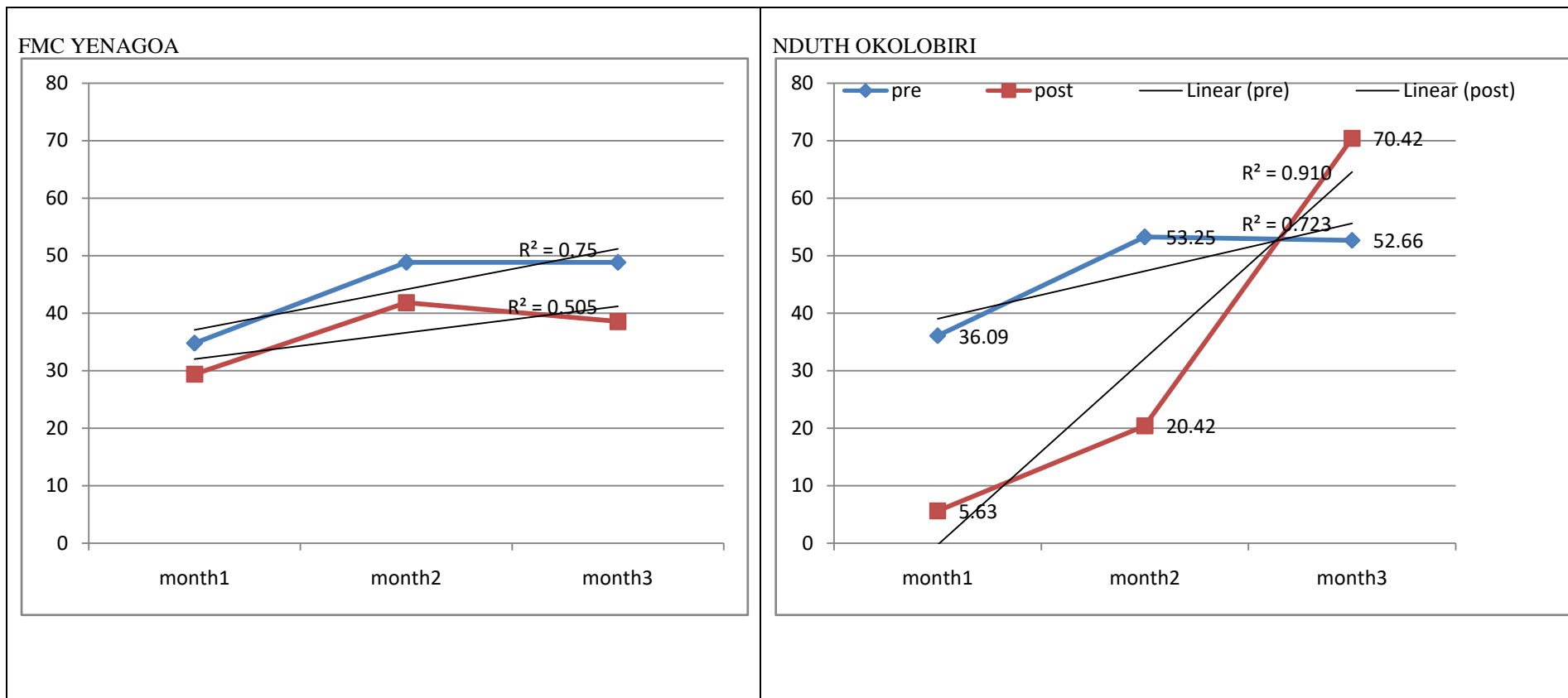


Figure 1: Adherence and goal BP attainment of hypertensive patients in FMC Yenagoa and NDUTH Okolobiri of Bayelsa state, Nigeria

CONCLUSION

The study concludes that educational intervention brought about low but increasing adherence patterns in health facilities in the region. , Marriage, company, education and employment are associated with improved medication adherence tendencies. . The study also revealed an improvement in performance to all psychometric measures of the instrument after the instrument. Goal BP increments were also in tandem with adherence increment.

DECLARATION

I. ACKNOWLEDGEMENT

I am grateful for the ethical consent from the three hospitals involved as well as the co-operation of the health team in these facilities. I say a big thank you to all my colleagues practicing in Bayelsa state for the helping hand given at my request.

CONFLICT OF INTEREST

No conflict of interest is associated with this work.

CONTRIBUTION OF AUTHORS

We declare that this work was done by the author(s) named in this article who also read and approved the manuscript for publication.

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